

DAY 7 AGENT ORANGE TESTIMONY
MOYER V DOW

11147

UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF NEW YORK

-----X
In re

"AGENT ORANGE"

Product Liability Litigation
-----X

MDL No. 381

(All Cases)

FILED

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U. S. DISTRICT COURT E.D.N.Y.

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NOTICE OF CONFIDENTIALITY
AND UPDATED INDEX OF
CONFIDENTIAL DOCUMENTS OF
DEFENDANT THE DOW CHEMICAL
COMPANY

UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF NEW YORK

-----X
In re

"AGENT ORANGE"

Product Liability Litigation
-----X

NOTICE OF CONFIDENTIALITY
AND UPDATED INDEX OF
CONFIDENTIAL DOCUMENTS OF
DEFENDANT THE DOW CHEMICAL
COMPANY

MDL No. 381
(All Cases)

Defendant The Dow Chemical Company ("Dow"), pursuant to the Protective Order regarding Production of Confidential Documents by Defendants dated February 6, 1981 (the "Confidentiality Order"), annexes hereto a Notice of Confidentiality (Exhibit A) and an Updated Index of Confidential Documents (Exhibit B) for those documents which Dow has designated as "CONFIDENTIAL." In accordance with the Confidentiality Order, documents produced pursuant to Procedure B are designated by asterisks herein. All documents produced pursuant to Procedure B are also produced pursuant to Procedure A of the Confidentiality Order.

In accordance with paragraph 14 of the Confidentiality Order, Dow reserves its right to prepare and distribute further notices of confidentiality and indexes as the need arises, and to avail itself of the procedures set forth in the Confidentiality Order for the documents identified therein.

Dated: Garden City, New York
November 16, 1983

RIVKIN, LEFF, SHERMAN, & RADLER

BY: Maurice S. Mintz
A Member of the Firm
Attorneys for the Dow Chemical Company
100 Garden City Plaza
Garden City, New York 11530
(516) 746-7500

TO: Attached Service List

11149

NOTICE OF CONFIDENTIALITY AND
UPDATED INDEX OF CONFIDENTIAL
DOCUMENTS OF THE DOW CHEMICAL
COMPANY

NOTICE OF CONFIDENTIALITY

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
0424112- 0424114*	641006	Dow Campbell, CA	

0424122- 0424124*	650302	Dow Campbell, CA	

1152

Distributees

Campbell, CA
Dow
Ballman, DK
Barstow, ED
Bennett, EW
Bennett, RB
Beutel, AP
Boundy, RH
Branch, CB
Calvin, M
Doan, HD
Doan, LA
Doan, LI
Dow, AB
Dow, HH
Gerstacker, CA
Griswold, ND
Lyon, HH
Weaver, CF
Whiting, M

Campbell, CA
Dow
Ballman, DK
Barstow, ED
Bennett, EW
Bennett, RB
Beutel, AP
Boundy, RH
Branch, CB
Calvin, M
Doan, HD
Doan, LI
Dow, AB
Dow, HH
Gerstacker, CA
Griswold, ND
Lyon, HH
Weaver, CF
Whiting, M

General Subject Matter

Dow Directors' Meeting-Tuesday,
641006

Dow Directors' Meeting-Tuesday,
650203

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
0424134- 0424136*	650706	Dow	
0424137- 0424139*	650707	Dow	
0424157- 0424159*	651102	Dow	
0424188- 0424190*	670606	Dow	
0424191- 0424192*	670505	Dow	

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Distributees

General Subject Matter

Dow Directors' Meeting-Tuesday,
650706

Summary of Executive Committee
Minutes - (650707 650711)

Dow Directors' Meeting-Tuesday,
651102

Dow Directors Meeting-Tuesday,
670606

Summary of Executive Committee
Minutes-670505 670512 670519

Dow Number

Date

Author

Recipient

1124977-
1125002*

670420

11154

Distributees

Dow
Kennett, WW
Putnam, MS
Staehling, EC

General Subject Matter

Defense Dept. Orange Project-
Bases for Dow Proposal

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>	<u>Distributees</u>	<u>General Subject Matter</u>
1726331- 1726333*	000000				Consequences of Overexposure For Tordon; 597 Building

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
1784663*	000000		
1784664*	000000		
1784665*	000000		

Distributees

General Subject Matter

Vinyltoluene-Tar Collection
System and Furnace Reboilers
(M-32052M)

245 - Trichlorophenol - New
Facility

245 - Trichlorophenol - New
Production Facilities

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
2022398- 2022406*	706217	Liening, EL	
2022407- 2022488*	66000	Dow	
2022489- 2022503*	710324	Dow Kennedy, TL Tree, RM	Dow Bosscher, H
2022504- 2022519*	651012	Anderson, RE Harris, JS	Anderson, RE Lueck, AF Schmidtke, DJ Wehn, WE
2022520- 2022528*	651012	Anderson, RE Harris, JS	Anderson, RE Lueck, AF Schmidtke, DJ Wehn, WE
2022529- 2022537*	650518	Wehn, WE Anderson, R.E. DeLisle, NG Leuck, AF Georgen, G	
2022548- 2022571*	700400		

1157

Distributees

General Subject Matter

Gorgacz, SM
Hicks, GM
Stone

Review of Materials Experience at
the Trichlorophenol Plant, 804
Building, for 1973, 1974 and 1975.

2, 4, 5-Trichlorophenol New Plant
- 1966

Trichlorophenol Plant Cooling
Tower, In-Plant Portion (M-700498)

Trichlorophenol Project-Process
Engineering

Trichlorophenol Project-Process
Engineering

New 245-Trichlorophenol Plant

Arteberry, DG
Barton, JT
Bauman, WC
Bechtold, RF
Bellow, RE

Organic Chemicals Department-TS&D
Highlights

Dow Number

Date

Author

Recipient

1158

Distributees

General Subject Matter

Bernstein, MK
 Blair, EH
 Blue, RD
 Bremmer, BJ
 Brown, TE
 Brown, WE
 Bryant, F
 Burgert, BE
 Butcher, BB
 Byrd, GW
 Carlson, RG
 Carmouche, LN
 Cessna, OC
 Chamberlain, M
 Christian, CA
 Coker, WP
 Coon, ET
 Davis, RH
 Davis, RM
 Derby, RL
 Dilley, R
 Dreyer, JW
 Dunn, EE
 Fay, BW
 Fischback, BC
 Friedli, H
 Gold, WL
 Grabiell, CE
 Hanners, HW
 Hansen, R
 Hanson, AW
 Heitz, RG
 Hickner, RA
 Hoblit, LD

Dow Number

Date

Author

Recipient

11159

Distributees

General Subject Matter

Honea, CR
Johnson, J
Jones, GD
Karns, RE
Kelly, ME
Kuchinic, RM
Langner, RB
Lindy, LB
Litherland, LO
Leavitt, FC
Look, AT
Maasberg, AT
Mackenzie, GF
Mackey, JC
Madison, NL
Marklewitz, WE
Marks, CD
McClure, HH
McCoy, CE
McDuff, JM
McIntire, OR
Munden, BJ
Nelson, DL
Nielson, JT
Nielson, WH
Neumann, FW
Ohlmann, EO
Palmer, T
Parsons, CP
Pearson, KS
Peterson, LR
Potts, WT
Prince, AK
Pruitt, ME

Dow Number

Date

Author

Recipient

2022616-
2022666*

700600

Dow

11160

Distributees

General Subject Matter

Rogers, WA
Ruh, RP
Sarge, TW
Schuhmann, JG
Sheehan, TJ
Sheetz, DP
Sienknecht, P
Snyder, IJ
Sorenson, RH
Sparta, TA
Stehling, EC
Trapp, WB
Tucker, JC
Tuttle, FC
Warren, GW
Yocum, RH
Yoshimine, M

Nummy, WR
Maasberg, AT
Ettinger, MB
Busk, RS
Blue, RD
Peterson, NR
Johnson, JE
Bauman, WC
Boyer, RF
Lindsav, RA
Look, AT
Struthers, JA
Rausch, DA
McCoy, E
Prince, AK
Kimmel, CE

Biochemical Research Laboratory.
Quarterly Report April-June 1970

Dow Number

Date

Author

Recipient

11
12
13
14
15

Distributees

General Subject Matter

Westveer, WM
 Schwarz, AJ
 Harrison, RP
 McIntire, OR
 McIntyre, HH
 Gordon, HL
 MacCutcheon, SM
 Kelly, ME
 Bumb, RR
 Dean, PE
 Johnson, RL
 Lake, DE
 Meyer, FJ
 Erratt, RL
 Cheney, GW
 Schaefer, HL
 Graham, DL
 Flynn, JM
 Johnston, RV
 Dowell, FH
 Bauriedel, WR
 Blair, EH
 Howe, RG
 Barrons, KC
 Hymas, TA
 Johnston, Chas.
 Moss, RD
 McCollister, DD
 Reifschneider, W
 Smith, GN
 Osborne, DW
 Strycker, SJ
 Dunbar, JE
 Dorman, LC

Dow Number

Date

Author

Recipient

1000
1001
1002
1003
1004
1005

Distributees

General Subject Matter

Young, AE
 Bjork, CK
 Johnson, MR
 Yates, WM
 Post, T
 Holder, BB
 Kramer, CG
 Morse, DB
 Shannon, ES
 Brower, FM
 Englibous, DL
 Kiley, LR
 Beamer, WW
 Muelder, WW
 Rabold, GP
 Kage, R
 Frevel, LK
 Alfrey, T
 Burgert, BE
 Houtman, T
 Murdoch, PG
 Leavitt, FC
 Pumpelly, CT
 Jezic, Z
 DeMott, DN
 Jones, GD
 Axe, FD
 Boeckler, WH
 Branson, DR
 Charm, JB
 Chenoweth, MB
 Dunn, EE
 Dunn, FL
 Gerguson, JT

Dow Number

Date

Author

Recipient

11163

DistributeesGeneral Subject Matter

Flores, GH
Gehring, PJ
Gooch, RM
Hinman, CW
Holmsen, TW
Hoover, WE
Hoyle, HR
Humiston, CG
Kociba, R
Leong, BK
McCarty, LP
McCollister, SB
McDermott, RD
Moyle, CL
Neely, WB
Norris, JM
Oriel, PJ
Piper, WN
Riley, WH
Rodia, RM
Rowe, VK
Schneider, CW
Schneider, EJ
Schwetz, BA
Silverstein, LG
Sparschu, GL
Spencer, HC
Torkelson, TR
Ts'o, TO
Wolf, MA
Wolf, PA
Wyse, HA
Milch, LJ
Renzi, AA

Dow Number

Date

Author

Recipient

1164

DistributeesGeneral Subject Matter

Barnhart, JW
Robinson, VB
White, HC
Hake, CI
Daniels, ME
Miner, NA
Steward, D
Kilian, DJ
Edwards, HN
Barton, JA
Pruitt, ME
Brown, JH
Ludwig, PD
Heitz, RG
Kagy, JF
Goring, CAI
Lloyd, BH
Staehling, EC
Biggers, MW
Tobey, SW
Hillary, BB
Skory, L
DeGesero, R
Rinzema, L
Schaffer, A
Thompson, C
Naranjo, P
Maffii, G
Sensi, P
Zeller-Celso, L
Lancini, G
Arrigoni-Martelli, E

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
2022674- 2022701*	700600	Dow	

115

Distributees

Johnson, JE
Nummy, WR
Barrons, KC
Hymas, TA
Kagy, JF
Goring, CAI
Heitz, RG
Bailes, RH
Johnston, H
Johnston, RV
Gowell, JH
Popoff, FP
Dowell, FH
Holmsen, TW
Reifschneider, W
Getzendaner, ME
Lynn, GE
Bjork, CK
Blair, EH
Schwarz, AJ
Ludwig, PD
Moss, RD
McCollister, DD
Osborne, DW
Seymour, KG
Winqvist, ME
Gum, W
Busk, RS
Cheney, GW
Flynn, JM
Kelly, ME
McCoy, CE
McIntire, OR
Prince, AK

General Subject Matter

Agricultural Department
Quarterly Progress Report
April - May - June 1970

Dow Number

Date

Author

Recipient

2022702-
202274*

700727

Dow

11165

Distributees

Schwarz, AJ
Struthers, JA
Peterson, LI
Johnston, C

Blair, EH
Hinman, CW
Gaska, R
Frevel, LK
Potts, WL
Friedli, HR
Kelly, ME
Bowman, C
Stall, DR
McIntire, OR
Johnson, JE
Blue, RD
Nummy, WR
VanWestenberg, JA
Prince, AK
Maasberg, AT
Peterson, LI
Brower, F
McCay, CE
Engibous, DL
Busk, RS
Sheetz, DP
Cook, P
Hanson, AW
Struthers, JA
MacKenzie, F
Leavier, FC
White, LW
Schwarz, AJ

General Subject Matter

Eastern Research Lab
Quarterly Progress
Report - April - June 1970

Dow Number

Date

Author

Recipient

2022762-
2022801*

691200

Dow

11167

Distributees

General Subject Matter

Burgert, BE
Novak, RM
Flynn, JM
Alfrey, T
Morocci, PG
Houtman, T
Beame, WH
Bache, AF
Griffii, JD
Rosene, R
Biggers, MW
Blake, CL
White, HC
Quinn, H
Thompson, CF
Brown, JH
Ludwig, PD
McClure, HH
Rogers, WA
Pruitt, ME
Heitz, RG
Kagy, JK
Bailes, R
Brown, CF
Mackey, JC

Johnson, JE
Nummy, WR
Barrons, KC
Hymas, TA
Kagy, JF
Goring, CAI
Heitz, RG
Bailes, RH

Agricultural Department-
Quarterly Progress Report
October - November - December - 1969

Dow Number

Date

Author

Recipient

2022831-
2022849*

700200

Dow

2022859-
2022891*

700300

Dow

1168

Distributees

General Subject Matter

Johnston, H
Johnston, RV
Gowell, JH
Popoff, FP
Dowell, FH
Holmsen, TW
Reifshneider, W
Getzendaner, ME
Lynn, GE
Spalding, JL
Blair, EH
Schwarz, AJ
Ludwig, PD
Jones, GD
Moss, RD
McCollister, DD
Osborne, DW
Seymour, KG
Winqvist, ME

Organic Chemicals Production
Research - Monthly Summary
February 1970

Johnson, JE
Nummy, WR
Barrons, KC
Hymas, TA
Kagy, JF
Goring, CAI
Heitz, RG
Bailes, RH
Johnston, H

Agricultural Department
Quarterly Progress
Report - January - February
March 1970

Dow Number

Date

Author

Recipient

2022892-
2022972*

700600

Dow

1169

Distributees

General Subject Matter

Johnston, RV
Gowell, JH
Popoff, FP
Dowell, FH
Holmsen, TW
Reifschneider, W
Getzendaner, ME
Lynn, GE
Bjork, CK
Blair, EH
Schwarz, AJ
Ludwig, PD
Jones, GD
Moss, RD
McCollister, DD
Osborne, DW
Seymour, KG
Winqvist, ME
Gum, W
Busk, RS
Cheney, GW
Flynn, JM
Kelly, ME
McCoy, CE
McIntire, OR
Prince, AK
Schwarz, AJ
Struthers, JA

Radiochemistry Research
Laboratory - Quarterly Progress
Reports - April - May - June
1970

Dow Number

Date

Author

Recipient

2022973-
2023110

700600

Dow

1110

Distributees

Milch, LJ
Brunton, AM
Dacquisto, MP
Hake, CL
Marshall, FN
Miller, BH
Munden, BJ
Renzi, AA
Robinson, VB
Schell, K
Stavropoulos, WS
White, HC
Shea, PJ
Barnhart, J
Trepanier, DL
Kulkarni, A
Eble, J
Abdallah, A
Wagner, E
Lewis, JE
Miner, N
Steward D
Kenny, M
Torney, H
Taylor, H
Sargent. R
Broersma, R
Anderson, JT
Kammeraad, A
Zoccolillo, R
Johnson, JE
Hinman, CS
McIntyre, OR
Peterson, NR

General Subject Matter

Semi-Annual Progress Report-
Human Health Research and
Development Laboratories - January
June 1970

Dow Number

Date

Author

Recipient

2023173-
2023219*

700900

Dow

1117

Distributees

General Subject Matter

Reifschneider, W
Nummy, WB
Schwarz, AJ
Rampy, LW
Johnson, MR
Blair, E
Strycker, SJ
Johnston, RV
Chenoweth MB
Neely, WB
Moss, RD
Champlain, CE
CRI
Peterson, L
Johnson, FE
Kagy, JF
Heitz, RG
Mulholland, RS
Zelter-Celso, L
Sensi, P
Maffii, G
Nicolias, FB
Furesz, S
Naranjo, P

Blair, EH
Hinman, CW
Hinman, CW
Gaska, R
Frevel, LK
Potts, WJ
Friedli, HR
Kelly, ME
Bowman, C

Eastern Research Laboratory
Quarterly Progress
Report July - September 1970

Dow Number

Date

Author

Recipient

11172

Distributees

General Subject Matter

Stull, DR
McIntire, OR
Johnson, JE
Blue, RD
Nummy, WB
VanWestenburg, JA
Prince, AK
Maasberg, AT
Peterson, LI
Brower, F
McCoy, CE
Engibous, DL
Busk, RS
Sheetz, DP
Look, AT
Hanson, AW
Struthers, JA
MacKenzie, GF
Leavitt, FC
White, LW
Schwarz, AJ
Burgert, BE
Nowak, RM
Flynn, JM
Alfrey, T
Murdock, PG
Houtman, T
Beamer, WH
Griffin, JD
Roche, AF
Rosene, R
Biggers, MW
Hake, CL
White, HC

Dow Number

Date

Author

Recipient

2023256-
2023386*

701200

Dow

11173

Distributees

General Subject Matter

Quinn, H
Thompson, CF
Brown, JH
Ludwig, PD
McClure, HH
Rogers, WA
Pruitt, ME
Heitz, RG
Kagy, JF
Bailes, R
Brown, WE
MacKey, JC

Milch, LJ
Brunton, AH
Dacquist, MP
Hake, CL
Marshall, FN
Miller, BH
Munden, BJ
Renzi, AA
Robinson, VB
Schell, K
Tedeschi, R
Stravropoulos, WS
White, HC
Shea, PJ
Barnhart, J
Trepanier, DL
Kulkarni, A
Fole, J
Abadallah, A
Wagner, E
Lewis, T

Human Health Research and
Development Laboratories
Semi-Annual Progress
Report - July - December 1970

Dow Number

Date

Author

Recipient

Distributees

General Subject Matter

Steward, D
Kenny, M
Turney, H
Taylor, H
Sargent, R
McCarthy, J
Jackson, J
Warner, S
Emerson, J
Molello, J
Gerbig, C
Boerman, R
Anderson, JT
Kammeraad, A
Zoccolillo, K
Johnson, JE
Hinman, CW
McIntyre, OR
Peterson, NR
Reifschneider, W
Nummy, W
Schwartz, AJ
Rampy, LW
Bjork, CK
Blair, E
Strycker, SJ
Johnston, RV
Chenoweth, MB
Neely, WB
Moss, RD
Champlain, E
Reitz, R
Dorman, L
Chow, R

Dow Number

Date

Author

Recipient

2023387-
2023478*

701200

Anders, OU
Atchison, GJ
Blanchard, FA
Doorenbos, HE
Harmer, DE
Himes, RP
Jewett, GL
Kamp, AJ
Kawahara, Y
Kocher, CW
Logan, RA
Mani, I
Muelder, WW
Powers, JB
Babold, GP
Takahaski, IT
Wass, MM

2023557-
2023578*

700615

Dow

11-2
11-2
11-2
11-2
11-2

Distributees

General Subject Matter

Freiter, E
Wysong, D
Tobey, SW
Johnson, FE
Mulholland, RS
Zeller Celso, L
Sensi, P
Maffii, G
Nicolis, FB
Arrigoni-Martelli, E
Nathansohn, G
Silvestri, L
Naranjo, P

Progress Report Covering
October, November, December
1970 and Yearly Summary

Barrons, KC
Blair, EH

Agricultural Department
Research and Development

Dow Number

Date

Author

Recipient

11176

Distributees

Bremner, BJ
Carlson, RG
Dowell, FH
Gantz, RL
Getzendaner, ME
Goring, CAI
Kagy, JF
Gowell, JH
Hanson, RG
Hymas, TA
Jantz, OK
Johnston, C
Johnston, RV
Laning, ER
Library, JC
Little, JC
Ludwig, PD
Shaver, RJ
MacLean, GJ
McCollister, DD
Lynn, GE
Moss, RD
Naegele, RE
Nyman, FA
Osborne, DW
Seymour, KG
Sheldon, HW
Gehring, P
Frevel, LK
McIntire, OR
Johnson, RB
Nummy, WR
Kelly, ME
Peterson, LI

General Subject Matter

Staff Meeting - June
15, 1970

Dow Number

Date

Author

Recipient

2023579-
2023975*

690000

Hess, TM

Nummy, WR
Frevel, LK
Potts, WJ
Department File

2023976-
2024000*

691200

2024001-
2024014*

700109

11172

Distributees

General Subject Matter

DeMott, DN
 Prince, AK
 Nichols, JL
 Schwarz, AJ
 Sheetz, DP
 Bremner, NW
 Kuyper, CK
 Ferguson, RH
 Saunders, ES
 Dalman, G
 Leavitt, FC
 Cheney, GW
 Bjork, K
 Jones, P
 Spalding, J
 Flynn, JM
 Jones, IC
 McClure, HH
 Pruitt, ME
 Bailes, RH
 Johnston, H
 Thompson, C

Chemical Physics Research
 Laboratory, Yearly Progress
 Report and Fourth Quarter
 Summary

Organic Chemicals
 Production Research -
 Monthly Summary

Johnson, JE
 Chamberlain, LC

Summary of Activities
 of the Electrochemical

Dow Number

Date

Author

Recipient

11178

Distributees

Busk, RS
 Bauman, WC
 Blue, RD
 Klesney, SP
 Jowanovitz, LS
 Burgert, BE
 Jones, GD
 Jeitz, RG
 Brubaker, RI
 Neipert, MP
 Myers, JC
 Hickey, JR
 Rollwage, WA
 Williams, EJ
 Frevel, LK
 Dale, EM
 Houtman, T
 Corey, JW
 Lindsay, RA
 Blackney, WC
 Guebert, KW
 Hotchkiss, RL
 Anderson, DL
 McCoy, CE
 Neiechterlein, DC
 Drake, LR
 Murdoch, PG
 Wilcox, AC
 Engibous, DL
 Groves, KO
 Gaska, RA
 Stuart, GA
 Gilbert, JF
 Hillary, BB

General Subject Matter

and Inorganic Chemical
 Research Laboratory
 (Midland) for the months
 October - November - December
 1969

Dow Number

Date

Author

Recipient

2024015-
2024023*

700100

1179

Distributees

General Subject Matter

Matheson, LA
McIntire, OR
Beamer, WH
Lowry, BS
Stenger, VA
Pumpelly, CT
Sarge, TW
Jones, IC
Mod, WA
Bothwell, MR
Thompson, CF

Nelson, DL
Ogden, SO
Parizek, E
Peterson, LI
Prince, AK
Pumpelly, CT
Putnam, MW
Roche, AF
Ruh, RP
Rausch, D
Skochdopole, RE
Sheetz, DP
Struthers, JA
Sutherland, S
Wegner, ER
Wing, MW
Woodward, GE
Woodward, RE
Hultin, R
Nielsoh, WH
Hammond, D
Chase, F

Hydrocarbons and Monomers Research
Laboratory - Inorganic and
Hydrocarbons Research Department
1969 Fourth Quarter Progress
Report - October -November -
December - 1969

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
2024024- 2024042*	700100	Dow	
2024081- 2024139*	700216		
2024140- 2024163*	691200		

091180

Distributees

General Subject Matter

Shannon, F
Zheitoun, M
Ilgenfritz, BM
Deline, D
Pfrommer, C

Organic Chemicals Production
Research Monthly Summary

Chemical Physics Research
Laboratory Summary -Progress
Report - October - November
December - 1969

Alexander, HC
Baker, RL
Bek, CM
Brosier, JS
Colbry, RJ
Daniele, SL
Davis, RD
Fox, RD
Hall, JR
Hall, SD
Hamilton, CE
Hintz, MJ
Ilgenfritz, EM
Kraut, DE
Krienke, ME
Lynch, JE
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Putnam, MS
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 Shively, JF
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 Wass, WE
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 Maasberg, AT
 Nummy, W
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Hemwall, J
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Brower, F
McCoy, GE
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Bosscher, H
Brubaker, RI
Chase, FI
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Coulter, KE
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 Hillary, BB
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From
Rev. Dr.
Rev. Dr.
Rev. Dr.
Rev. Dr.
Rev. Dr.

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Kearney, JK
Kenaga, EE
Kennedy, TL
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made
pen &
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Getzendaner, ME
Lynn, GE
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245-Trichlorophenol 804-7 Bldgs. production facilities

245-Trichlorophenol plant return of funds (authorization M-32063A)

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245-Trichlorophenol plant

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245-Trichlorophenol plant 804-7 Bldg. cost estimate

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0201086 *	000000	Dow	
0201087	650000	W.C.T.	
0201088 *	651006	Hutchenreuther, C Goergen, GG Bosscher, H M.K. B.J.C.	
0201089- 0201090*	651021	Bosscher, H	Timm, WC
0201091 *	651020	Dixon, WR	Key, M
0201092 *	651011	Bosscher, H	Key, M
0201093 *	651027	Goergen, G	
0201094- 0201097*	651027	Wehn, WE	

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Distributees

General Subject Matter

Putnam, MS
Goergen, GG
Bosscher, H

alterations

Staehling, EC
Lueck, AF
Bosscher, H
Putnam, MS
Goergen, GG

245-Trichlorophenol authorized
spent differences capital

New 245-Trichlorophenol (Dow Bd.
of Dir. authorization request
M-32063)

245-Trichlorophenol additional
funds

Review of Trichlorophenol job

Bosscher, H
Henske, JM
Pletcher, DE

Position on the Midland division
Trichlorophenol plant

New 245-Trichlorophenol plant
M-32063

245 Trichlorophenol plant

660000 Trichlorophenol plant cost
reduction

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
0201098 *	650707	Goergen, G	
0201099- 0201101*	651021	Bosscher, H	Branch, CB
0201102- 0201104*	650927	Delisle, NG Wappenhensch, OA Stuart, GA Goergen, GG	
0201105 *	651007	Goergen, GG	Bosscher, H
0201106- 0201107*	651004	Vanarsdale, JD	Timm, W Dimmick, D Doedens, J Hutchenreuther, Staehling, E Gill, W Perry, R Goergen, G Lundquist, J Saphier, L
0201108 *	651001	Vanarsdale, JD	Goergen, GG
0201109 *	650929	Taylor, N	Delisle, NG
0201110- 0201111*	651012	Churchman, JW	Bosscher, H

11209

Distributees

General Subject Matter

Key, M

New Trichlorophenol plant

Trichlorophenol authorization

New 245-Trichlorophenol plant
project scope summary (job 50175)

245-Trichlorophenol

245-Trichlorophenol expansion

C

Delisle, NG
Domick, D

Trichlorophenol requirements

Manning of new Trichlorophenol
plant

Hutchenreuther, C
Timm, WC
Goergen, GG
Mitchel, JE
Moore, HJ

Overrun 245-Trichlorophenol new
facility

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
0201112 *	651018	Churchman, JW	
0201113- 0201114*	651000	Wehn, WE Wappenhensch, O	
0201115 *	000000	H.A.S.	
0201116 *	650526	Churchman, JW	
0201117 *	650608	Bosscher, H	Branch, CB
0201118 *	650622	Henske, JM Doedens, JD	Branch, CB
0278395- 0278390*	540106	Dow Wolf, MA	
0278390- 0278392*	531230		
0278393- 0278395*	540106		
0278396- 0278404*	540106		
0424112- 0424114*	641006	Dow Campbell, CA	

100
 100
 100
 100
 100

Distributees

General Subject Matter

245-Trichlorophenol new facility
(economic summary 39458-65)

245-Trichlorophenol (cost
estimate)

245-Trichlorophenol new facility
(Dow Bd. of Dir. agenda)

245-Trichlorophenol new facility
economic summary

245-Trichlorophenol new
facilities

245-Trichlorophenol new
facilities

M-213 (Acute oral toxicity)

M-213 (Acute oral toxicity)

M-213

M-213 (Skin irritation)

Campbell, CA
Dow
Ballman, DK
Barstow, ED

Dow Directors' Meeting-Tuesday,
641006

Dow Number

Date

Author

Recipient

0424122-
0424124*

650302

Dow
Campbell, CA

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Distributees

General Subject Matter

Bennett, EW
Bennett, RB
Beutel, AP
Boundy, RH
Branch, CB
Calvin, M
Doan, HD
Doan, LA
Doan, LI
Dow, AB
Dow, HH
Gerstacker, CA
Griswold, ND
Lyon, HH
Weaver, CF
Whiting, M

Campbell, CA
Dow

Dow Directors' Meeting-Tuesday,
650203

Ballman, DK
Barstow, ED
Bennett, EW
Bennett, RB
Beutel, AP
Boundy, RH
Branch, CB
Calvin, M
Doan, HD
Doan, LI
Dow, AB
Dow, HH
Gerstacker, CA
Griswold, ND
Lyon, HH

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
0424134- 0424136*	650706	Dow	
0424137- 0424139*	650707	Dow	
0424157- 0424159*	651102	Dow	
0424188- 0424190*	670606	Dow	
0424191- 0424192*	670505	Dow	
0501285- 0501288*	701111	Hoerger, FD	USDA ARS
0501289- 0501291*	701110	Hoerger, FD	USDA ARS
0501292 *	700615	Gladstone, MM	Hoerger, FD
0501356- 501360*	651105	Dow	
0501415 *	660105	Dow	
0501418 *	660105	Dow	

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Distributees

Weaver, CF
Whiting, M

General Subject Matter

Dow Directors' Meeting-Tuesday,
650706

Summary of Executive Committee
Minutes - (650707 650711)

Dow Directors' Meeting-Tuesday,
651102

Dow Directors Meeting-Tuesday,
670606

Summary of Executive Committee
Minutes-670505 670512 670519

Brush Killer LV2-2

Brush killer LV2-2

Product registration

Brush killer LV 2-2 composition
statement

Brush killer X confidential state-
ment of formula

Brush killer X confidential
statement of formula

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
0501659 *	691015	Turner, WF	
0501660- 0501668*	700629	Parsey, ES Van Horn, RL	
0502357- 502358*	650618	Sachs, SD	Downard, GM
0502631 *	660630	Dow	
0502740 *	690108	Dow	
0503722 *	670111	Dow	
0503890 *	630910	Dow	
0503923 *	000000	Dow	
0504055 *	660721	Dow	

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Distributees

General Subject Matter

Registration of economic poisons

Butyl 400 evaluation

Rutherford, RE
Sunderland, WW
Hammer, OH

DMA-6 confidential ingredient
statement

Esteron brush killer OS complete
ingredient statement

Alford, HG
McCollister, DD
Davidson, JH
McCoy, WJ
Sunderkland, WW
Talcott, AT
Hammer, OH

Esteron 3-3 weed and brush killer
production specifications

Esteron 67-33 OS confidential
complete statement of ingredients
and sources of raw materials

Esteron 76BE production
specification

Esteron 76BE

Downard, GM
Sachs, SB
Hammer, OH
Sunderland, WW

Production specifications for
Esteron 76E and sources of
raw materials

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
0504056 *	667021	Dow	
0504060 *	640422	White, LC, Jr. DeLong, HC Highhill, CA Hudberg, RN Loucks, MF Ouellette, FE Korsmeier, KB	
0504090- 0504093*	000000	Dow	
0504094 *	620521	Holdeman, GE	Gildart, CM
0504438 *	700619		
0504439- 0504447*	700519	Van Horn, RL Parsey, ES	
0505582 *	000000		
0525660- 0525661*	660427	Dow	
0526601 *	671030	Dow	
0526602- 0526603*	671030	Dow	

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Distributees

General Subject Matter

Downard, GM
Sachs, SB
Hammer, OH
Sunderland, WW

Production specifications for
Esteron 76E and sources of
raw materials

Sheddel, RJ
Higgins, HS

Production specifications for
Esteron 76E

Information on inert ingredients
used in Dow pesticides

Vanvalkenburg, JW

Carlisle base 5136
Carlisle chemical works

Esteron 99 concentrate, com-
position and raw materials

Esteron 99 concentrate - eva-
luation of revised formulation

Formula 40, ingredient statement

M-3060 specifications

Composition and raw materials
for Tordon 2S weed killer

Composition and raw materials for
Tordon 202 mixture

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
0526604- 0526605*	671030	Dow	
0525606- 0526607*	671030	Dow	
0526608- 0526612*	671103	Dow	
0538171- 0538172*	710114	Dow	
0538173 *	710114	Dow	
0538174 *	710114	Dow	
0538175 *	710114	Dow	
0538176 *	710114	Dow	
0538177 *	710114	Dow	
0538178 *	710114	Dow	
0538179 *	710114	Dow	
0538180 *	710114	Dow	
0538181 *	710114	Dow	
0538182 *	710114	Dow	

Distributees

General Subject Matter

Composition and raw materials
for Tordon 212 mixture

Composition and raw materials
for Tordon 225 herbicide

Composition of formulations used
in experimental work for
registration

Brush killer LV 4T specifications

Brush killer T specifications

Brush killer TX specifications

Esteron 3-3 specifications

Esteron 245 specifications

Esteron 245 specifications

Esteron brush killer specifi-
cations

Reddon specifications

Tippon 2-2 specifications

Tippon T6 specifications

Veon 245 specifications

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
0554125- 0554176*	680613	Seidel, M Brown, M. Highhill, C	
0564850- 0564851*	000000	Dow Hoyle, HR JMN	
0706649- 0706659*	650518	Dow	
0724839- 0724844*	000000	Dow	
0724845- 0724872*	631104	Seidel, EM	

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General Subject Matter

Bleiweiss, J
Beauchamp, R
Crummett, W
Deline, D
DeLong, H
Dosser, R
Fernandez, J
Highhill, C
Hoff, D
Seidel, M
Schwark, J
Snodgrass, B
Woodward, D

A technological review of phenoxy
and Tordon formulation

Tordon 225 herbicide (Data sheet
of properties, health hazards, and
precautions for safe handling of
materials)

245T plant operations course
P.O.C. 6020-Unit 13

General process description new
processes for 2,4-D, 2,4,5-T

Chase, FI
Seidel, EM
Dosser, RC
Amstutz, FC
Dylewski, SW
Deline, DD
Delisle, NG
Croese, WL
Fernandez, JB

Preliminary economics in alter-
nate 245T ester process

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
0724873- 0724885*	640309	Seidel, EM	
0724886- 0724892*	640104	Seidel, EM	
0724963 *	000000	Dow	
0725072- 0725075*	000000	Dow	
0725076- 0725078*	000000	Dow	
0725107- 0725112*	000000	Dow	
0725134 *	000000	Chase, FI	
0725135- 0725136*	660608	Dow	
0725137- 0725144*	000000	Dow	

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Distributees

General Subject Matter

Sculati, JJ
Seidel, EM

Dosser, RC
Amstutz, FC
Dylewski, SW
Deline, DD
Delisle, NG
Grose, WL
Highhill, CA
Fernandez, JB
Sculati, JJ
Chase, FI

Economic evaluation of alternate
245T ester process

Analysis of two processes for
producing phenoxy esters

245T process block flow chart

Direct ester operating
instructions

Transfer of raw materials to H, E
& C

Procedures

Switching pumps, instructions

Column flush

Operating instructions

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
0725145 *	000000	Dow	
0725179- 0725184*	650615	Dow	
0725190- 0725191*	000000	Dow	
0725218- 0725224*	000000	T.A.G.	
0725503 *	640810	White, LC, Jr. DeLong, HC Highhill, CA Amstutz, FC Hudberg, RN Loucks, MF McCoy, WJ Ouellette, FE Holdeman, GE	
0725504 *	640810	White, LC, Jr. DeLong, HC Highhill, CA Amstutz, FC Hudberg, RN Loucks, MF Corbin, WL Ouellette, FE Holdeman, GE	

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General Subject Matter

Instructions

Pulsafeeder test sheet hydrochloric acid

Instructions, procedures

Direct Ester reaction information
489 Bldg. Dichlorophenol Dowanol

Product specification for Veon 245

White, LC, Jr.
DeLong, HC
Highhill, CA
Amstutz, FC
Hudberg, RN
Loucks, MF
McCoy, WJ
Ouellette, FE
Holdeman, GE
Scheddel, RT
Higgins, HS

Product specification for Veon
brush killer

White, LC, Jr.
DeLong, HC
Highhill, CA
Amstutz, FC
Hudberg, RN
Loucks, MF
Corbin, WLN
Ouellette, FE
Holdeman, GE
Scheddel, RT
Higgins, HS

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
0725505 *	601101	Dosser, RC Highhill, CA Luce, EN Loucks, MF Nyman, FA Smith, HL Ouellette, FE	
0725508 *	660406	Highhill, CA White, LC, Jr. DeLong, HC Amstutz, FC Hudberg, RN Loucks, MF McCoy, WJ Talcott, AT Holdeman, GE	
0725509 *	670413	Falkenstein, WJ Amstutz, FC Hudberg, RN Loucks, MF McCoy, WJ Talcott, AT Holdeman, GE	
0725510 *	690227	Matuska, RJ Murphy, RW	

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Distributees

General Subject Matter

Dosser, RC
 Highhill, CA
 Luce, EN
 Loucks, MF
 Nyman, FA
 Smith, HL
 Ouellette, FE

Product specification for 245T
 Amine weed killer

Highhill, CA
 White, LC, Jr.
 Delong, HC
 Amstutz, FC
 Loucks, MF
 McCoy, WJ
 Talcott, AT
 Holdeman, GE
 Scheddel, RP
 Higgins, HS

Product specifications for weed
 killer LV4

Falkenstein, WJ
 Amstutz, FC
 Hudberg, RN
 Loucks, MF
 McCoy, WJ
 Talcott, AT
 Holdeman, GE
 Scheddel, RT
 Higgins, HA
 Richardson, HA
 Skory, L
 Brown, R

Product specification for Verton
 T

Matuska, RJ
 Murphy, RW

Product specification for Verton
 4D

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
		Loucks, MF Fraser, JM Hawley, HM Sheldon, HW Talcott, AT Holdeman, GE	
0725511 *	680416	White, LC Falkenstein, WJ Hawley, HM Corbin, WL Talcott, AT Holdeman, GE	
0725512 *	670708	Falkenstein, WJ Scoles, GW Amstutz, FC Hudberg, EN Scheddel, RT Luce, EN McCoy, WJ Talcott, AT Holdeman, GE	
0725513 *	730223	Blosser, KC Gill, HH Chase, FI	

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DistributeesGeneral Subject Matter

Loucks, MF
 Fraser, JM
 Hawley, HM
 Sheldon, HW
 Talcott, AT
 Holdeman, GE
 McCoy, WJ

White, LC
 Falkenstein, WJ
 Hawley, HM
 Corbin, WL
 Talcott, AT
 Holdeman, GE
 Scheddel, RT
 Reigler, PT

Falkenstein, WJ
 Amstutz, FC
 Hudberg, EN
 Scheddel, RT
 Luce, EN
 McCoy, WJ
 Talcott, AT
 Holdeman, GE
 Wiffin, EE
 Richardson, HA
 Skory, L
 Brown, R
 Butler, A

Blosser, KC
 Gill, HH
 Chase, FI

Product specification for Verton
 2D

Product specification for Verton
 CE

Product specification for Dow
 Butyl 400 24D weed killer

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
		Woodward, R Hoff, RC Fraser, JM Seymour, KG Hanson, KY Flannery, RF Talcott, AT Holdeman, GE	
0725514 *	630507	White, LC, Jr. DeLong, HC Highhill, CA Amstutz, FC Niehoff, BR Loucks, MF Korsmeier, RB Ouellette, FE Holdeman, GE	
0725515 *	720316	Flannery, RF Seymour, KG Chase, FI Woodward, R Gill, HH Blosser, KC Hoff, RC Scoles, GW Talcott, AT Holdeman, GE	
0725516 *	630507	White, LC, Jr. DeLong, HC Highhill, CA Amstutz, FC	

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General Subject Matter

Woodward, R
Hoff, RC
Frazer, JM
Seymour, KG
Hanson, KY
Flannery, RF
Talcott, AT
Holdeman, GE

Product specification for Dow
Butyl 400

White, LC, Jr.
Delong, HC
Highhill, CA
Amstutz, FC
Niehoff, BR
Loucks, MF
Ouellette, FE
Holdeman, GE

Product specification for lawn
weed killer

Flannery, RF
Seymour, KG
Chase, FT
Woodward, R
Gill, HH
Blosser, KC
Hoff, RC
Scoles, GW
Talcott, AT
Holdeman, GE

Product specification for
Reddon

White, LC. Jr.
Delong, HC
Highhill, CA
Amstutz, FC

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
		Niehoff, BR Loucks, MF Korsmeier, RB Ouellette, FE Holdeman, GE	
0725517 *	640213	White, LC, Jr. DeLong, HC Highhill, CA Amstutz, FC Niehoff, BR Loucks, MF Korsmeier, RB Ouellette, FE Holdeman, GE	
0725518 *	630415	Highhill, CA Amstutz, FC White, LC, Jr. Niehoff, BR Loucks, MF Korsmeier, RB Ouellette, FE Holdeman, GE	
0725519 *	730822	Seymour, KG Blosser, KC Hodges, KL Chase, FI Woodward, R Hoff, RC Fraser, JM McCutchen, L	

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Distributees

General Subject Matter

Niehoff, BR
Loucks, MF
Ouellette, FE
Holdeman, GE

White, LC, Jr.
DeLong, HC
Highhill, CA
Amstutz, FC
Niehoff, BR
Loucks, MF
Korsmeier, RB
Ouellette, FE
Holdeman, GE

Product specification for Tippon
2-2

Highhill, CA
Amstutz, FC
White, LC, Jr.
Niehoff, BR
Loucks, MF
Ouellette, FE
Holdeman, GE

Product specification for Tippon T4

Seymour, KG
Blosser, KC
Hodges, KL
Chase, FI
Woodward, R
Hoff, RC
Fraser, JM
McCutchen, L

Production specification for
Tippon T6 weed and brush killer

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
		Flannery, RF Talcott, AT Holdeman, GE	
0725522 *	690106	Dow	
0725523 *	690106	Dow	
0725524 *	660418	White, LC, Jr. DeLong, HC Amstutz, FC Hudberg, RN Loucks, MF McCoy, WJ Talcott, AT Holdeman, GE	
0725525 *	720218	Seymour, KG Chase, FI Flannery, MF Tait, SR Woodward, R Scoles, GW Hoff, RC Talcott, AT Flannery, RF Holdeman, GE	
0725526 *	660418	White, LC, Jr. DeLong, HC	

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Distributees

General Subject Matter

Flannery, RF
Talcott, AT
Holdeman, GE

Suggested product specification
for brush killer T 334

Suggested product specification
for brush killer 50-25

White, LC, Jr.
DeLong, HC
Amstutz, FC
Hudberg, RN
Loucks, MF
McCoy, WJ
Talcott, AT
Holdeman, GE
Scheddel, RT
Higgins, HS

Product specification for brush
killer LV 4T

Seymour, KG
Chase, FI
Flannery, MF
Tait, SR
Woodward, R
Scoles, GW
Hoff, RC
Talcott, AT
Flannery, RF
Holdeman, GE

Product specification for brush
killer LV 2-2

White, LC, Jr.
DeLong, HC

Product specification for brush
killer LV 2-2

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
		Amstutz, FC Hudberg, RN Loucks, MF McCoy, WJ Talcott, AT Holdeman, GE	
0725527 *	651007	Dow	
0725528 *	630424	DeLong, HC Highhill, CA Amstutz, FC White, LC, Jr. Hoff, RC Loucks, MF Korsmeier, RB Ouellette, FE	
0725529 *	721013	Flannery, RF Blosser, KC Gill, HH Chase, FI Woodward, R Hoff, RC Fraser, JM Talcott, AT Holdeman, GE	
0725530 *	630424	DeLong, HC Highhill, CA	

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Distributees

General Subject Matter

Amstutz, FC
Hudberg, RN
Loucks, MF
McCoy, WJ
Talcott, AT
Holdeman, GE
Scheddel, RT
Higgins, HS

Product specification for brush
killer Lv 2-2

DeLong, HC
Highhill, CA
Amstutz, FC
White, LC, Jr.
Hoff, RC
Loucks, MF
Ouellette, FE
Holdeman, FE

Product specification for Esteron
brush killer OS

Flannery, RF
Blosser, KC
Gill, HH
Chase, FI
Woodward, R
Hoff, RC
Fraser, JM
Talcott, AT
Holdeman, GE

Product specification for Reddon

DeLong, HC
Highhill, CA

Product specification for Esteron
Ten-Ten

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
		Amstutz, FC White, LC, Jr. Hoff, RC Loucks, MF Korsmeier, RB Ouellette, FE	
0725531 *	720108	Flannery, RF Seymour, KG Loucks, MF Tait, SR Chase, FI Woodward, R. Hoff, RC Scoles, GW Talcott, AT Holdeman, GE	
0725532 *	601004	Dosser, RC DeLong, HC Loucks, MF Luce, EN Nyman, FA Smith, HL Ouellette, FE	
0725533 *	650125	Dow	
0725534 *	640612	White, LC, Jr. DeLong, HC Highhill, CA Amstutz, FC	

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20
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Distributees

General Subject Matter

Amstutz, FC
 White, LC, Jr.
 Hoff, RC
 Loucks, MF
 Ouellette, FE
 Holdeman, GE

Flannery, RF
 Seymour, KG
 Loucks, MF
 Tait, SR
 Chase, FI
 Woodward, R
 Hoff, RC
 Scoles, GW
 Talcott, AT
 Holdeman, GE

Product specification for Esteron
 44 weed killer

Dosser, RC
 Delong, HC
 Loucks, MF
 Luce, EN
 Nyman, FA
 Smith, HL
 Ouellette, FE

Product specification for Esteron
 44

Suggested product specification
 for Esteron 47

White, LC, Jr.
 Delong, HC
 Hudberg, RN
 Loucks, MF

Product specification for Esteron
 67-33 OS

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
		Hudberg, RN Loucks, MF Korsmeier, RB Ouellette, FE Holdeman, GE	
0725535 *	660721	White, LC, Jr. Delong, HC Highhill, CA Deline, DD Hudberg, RN Loucks, MF McCoy, WJ Talcott, AT Holdeman, GE	
0725536 *	681118	Highhill, CA Woodward, RE Hawley, HM Loucks, MF McCoy, WJ Talcott, AT Holdeman, GE	
0725537 *	710317	Seymour, KG Chase, FI Loucks, MF Reigler, PF Woodward, R Hawley, HM	

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DistributeesGeneral Subject Matter

Korsmeier, RB
 Ouellette, FE
 Holdeman, GE
 Higgins, HS
 Scheddel, RT

White, LC, Jr.
 Delong, HC
 Highhill, CA
 Deline, DD
 Hudberg, RN
 Loucks, MF
 McCoy, WJ
 Talcott, AT
 Holdeman, GE
 Scheddel, RT
 Higgins, HS

Product specification for Esteron
 76E

Highhill, CA
 Woodward, RE
 Hawley, HM
 Talcott, AT

Product specification for Esteron
 76BE

Seymour, KG
 Chase, FI
 Loucks, MF
 Reigler, PF
 Woodward, R
 Hawley, HM

Product specification for Esteron
 76E herbicide

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
		Talcott, AT MacDonald, LA Holdeman, GE	
0725538 *	630424	Delong, HC Highhill, CA Amstutz, FC White, LC, Jr. Hoff, RC Loucks, MF Korsmeier, RB Ouellette, FE Holdeman, FE	
0725539 *	670717	Highhill, CA White, LC Deline, DD Hudberg, RN Loucks, MF McCoy, WJ Talcott, AT Holdeman, GE	
0725540 *	670214	White, LC Delong, HC Highhill, CA Deline, DD	

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Distributees

General Subject Matter

Talcott, AT
MacDonald, LA
Holdeman, GE

DeLong, HC
Highhill, CA
Amstutz, FC
White, LC, Jr.
Hoff, RC
Loucks, MF
Ouellette, FE
Holdeman, GE

Product specification for Esteron 99

Highhill, CA
White, LC
Deline, DD
Hudberg, RN
Loucks, MF
McCoy, WJ
Talcott, AT
Holdeman, GE
Higgins, HS
Scheddel, RT
Wiffen, EE
Richardson, HA
Skory, LK
Brown, R
Butler, A

Product specification for Esteron 99
concentrate

White, LC
DeLong, HC
Highhill, CA
Deline, DD

Product specification for Esteron
245 OS

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
		Hudberg, RN Loucks, MF McCoy, WJ Talcott, AT Holdeman, GE	
0725541 *	630507	White, LC, Jr. DeLong, HC Highhill, CA Amstutz, FC Niehoff, BR Loucks, MF Korsmeier, RB Ouellette, FE Holdeman, GE	
0725542	641019	White, LC, Jr. DeLong, HC Highhill, CA Amstutz, FC Hudberg, RN Loucks, MF McCoy, WJ Ouellette, FE Holdeman, GE	
0725543 *	610906	Vanvalkenburg, W White, LC, Jr.	

11228

Distributees

General Subject Matter

Hudberg, RN
 Loucks, MF
 McCoy, WJ
 Talcott, AT
 Holdeman, GE
 Higgins, HS
 Scheddel, RL
 Richardson, HA
 Skory, L
 Brown, R

White, LC, Jr.
 Delong, HC
 Highhill, CA
 Amstutz, FC
 Niehoff, BR
 Loucks, MF
 Ouellette, FE
 Holdeman, GE

Product specification for Esteron
 245 concentrate

White, LC, Jr.
 Delong, HC
 Highhill, CA
 Hudberg, RN
 Loucks, MF
 McCoy, WJ
 Holdeman, FE
 Scheddel, RT
 Higgins, HS

Product specification for Esteron
 600

Vanvalkenburg, W
 White, LC, Jr.

Product specification for Esteron
 seventy

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
		DeLong, HC Luce, EN Loucks, MF Nyman, FA Smith, HL Ouellette, FE	
0725544 *	660121	White, LC, Jr. DeLong, HC Highhill, CA Amstutz, FC Hudberg, RN Loucks, MF McCoy, WJ Talcott, AT Holdeman, GE	
0725546 *	571226	Watson, G	
0725547 *	620104	Scoles, GW	
0725548 *	690219	Vanhorn, R	
0725549 *	620213	Scoles, G	
0725550 *	620213	Scoles, G	

11000

Distributees

General Subject Matter

DeLong, HC
Luce, EN
Loucks, MF
Nyman, FA
Smith, HL
Ouellette, FE

White, LC, Jr.
DeLong, HC
Highhill, CA
Amstutz, FC
Hudberg, RN
Loucks, MF
McCoy, WJ
Talcott, AT
Holdeman, GE
Scheddel, RT
Higgins, HS

Product specification for Esteron
6E

Production specification Brush
Killer 21

Production specification Brush
Killer 50-50

Brush Killer T production
specification

Brush Killer TX production
specification

Brush Killer X production
specification

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
0725551 *	650809	Vanhorn, R	
0725555 *	610928	Scoles, G	
0725558 *	661011	Vanhorn, R	
0725871 - 0725881 *	000000	Dow	
0725903 *	000000	Dow	
0725904 *	000000	Dow	
0725905 *	000000	Dow	
0725906 *	000000	Dow	
0725907 *	000000	Dow	
0725908 *	000000	Dow	
0725909 *	000000	Dow	
0725910 *	000000	Dow	

Distributees

General Subject Matter

Esteron T2 production specification

Clover Killer (discontinued) production specification

Verton 2 (not released) production specification

Safe work procedure Tordon 225E

Tordon production charges

Tordon 101 batch calculations and adjustments

Tordon 212 batch calculations and adjustments

Tordon 2696 batch calculations and adjustments

Tordon K salt and Tordon 22K batch calculations and adjustments

Tordon 155 batch calculations and adjustments

Tordon 472 batch calculations and adjustments

Tordon 40 batch calculations and adjustments

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
0725911 *	000000	Dow	
0725912 *	000000	Dow	
0725915 *	000000	Dow	
0725917- 0725920*	000000	Dow	
0725940 *	700414	Dow	
0725954- 0725960*	690612	Dow	
0725961- 0725963*	700921		
0725977	720218	Dow	
0726026- 0726036*	000000	Dow	
0726037 *	701020	Dow	
0746427- 0746472*	670109	Johnson, RL Widiger, AH	

1004
1-1
20
60
1004

Distributees

General Subject Matter

Loading TIPA Tordon concentrate

Tordon formulations

Tordon formulations

Tordon 22K batch 810713

Tordon 225 product specification

Tordon 225 formulation

Description of process for production of Tordon 225

245T production specification

Formulating instructions for Tordon 472

Tordon brush killer 520 production and sales specifications

Johnson, RL
Widiger, H
Bender, S
Bailey, C
Silverstein, L
Cobler, J
Haberstroh, W
Sauers, R

Thermal decomposition of dry sodium salts of chlorinated phenates

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
0746430- 0746447*	650804	Wagoner, EJ Cobler, JG	Widiger, A Johnson, RL
0747126- 0747128*	640730	Holmes, R	Hoyle, HR
0750332- 0750354*	571122	Dow McCollister, DD Olson, KJ	

0750465- 0750469*	501017	Adams, EM Dow McCollister, DD Rowe, VK	Allen, WW Alquist, FN Britton, JW Dossier, RC Dow

112222

Distributees

General Subject Matter

Differential thermal analysis of various chlorophenols

Trichlorophenol manufacture

Allinson, RL
Athay, RN
Beshgetoor, AW
Boundy, RH
Colby, RW
Dosser, RC
Dow
Elshere, D
Gay, HH
Greene, LM
Hart, A
Hymas, TA
Jones, GD
Kilian, DJ
Luce, EN
Martin, D
McIntyre, HH
Mussell, DR
Perkins, RP
Tisdale, WO
White, LC
Wright, N

Results of range finding toxicological tests on Brush Killer X, Weed Killer X, and Brush Killer TX

Results of skin irritation and skin sensitization tests conducted on human subjects with Esteron 245 (New Ester)

Dow Number

Date

Author

Recipient

Dutton, WC
Irish, DD
Kagy, JF
Lynn, GE

0750470-
0750484*

530217

Dow
RJE
McCollister, DD
Oyen, F

11233

Distributees

General Subject Matter

Allen, WW
Allinson, RL
Alquist, FN
Beshgetoor, AW
Boundy, RH
Britton, EC
Britton, JW
Collier, B
Davidson, JH
Dow
Dutton, WC
Gay, HH
Gibson, J
Greene, LN
Heath, SB
Johnson, JE
Kagy, JF
Kelly, JA
Kriner, RR
Luce, EN
Lynn, GE
MacCutcheon
Melass, VH
Nation, HA
Otis, CE
Prendergast, DT
Southwick, L
Sunderland, WW

Results of range finding toxicological tests on Esteron 245

Dow Number

Date

Author

Recipient

0750560-
0750587*

531030

Adams, EM
Oyen, F

0750602-
0750633*

560501

Dow
McCollister, DD
Torkelson, TR

1
1
2
3
4

Distributees

Vanhorn, JC
Walker, H
White, LC
Wright, P
Zuhl, HH

General Subject Matter

Results of range finding toxicological tests on Dow Brush Killer T

Allen, WW
Allinson, RL
Alquist, FN
Barrons, KC
Beshgetoor, AW
Boundy, RH
Britton, EC
Davidson, JH
Dow
Dutton, WC
Gay, HH
Greene, LM
Kagy, JF
Luce, EN
Lynn, GE
MacCutcheon, SM
Prescott, RF
Sunderland, WW
White, L
Wright, P

Results of range finding toxicological tests on M-631 (Esteron 245-Type Formulation)

Allinson, RL
Beshgetoor, AW
Boundy, RH
Britton, EC
Coulter, LL
Dow

Dow Number

Date

Author

Recipient

0750666-
0750693*

560409

Dow
McCollister, DD
Wolf, MA

0750694-
0750714*

560702

Dow
McCollister, DD
Olson, KJ

11235

Distributees

Elshere, D
 Gay, HH
 Greene, LM
 Hart, A
 Kilian, DJ
 Luce, EN
 McCutcheon, SM
 Martin, D
 Scoles, G
 Sunderland, WW
 Wright, N

Allinson, RL
 Beshgetoor, AW
 Boundy, RH
 Britton, EC
 Colby, RW
 Dow
 Elshere, D
 Gay, HH
 Greene, LM
 Hart, A
 Kagy, JF
 Kelly, J
 Kilian, DJ
 Luce, EN
 Lynn, GE
 MacCutcheon, SM
 Sunderland, WW
 Wright, N

Allinson, RL
 Alquist, FN
 Barrons, KC

General Subject Matter

Results of range finding toxicological tests on formulations of Reddon (M-640 and M-713)

Results of range finding toxicological tests on Esteron Brush Killer O.S. (M-726)

Dow Number

Date

Author

Recipient

0750719-
0750726*

570806

Dow
Hoyle, HR
Wolf, MA

11388

Distributees

General Subject Matter

Beshgetoor, AW
 Boundy, RH
 Britton, EC
 Colby, RW
 Dow
 Elshere, D
 Gay, HH
 Greene, LM
 Hart, A
 Kagy, KF
 Kelly, JA
 Kilian, DJ
 Luce, EN
 Lynn, GE
 MacCutcheon, SM
 Sunderland, WW
 Wright, N

Results of range finding toxicological tests on M-1085 (A 245T Triethylamine Liquid Formulation)

Allinson, RL
 Athay, RM
 Beshgetoor, AW
 Boundy, RH
 Colby, RW
 Dow
 Elshere, D
 Gay, HH
 Greene, LM
 Hart, A
 Jones, GD
 Kagy, JF
 Kilian, DJ
 Luce, EN
 Lynn, GE
 McCollister, DD

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
0750727- 0750736*	570510	Babcock, I Dow Dunn, EE KS MAW	Dow Wolf, MA
0750739- 0750740*	570510	Dow Hoyle, HR McCollister, DD Wolf, MA	
0750741- 0750743*	000000	Dow Hoyle, HR McCollister, DD Wolf, MA	
0750744- 0750746*	580521	Dow McCollister, DD Olson, KJ	Coulter, LL Dow
0750747- 0750764*	580425	Dow Hoyle, HR McCollister, DD Olson, KJ	

11237

Distributees

McIntyre, HH
 Mussell, DR
 Perkins, RP
 Scoles, GW
 Tisdale, WL
 Wright, N

General Subject Matter

Request for application testing
 for M-1085 with eye and skin
 contact tests attached

M-1085 data sheet of properties,
 health hazards, and precautions
 for safe handling of materials

M-1085 data sheet of properties,
 health hazards, and precautions
 for safe handling of materials

Results of range finding toxicolo-
 gical tests on Weed Killer
 Formulation M-1094 containing a
 245T Ester

Allinson, RL
 Athay, RM
 Beshgetoor, AW
 Boundy, RH
 Colby, RW
 Coulter, LL

M-1094 Weed Killer Formulation
 Data sheet of properties, health
 hazards and precautions for safe
 handling of materials

Dow Number

Date

Author

Recipient

0750769-
0750790*

610316

Hoyle, HR
Olson, KJ
Oyen, F
Thompson, E

112300

Distributees

General Subject Matter

Dow
Elshere, D
Fletcher, FW
Gay, HH
Greene, LM
Hammer, OH
Hart, A
Jones, GD
Kagy, JF
Kilian, DJ
Luce, EN
McIntyre, HH
Perkins, RP
Scoles, GW
Tisdale, WL
Vanvalkenburg, W
Wright, N

Results of range finding toxicological tests on M-1123

Barrons, KC
Boundy, RH
Colby, RW
Dow
Elshere, D
Falkenstein, WJ
Gay, HH
Greene, LM
Hart, A
Jones, GD
Kagy, JF
Kilian, DJ
Luce, EN
Lynn, GE
McIntyre, HH
Perkins, RP

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>

0750791- 0750793*	000000	Hoyle, HR Olson, KJ Oyen, F	

0750795- 0750813*	600125	Dow Oyen, F Wolf, MA	

0750814- 0750827*	610601	Dow Olson, KJ Oyen, F	

11239

Distributees

Shrader, SA
Tisdale, WL
Vanvalkenburg, W
Wright, N

General Subject Matter

M-1123 data sheet of properties,
health hazards, and precautions
for safe handling of materials

Barrons, KC
Boundy, RH
Colby, RW
Dow
Elshere, D
Gay, HH
Greene, LM
Hammer, OH
Hart, A
Hymas, TA
Jones, GD
Kagy, JF
Kilian, DJ
Luce, EN
Lynn, GE
McIntyre, HH
Perkins, RP
Stenger, VA
Tisdale, WL
Wright, N

Results of range finding toxicolo-
gical tests on Esteron 245 OS
(M-1257)

Barrons, KC
Boundy, RH
Colby, RW
Dow

Results of range finding toxicolo-
gical tests on Esteron 245 OS
(Replacement for present
Formulation M-1257)

Dow Number

Date

Author

Recipient

0750833-
0750854*

571122

Dow
McCollister, DD
Olson, KJ

11240

Distributees

General Subject Matter

Elshere, D
 Falkenstein, WJ
 Gay, HH
 Greene, LM
 Hart, A
 Jones, GD
 Kagy, JF
 Kilian, DJ
 Luce, EN
 Lynn, GE
 McIntyre, HH
 Perkins, RP
 Shrader, SA
 Tisdale, WL
 White, LC, Jr.
 Wright, N

Results of range finding toxicological tests on Brush Killer X, Weed Killer X, and Brush Killer TX

Allinson, RL
 Athay, RM
 Beshgetoor, AW
 Boundy, RH
 Colby, RW
 Dosser, RC
 Dow
 Elshere, D
 Gay, HH
 Greene, LM
 Hart, A
 Hymas, TA
 Jones, GD
 Kilian, DJ
 Luce, EN
 Martin, D
 McIntyre, HH

Dow Number

Date

Author

Recipient

0750855-
0750873*

590818

Olson, KJ
Oyen, F

0750874-
0750876*

590706

Dow
Hoyle, HR
Olson, KJ
Oyen, F

11241

Distributees

Mussell, DR
Perkins, RP
Tisdale, WL
White, LC
Wright, N

Barrons, KC
Boundy, RH
Colby, RW
Dow
Elshere, D
Gay, HH
Gray, HE
Greene, LM
Hammer, OH
Hart, A
Hymas, TA
Jones, GD
Kagy, JF
Kilian, DJ
Luce, EN
Lynn, GE
McIntyre, HH
Perkins, RP
Scoles, G
Stenger, VA
Tisdale, WL
Wright, N

General Subject Matter

Results of range finding toxicological tests on M-1413 (Formulation of Dowanol Ester 245T) made for the Stull Chemical Company

M-1413 Formulation of K 7856 (Dowanol Ester 245T). Data sheet of properties, health hazards and precautions for safe handling of materials

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
0750878- 0750903*	590506	Dow McCollister, DD Wolf, MA	

0750915- 0750940*	590506	Dow McCollister, DD Wolf, MA	

11242

Distributees

Barrons, KC
 Boundy, RH
 Colby, RW
 Dow
 Elshere, D
 Gay, HH
 Gray, HE
 Greene, LM
 Hammer, OH
 Hart, A
 Hymas, TA
 Jones, GD
 Kagy, JF
 Kilian, DJ
 Luce, EN
 Lynn, GE
 McIntyre, HH
 Perkins, RP
 Stenger, VA
 Tisdale, WL
 Vanvalkenburg, JW
 Wright, N

Barrons, KC
 Boundy, RH
 Colby, RW
 Dow
 Elshere, D
 Gay, HH
 Gray, HE
 Greene, LM
 Hammer, OH
 Hart, A
 Hymas, TA

General Subject Matter

Results of range finding toxicological tests on M-1447 and M-1443 Weed Killer Formulations (Similar to Esteron 245 OS and Esteron Brush Killer OS respectively)

Results of range finding toxicological tests on M-1447 and M-1433 Weed Killer Formulations (Similar to Esteron 245 OS and Esteron Brush Killer OS respectively)

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
0750951- 0750952*	591209	Dow Wolf, MA	McIntyre, HH
0750956- 0750974*	590903	Dow Olson, KJ Oyen, F	

11243

Distributees

General Subject Matter

Jones, JD
 Kagy, JF
 Kilian, DJ
 Luce, EN
 Lynn, GE
 McIntyre, HH
 Perkins, RP
 Stenger, VA
 Tisdale, WL
 Vanvalkenburg, JW
 Wright, N

Dow
 Wolf, MA

Toxicological information on
 Esteron 99 granules (M-1741)
 suitable for presentation to the
 USDA

Barrons, KC
 Boundy, RH
 Colby, RW
 Dow
 Elshere, D
 Gay, HH
 Greene, LM
 Hammer, OH
 Hart, A
 Hymas, TA
 Jones, GD
 Kagy, JF
 Kilian, DJ
 Leasure, JK
 Luce, EN
 Lynn, GE
 McIntyre, HH

Results of range finding toxicolo-
 gical tests on Agricultural
 Chemical Formulation M-1511 con-
 taining Dowanol 97B70 Ester 245T
 (K-7856)

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>

0750975- 0750976*	590811	Dow HRH Olson, KJ Oyen, F	

0750977- 0550996*	600216	Dow Olson, K Oyen, F	

11244

Distributees

Perkins, RP
Scoles, G
Stenger, VA
Tisdale, WL
Wright, N

General Subject Matter

M-1511 Data sheet of properties,
health hazards and precautions for
safe handling of materials

Barrons, KC
Boundy, RH
Colby, RW
Dow
Elshere, D
Gay, HH
Greene, LM
Hammer, OH
Hart, A
Hymas, TA
Jones, GD
Kagy, JF
Kilian, DJ
Luce, EN
Lynn, GE
McIntyre, HH
Perkins, RP
Scoles, GW
Stenger, VA
Tisdale, WL
Wright, N

Results of range finding toxicolo-
gical tests on Agricultural
Chemical Formulation M-1683
(Esteron 245 Type)

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
0750998- 0751016*	600223	Dow Olson, KJ Oyen, F	

0751056- 0751058*	611120	Dow Olson, KJ Oyen, F Plomer, ET Scoles, GW

11245

Distributees

Barrons, KC
 Boundy, RH
 Colby, RW
 Dow
 Elshere, D
 Gay, HH
 Greene, LM
 Hammer, OH
 Hart, A
 Hymas, TA
 Jones, GD
 Kagy, JF
 Kilian, DJ
 Luce, EN
 Lynn, GE
 McIntyre, HH
 Perkins, RP
 Scoles, GW
 Stenger, VA
 Tisdale, WL
 Wright, N

Barrons, KC
 Boundy, RH
 Colby, RW
 Dow
 Elshere, D
 Falkenstein, W
 Gay, HH
 Greene, LM
 Hart, A
 Jones, GD
 Kagy, JF
 Kilian, DJ

General Subject Matter

Results of range finding toxicological tests on Agricultural Chemical Formulation M-1684 (Esteron Brush Killer Type)

Results of range finding toxicological tests on M-2115, an agricultural chemical formulation containing 245T and triethyl amine

Dow Number

Date

Author

Recipient

0751059 *

611120

0751060-
0751075*

611106

Dow
Hoyle, HR
Olson, KJ
Oyen, F

11246

Distributees

General Subject Matter

Luce, EN
Lynn, GE
McIntyre, HH
Perkins, P
Scoles, GW
Shrader, SA
Tisdale, WL
Wright, N

First aid measures

Barrons, KC
Boundy, RH
Colby, RW
Dow
Elshere, D
Falkenstein, W
Gay, HH
Greene, LM
Hart, A
Jones, GD
Kagy, JF
Kilian, DJ
Luce, EN
Lynn, GE
McIntyre, HH
Perkins, P
Scoles, GW
Shrader, SA
Tisdale, WL
Wright, N

M-2115 data sheet of properties,
health hazards and precautions for
safe handling of materials

Barrons, KC
Boundy, RH
Colby, RW
Dow

Dow Number

Date

Author

Recipient

Plomer, ET

0751078-
0751080*

620403

Dow
Olson, KJ
Oyen, F
Vanvalkenburg, W

11247

Distributees

General Subject Matter

Elshere, D
Falkenstein, W
Gay, HH
Greene, LM
Hart, A
Jones, GD
Kagy, JF
Kilian, DJ
Luce, EN
Lynn, GE
McIntyre, HH
Perkins, P
Scoles, GW
Shrader, SA
Tisdale, WL
Wright, N

Results of range finding toxicological tests on M-2235, an emulsifiable formulation of 24D and 245T Dowanol Esters in kerosene

Barrons, KC
Boundy, RH
Brown, R
Colby, RW
Dow
Elshere, D
Falkenstein, WJ
Gay, HH
Greene, LM
Hart, A
Jones, GD
Kagy, JF
Kilian, DJ
Luce, EN
Lynn, GE
McIntyre, HH
Nash, HA

Dow Number

Date

Author

Recipient

0751081 *

620323

0751082-
0751098*

620323

Dow
Hoyle, HR
Olson, KJ
Oyen, F

112400

Distributees

General Subject Matter

Perkins, RP
Shrader, SA
Vanvalkenburg, W
Wilson, AW
Wright, N

First aid measures

Barrons, KC
Boundy, RH
Brown, R
Colby, RW
Dow
Elshere, D
Falkenstein, WJ
Gay, HH
Greene, LM
Hart, A
Jones, GD
Kagy, JF
Kilian, DJ
Luce, EN
Lynn, GE
McIntyre, HH
Nash, HA
Perkins, RP
Shrader, SA
Vanvalkenburg, W
Wilson, AW
Wright, N

M-2235 data sheet of properties,
health hazards, and precautions for
safe handling of materials

Barrons, KC
Boundy, RH
Brown, R
Colby, RW
Dow

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
0751099- 0751101*	630809	Hoyle, HR Olson, KJ Oyen, F	
0751102 *	620124	Dow Wolf, MA	Dow McIntyre, HH
0751209- 0751210*	630225	Dow Olson, KJ Oyen, F Scoles, G	

Distributees

General Subject Matter

Elshere, D
Falkenstein, WJ
Gay, HH
Greene, LM
Hart, A
Jones, GD
Kagy, JF
Kilian, DJ
Luce, EN
Lynn, GE
McIntyre, HH
Nash, HA
Perkins, RP
Shrader, SA
Vanvalkenburg, W
Wilson, AW
Wright, N

Verton T sales specification

Suggested precautionary labeling
for M-2235

Barrons, KC
Boundy, RH
Brown, R
Colby, RW
Dow
Elshere, D
Falkenstein, WJ
Gay, HH
Greene, LM

Results of range finding toxicological tests on agricultural chemical formulation M-2422 containing 91 percent Dowanol PIB Ester of 245T

Dow Number

Date

Author

Recipient

0751211 *

630225

11250

Distributees

General Subject Matter

Hart, A
 Jones, GD
 Kagy, JF
 Kilian, DJ
 Luce, EN
 Lynn, GE
 McIntyre, HH
 Mullison, WR
 Nash, HA
 Norton, TR
 Shrader, SA
 Wilson, AW
 Wright, N

First aid measures

Barrons, KC
 Boundy, RH
 Brown, R
 Colby, RW
 Dow
 Elshere, D
 Falkenstein, WJ
 Gay, HH
 Greene, LM
 Hart, A
 Jones, GD
 Kagy, JF
 Kilian, DJ
 Luce, EN
 Lynn, GE
 McIntyre, HH
 Mullison, WR
 Nash, HA
 Norton, TR
 Shrader, SA

Dow Number

Date

Author

Recipient

0751212-
0751213*

630220

Dow
Hoyle, HR
Olson, KJ
Oyen, F

0751214-
0751236*

630225

11251

Distributees

Wilson, AW
Wright, N

Barrons, KC
Boundy, RH
Brown, R
Colby, RW
Dow
Elshere, D
Falkenstein, WJ
Gay, HH
Greene, LM
Hart, A
Jones, GD
Kagy, JF
Kilian, DJ
Luce, EN
Lynn, GE
McIntyre, HH
Mullison, WR
Nash, HA
Norton, TR
Shrader, SA
Wilson, AW
Wright, N

Barrons, KC
Boundy, RH
Brown, R
Colby, RW
Dow
Elshere, D
Falkenstein, WJ
Gay, HH

General Subject Matter

M-2422 data sheet of properties,
health hazards and precautions for
safe handling of materials

Toxicological properties of
Formulation M-2422

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
0752264- 0752265*	670328	Dow Hoyle, HR McCollister, DD Olson, KJ	
0752266 *	661220	Buerge, TE Dow	Dow Lynn, GE
0752360- 0752361*	670410		
0752385- 0752386*	690415	Dow Norris, JM Torkelson, TR	

11252

Distributees

General Subject Matter

Greene, LM
Hart, A
Jones, GD
Kagy, JF
Kilian, DJ
Luce, EN
Lynn, GE
McIntyre, HH
Mullison, WR
Nash, HA
Norton, TR
Shrader, SA
Wilson, AW
Wright, N

M-3060 data sheet of properties,
health hazards and precautions for
safe handling of materials

M-3060 request for screening or
application testing

M-3060, Safety Data and
Formulation

M-3401 Brush Killer-A Tordon Acid
Formulation

Axe, FD
Barton, J
Beauchamp, RR
Blair, EH
Burgert, BE
Dow
Edwards, H
Elshere, D

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>

0752388- 0752389*	690320	Dow Hoyle, HR Norris, JM Torkelson, TR	

0752390- 0752395*	690417	Dow Norris, JM	

0752550- 0752552*	700130	Dow Gowell, JH Loucks, MF Lynn, GE Naegele, RE Newport, JJ Ridner, JM Seymour, KG Stein, JS	

11253

Distributees

General Subject Matter

Gordon, HL
Holder, BB
Johnson, JE
Kagy, JF
Kilian, DJ
Kimmel, CE
Lloyd, BH
MacCutcheon, SM
McCollister, DD
McIntyre, HH
Morse, D
Pitman-Moore
Robinson, VB
Schwartz, AJ
Wright, N

M-3402 Brush Killer data sheet of
properties, health hazards and
precautions for safe handling of
materials

Toxicological properties of M-3401
Brush Killer-A Tordon acid for-
mulation

Tordon 225 herbicide release to
sales

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
		Williams, CS Williams, RW Wolf, MA	
0752553- 0752554*	690429	Dow Hoyle, HR Norris, JM	
0762493- 0762496*	500829	Dow Rowe, VK Spencer, HC	Allen, WW Barrons, KC Britton, JW Dosser, RC Dow Dutton, WC Irish, DD Kagy, JF Lynn, GE
0762497 *	000000		
0762498 *	490309	Dow Irish, DD McCollister, DD Rowe, VK White, L	
0762499 *	490412	Dow Wyse, H	
0762500 *	490321	Dow Wyse, H	

11254

Distributees

General Subject Matter

Tordon 225 mixture herbicide data sheet of properties, health hazards and precautions for safe handling of materials

Results of range finding toxicological tests on Esteron 245T formulations

Summary of toxicological information on 24D & 245T formulations

Esteron 245T (New formulation)
(Request for biological test)

K7716-1 Esteron 245T (New formulation) (Acute oral toxicity)

Esteron 245T (New formulation)

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
0762501- 0762504*	490000	Dow Wyse, H	
0762505 *	490517	Dow Wyse, H	
0762506 *	490225	Dow HAS RSH Irish Rowe, VK White, L	
0762507 *	490414	Dow Wyse, H	
0762508 *	490321	Dow Wyse, H	
0762509- 0762512*	490000	Dow Wyse, H	
0762513 *	490517	Dow Wyse, H	
0766698- 0766699*	690415	Beauchamp, RR Dow Norris, JM Torkelson, TR	

11257

Distributees

General Subject Matter

K7716-1 Esteron 245T (New
formulation) (Skin irritation)

K7716-1 Esteron 245T (New
formulation) (Single absorption
exposure record)

Esteron 245T formulation (Request
for biological test)

K7716-2 Esteron 245T formulation
(acute oral toxicity)

Esteron 245T formulation

K7716-2 Esteron 245T formulation
(Skin irritation)

K7716-2 Esteron 245T formulation
(Single absorption exposure
record)

Axe, FD
Barron, J
Beauchamp, RR
Blair, EH
Burgert, BE
Dow
Edwards, H

M-3401 Brush Killer-A Tordon Acid
Formulation

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
0766700- 0766701*	690320	Dow Hoyle, JR Norris, JM Torkelson, TR	
0766702- 0766708*	690417	Dow Norris, JM	
0766709 *	681008	Beauchamp, RR Dow McCollister, DD	Byrd, BC Dow Hoerger, FD McCollister, DD
0766710 *	681008	Dow	
0766711- 0766726*	680000	Dow Litchfield, N Norris, JM	

11256

Distributees

General Subject Matter

Elshere, D
Gordon, HL
Holder, BB
Johnson, JE
Kagy, JF
Kilian, DJ
Kimmel, CE
Lloyd, BH
MacCutcheon, SM
McCollister, DD
McIntyre, HH
Morse, D
Robinson, VB
Schwarz, AJ
Wright, N

M-3401 Brush Killer (Data sheet of properties, health hazards and precautions for safe handling of materials)

Toxicological properties of M-3401 Brush Killer, a Tordon acid formulation

Proposed name, Tordon 124V Brush Killer (M3401) (Request for screening or application testing)

Toxicology work sheet (Tordon 124V Brush Killer)

Tordon 124V Brush Killer (Acute oral toxicity)

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
0766727- 0766729*	690310	Dow Norris, JM	
0766730- 0766737*	680000	Dow King, CD Litchfield, N Sparschu, GL Trice, V	
0766738- 0766740*	681000	Dow Dunn, FL	
0766741- 0766744*	681104	Dow Dunn, FL	
0766745- 0766746*	690128	Dow Dunn, FL	
0766747- 0766750*	690000	Dow Litchfield, N	
0766751- 0766765*	690123	Dow Norris, JM	
0766766 *	690123	Dow	
0766767 *	681008	Beauchamp, RR Dow McCollister, DD	
0766768- 0766769*	000000	Dow	

11257

Distributees

General Subject Matter

M-3401 Brush Killer, oral dosage
to male rats

Tordon 124V Brush Killer (Request
for pathology)

Tordon 124V Brush Killer (Eye con-
tact test)

Tordon 124V Brush Killer (Skin
contact, irritation)

M-3401 Tordon 124V Sample 2, (Skin
contact, irritation)

Tordon (Skin contact absorption)

Toxicological properties of Tordon
124V Brush Killer made with CA
Tordon acid

Tordon 124V Brush Killer
(Toxicology work sheet)

Proposed name Tordon 124V Brush
Killer (Request for screening or
application testing)

M3401 Brush Killer (Data sheet of
properties, health hazards and

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
0766770- 0766800*	680000	Dow Dunn, FL Litchfield, N	
0766801- 0766821*	680000	Conran, PB Dow King, CD Litchfield, N Sparschu, GL Trice, V	
0766822- 0766823*	690107	Beauchamp, RR Dow Leong, BKJ Trice, VR	
0766824- 0766847*	690113	Beauchamp, RR Conran, PB Dow Leong, BKJ Sparschu, GL Trice, VR	
0766848- 0766849*	690320	Norris, JM Torkelson, TR Hoyle, HR	
0766850 *	560524	Peterson, JE HRH	

11258

Distributees

General Subject Matter

precautions for safe handling of materials)

Tordon 124V Brush Killer, male rat testing

Tordon 124V Brush Killer (Request for pathology)

Summary report on the effect of acute inhalation of the volatile components of California Tordon Acid and Texas Tordon Acid (Biochemical Res Lab Sample 1)

Summary pathology report on the effect of acute inhalation of the volatile components of California Tordon Acid and Texas Acid (Biochem Res Lab Pathology Report Sample)

M-3401 Brush Killer (data sheet of properties, health hazards, and precautions for safe handling of materials)

Brush Killer

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
0766851 - 0766852*	690320	JMN H	
0767018- 0767019*	560412	Dow	
0767020- 0767021*	610525	Dow Hoyle, HR Olson, KJ Oyen, F	
0767022- 0767023*	790216	Dow Fishbeck, WA Keeler, P	
0767024- 0767025*	720329	Dow	
0767026- 0767027*	580613	Dow McCollister, DD Wolf, MA	
0767028- 0767029*	610525	Dow Olson, KJ Oyen, F	
0767030 *	610531	Dow	
0767031 *	000000	Dow	

11259

Distributees

General Subject Matter

M-3401 Brush Killer (safety information)

Esteron Brush Killer OS M-726 (T2.30-71-1), safety data sheet with formulation

Esteron 99 data sheet of properties, health hazards and precautions for safe handling of materials

Esteron 99 medical information

Esteron 99 material safety data sheet

Esteron 99 data sheet of properties, health hazards and precautions for safe handling of materials

Esteron 99 data sheet of properties, health hazards and precautions for safe handling of materials

Esteron 99 (Replacement formulation)

Esteron 99 medical information symptomatology and treatment

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
0767032 *	700721	Dow	
0767033- 0767034*	720329	Dow	
0767054- 0767055*	570514	Dow Hoyle, HR McCollister, DD Wolf, MA	
0767056- 0767057*	580514	Dow Hoyle, HR McCollister, DD Wolf, MA	
0767058 *	000000	Dow Hoyle, HR Wolf, MA	
0767059- 0767060*	710900	Dow	
0767061 *	580716	Dow Wolf, MA	Dow McIntyre, HH
0767062 *	610112	Dow Wolf, MA	Dow McIntyre, HH
0767063- 0767064*	580425	Dow Hoyle, HR McCollister, DD Olson, KJ	

11260

Distributees

General Subject Matter

Esteron 99 toxicology, anticipated human response

Esteron 99 material safety data sheet

M-1086 data sheet of properties, health hazards and precautions for safe handling of materials

Veon brush killer (M-1086) data sheet of properties, health hazards and precautions for safe handling of materials

M-1086 (A herbicidal formulation T2.3098), safety data sheet

Veon brush killer

Suggested precautionary labeling for M-1094

Suggested precautionary labeling for M-1094

M-1094 weed killer formulation data sheet of properties, health hazards and precautions for safe handling of materials

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
0767065 *	580717	Dow Hoyle, HR Olson, KJ	
0767066 *	570730	Dow Wolf, MA	Coulter, LL Dow
0767067- 0767068*	571120	Dow Hoyle, HR McCollister, DD Olson, KJ	
0767069- 0767070*	571028	Dow Hoyle, HR McCollister, DD Olson, KJ	
0767071 *	571206	Dow Hoyle, HR Olson, KJ	
0767072 *	571206	Dow Hoyle, HR Olson, KJ	
0767073 *	610112	Dow Wolf, MA	Dow McIntyre, HH
0767073- 0767074*	610311	Dow Hoyle, HR Olson, KJ Oyen, F	
0767075 *	610400	Dow	

11251

Distributees

General Subject Matter

M-1094 containing 245T Ester T2,
30-112-1, safety data sheet

Inverton, a letter showing concern
for hazards

Inverton M-1116 data sheet of pro-
perties, health hazards and pre-
cautions for safe handling of
materials

M-1116 dilution C1-14-100 data
sheet of properties, health
hazards and precautions for safe
handling of materials

Inverton weed killer (M-1116)
T2.30-101-1, safety data sheet

M-1116 dilution Inverton for-
mulation

Suggested precautionary labeling
for M-1123

M-1123 data sheet of properties,
health hazards and precautions for
safe handling of materials

M-1123, safety data sheet

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
0767092- 0767098*	531029	Adams, EM Dow Eslunn, E Maxey, JS Oyen, F	
0767099- 0767119*	530325	Dow HCS Rowe, VK Wolf, MA	
0767153- 0767160*	570806	Dow McCollister, DD Wolf, MA	

115313

Distributees

Allen, WW
 Allinson, RL
 Alquist, FN
 Barrons, KC
 Beshgetoor, AW
 Boundy, RH
 Britton, EC
 Davidson, JH
 Dow
 Dutton, WC
 Gay, HH
 Greene, LM
 Kagy, JF
 Luce, EN
 Lynn, GE
 MacCutcheon, SM
 Prescott, RF
 Sunderland, WW
 White, LC
 Wright, P

General Subject Matter

Results of range finding
 toxicological tests on Dow
 Brush Killer 50-50

Toxicity of Dow Brush Killer 50-50
 (T2.30-28-1)

Allinson, RL
 Athay, RM
 Beshgetoor, AW
 Boundy, RF
 Colby, RW
 Dow
 Elshere

Results of range finding toxicolo-
 gical tests on M-1085 (A 245T
 triethylamine liquid formulation
 T2.30-97-1)

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
0767154- 0767155*	571005	Dow Hoyle, HR McCollister, DD Wolf, MA	
0767161 *	570228	Dow	
0767162 *	570301	Dow	Barrons, KC Dow
0767163- 0767164*	570402	Babcock, D Dow Wolf, MA	
0767165- 0767166*	570415	Dow	

11253

Distributees

Gay, HH
Greene, LM
Hart, A
Jones, GD
Kagy, JF
Kilian, DJ
Luceen
Lynn, GE
McIntyre, HH
Mussell, DR
Perkins, RP
Scoles, GW
Tisdale, WL
Wright, N

General Subject Matter

M-1085 (A 245T alkyl amine formulation) data sheet of properties, health hazards and precautions for safe handling of materials

Sample 1, M-1085 (T2.30-97-1), eye and skin contact

M-1085 request for applications testing (2.30-97-1)

Sample 1 (2.30-97-1) (eye contact test)

Sample 1 M-1085 skin contact irritation T2.30-97-1

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
0767184- 0767191*	570806	Dow McCollister, DD Wolf, MA	
0767185- 0767186*	570511	Dow Hoyle, HR McCollister, DD Wolf, MA	
0767192 *	570228	Dow Wolf, MA	
0767193 *	570227	Dow Scoles, G	Barrons, KC Dow

11264

Distributees

General Subject Matter

Allison, RW
Athay, RM
Barrons, KC
Beshgetoor, AW
Boundy, RH
Colby, RW
Dow
Elshere, D
Gay, HH
Greene, LM
Hart, A
Jones, GD
Kagy, JF
Kilian, DJ
Luce, EN
Lynn, GE
McIntyre, HH
Perkins, RP
Russel, DR
Scoles, G
Tisdale, WL
Wright, N

Results of range finding toxicological tests on M-1086 (A 245T and 24D alkyl amine formulation)

M-1086 (Data sheet of properties, health hazards and precautions for safe handling of materials)

Sample 1, M-1086 (Toxicology work sheet)

M-1086 (2.30-96-1) (Request for applications testing)

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
0767194- 0767195*	570326	Dow Stagerstron, E	
0767196- 0767197*	570228	Dow	
0767213- 0767222*	580521	Dow McCollister, DD Olson, K	

0767216- 0767217*	580425	Dow Hoyle, HR McCollister, DD Olson, KJ
0767223 *	580225	Dow

11
08
01

Distributees

General Subject Matter

Eye contact test M-1086,
T2.30-96-1

M-1086 (Skin contact irritation)
(T2.30-96-1)

Results of range finding toxicological tests on weed killer formulation M-1094 containing a 245T Ester (T2.30-112-1)

Allinson, RL
Athay, RM
Beshgetoor, AW
Boundy, RH
Colby, RW
Dow
Elshere, D
Gay, HH
Greene, LM
Hammer, OH
Hart, A
Jones, GD
Kagy, JF
Kilian, DJ
Luce, EN
McIntyre, HH
Perkins, RP
Scoles, GW
Tisdale, WL
Vanvalkenburg, W
Wright, N

M-1094 Weed Killer formulation
(Data sheet of properties, health hazards, and precautions for safe handling of materials)

Sample 1 Weed Killer formulation
(M-1094) (Toxicology work sheet)

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
0767224 *	000000	Dow Scoles, G	
0767225 *	580218	Coulter, LL Dow	Dow Rowe, VK
0767226 *	580225	Dow NCG	
0767227- 0767228*	530311	Dow NCG	
0767229- 0767230*	580525	Dow NCG	
0767231 *	580402	Coulter, LL Dow	Dow Rowe, VK
0767243- 0767251*	571220	Dow McCollister, DD Olson, KJ	

11250

Distributees

Dow
Fletcher, FW
Scoles, GW
Vanvalkenburg, W

Dow
Fletcher, FW
Scoles, GW
Vanvalkenburg, JW

Allinson, RL
Beshgetoor, AW
Boundy, RH
Colby, RW
Coulter, LL
Dow
Elshere, D
Gay, HH
Gray, HE
Greene, LM

General Subject Matter

245T (Request for screening or application testing)

Formulation M-1094, contemplated sales program

Sample 1 Weed Killer formulation (M-1094) (T2.30-112-1) (acute oral toxicity)

Sample 1 Weed Killer formulation (M-1094) (eye contact test)

Sample 1, weed killer formulation (M-1094) (T2.30-112-1) (skin contact irritation)

M-1094, will remain in development during 580000

Results of range finding toxicological tests on Inverton (brush killer). (T2.30-101-1)

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
0767245- 0767246*	571120	Dow Hoyle, HR McCollister, DD Olson, KJ	
0767252 *	570520	Dow	
0767253 *	000000	Dow Scoles, G	
0767254 *	570520	Dow	
0767255- 0767256*	570520	Babcock, D Dow	
0767257- 0767258*	570624	Babcock, D Dow	

11267

Distributees

General Subject Matter

Hart, A
Hymas, TA
Jones, GD
Kagy, JF
Kilian, DJ
Luce, EN
Lynn, GE
McIntyre, HH
Mussell, DR
Perkins, RP
Scoles, GW
Tisdale, WL
Wright, N

Inverton M-1116 (Data sheet of properties, health hazards and precautions for safe handling of materials)

Sample 1 M-1116 (T2.30-101-1)
(Toxicology work sheet)

M-1116 (Request for applications testing) (2.30-101-1)

Sample 1 M 1116 (Acute oral toxicity) (T2.30-101-1)

Sample 1 M-1116 (Eye contact test) (T2.30-101-1)

Sample 1 M-1116 (Skin contact irritation) (T2.30-101-1)

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
0767259- 0767260*	570730	Dow Wolf, MA	Coulter, LL Dow
0767261 *	580221	Dow	Dow Olson, KJ
0767262 *	580408	Dow Wolf, MA	Dow McIntyre, HH
0767263- 0767267*	610316	Dow Olson, KJ Oyen, K Thompson, E Vanvalkenburg, W	

0767268- 0767269*	610311	Dow Hoyle, HR Olson, KJ Oyen, F

110000

Distributees

General Subject Matter

Inverton, a letter showing concern
for hazards

Request for report

Suggested precautionary labelling
for Inverton (M-1116)

Results of range finding toxicolo-
gical tests on M-1123
(T2.30-201-1)

Barrons, KC
Boundy, RH
Colby, RW
Dow
Elshere, D
Falkenstein, WJ
Gay, HH
Greene, LM
Hart
Jones, GD
Kagy, JF
Kilian, DJ
Luce, EN
Lynn, GE
McIntyre, HH
Perkins, RP
Shrader, SA
Tisdale, WL
Vanvalkenburg, W
Wright, N

M-1123 (Data sheet of properties,
health hazards and precautions for
safe handling of materials)

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
0767270 *	601228	Dow	
0767271 *	601229	Dow	
0767272 *	601223	Dow Vanvalkenburg, W	Dow Olson, KJ
0767273 *	610106	Dow Wolf, MA	Dow Ritty, PM
0767274 *	601228	Dow	
0767275- 0767276*	610110	Dow Thompson, E	
0767277- 0767280*	601228	Dow Thompson, E	
0767281- 0767282*	610120	Dow Thompson, E	
0767288- 0767300*	610601	Dow White, LC, Jr.	

1155

Distributees

General Subject Matter

M-1123 (Toxicology work sheet)
(T2.30-201-1)

M-1123 (request for screening or
application testing)

M-1123, Formulation, use, release
to sale plans

Formulation for M-1094, no data
available on toxicity for M-1123

Sample 1 M-1123 (Acute oral
toxicity) (T2.30-201-1)

Sample 1 M-1123 (Eye contact test)
(T2.30-201-1)

Sample 1 M-1123 (Skin contact
irritation) (T2.30-201-1)

Sample 1 M-1123 (Skin contact
absorption) (T2.30-201-1)

Results of range finding toxicolo-
gical tests on Esteron 245-0S
(replacement for present for-
mulation M-1257) (BC T2.30-167-2)

Dow
Johnson, JE
Ritty, PM

Barrons, KC
Boundy, RH
Colby, RW
Dow
Elshere, D
Falkenstein, WJ
Gay, HH
Greene, LM
Hart, A

Dow Number

Date

Author

Recipient

0767301-
0767314*

600125

Dow
Wolf, MA

11270

Distributees

General Subject Matter

Jones, GD
 Kagy, JF
 Kilian, DJ
 Luce, EN
 Lynn, GE
 McIntyre, HH
 Oyen, F
 Perkins, RP
 Shrader, SA
 Tisdale, WL
 White, LC, Jr.
 Wright, N

Results of range finding toxicological tests on Esteron 245
 OS(M.1257) (BC T2.30-167-1)

Barrons, KC
 Boundy, RH
 Colby, RW
 Dow
 Elshere, D
 Gay, HH
 Greene, LM
 Hammer, OH
 Hart, A
 Hymas, TA
 Jones, GD
 Kagy, JF
 Kilian, DJ
 Luce, EN
 Lynn, GE
 McIntyre, HH
 Oyen, F
 Perkins, RP
 Stenger, VA
 Tisdale, WL
 Wright, N

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
0767309 *	591102	Dow Vanvalkenburg,JW	Dow Wolf, MA

0767315 *	591028	Dow Ritty, PM	Dow Wolf, MA

11271

Distributees

Barrons, KC
 Boundy, RH
 Colby, RW
 Coulter, LL
 Dow
 Elshere, D
 Gay, HH
 Greene, LM
 Hammer, OH
 Hart, A
 Heath, SB
 Hymas, TA
 Jones, GD
 Kagy, JF
 Kilian, DJ
 Luce, EN
 Lynn, GE
 McIntyre, HH
 Oyen, F
 Perkins, RP
 Stenger, VA
 Tisdale, WL
 Wright, N

Barrons, KC
 Boundy, RH
 Colby, RW
 Coulter, LL
 Dow
 Elshere, D
 Gay, HH
 Greene, LM
 Hammer, OH
 Hart, A

General Subject Matter

Esteron 245 OS (M-1257), Formulation plans for toxicological evaluation

Need toxicology information sheets on Esteron Brush Killer O.S.

Dow Number

Date

Author

Recipient

0767321-
0767342*

571122

Dow
Olson, KJ

11272

Distributees

General Subject Matter

Heath, SB
Hymas, TA
Jones, GD
Kagy, JF
Kilian, DJ
Luce, EN
Lynn, GE
McIntyre, HH
Oyen, F
Perkins, RP
Stenger, VA
Tisdale, WL
Wright, N

Results of range finding toxicological tests on Brush Killer X, Weed Killer X and Brush Killer TX
(T2.30-76-1 T2.30-77-1
T2.30-78-1)

Allinson, RL
Athay, RM
Beshgetoor, AW
Boundy, RH
Colby, RW
Dossier, RC
Dow
Elshere, D
Gay, HH
Greene, LM
Hart, A
Hymas, TA
Jones, GD
Kilian, DJ
Luce, EN
Martin, D
McCollister, DD
McIntyre, HH
Mussell, DR
Perkins, RP

Dow Number

Date

Author

Recipient

0767366-
0767385*

590423

Dow
Wolf, MA

0767402-
0767416*

590818

Olson, KJ
Oyen, F
KS
Hoyle, HR

11273

Distributees

Tisdale, WL
 White, LC
 Wright, N

Athay, RM
 Barrons, KC
 Boundy, RH
 Colby, RW
 Dow
 Elshere, D
 Gay, HH
 Greene, LM
 Hammer, OH
 Hart, A
 Hymas, TA
 Jones, GD
 Kagy, JF
 Kilian, DJ
 Luce, EN
 Lynn, GE
 McCollister, DD
 McIntyre, HH
 Perkins, RP
 Stenger, VA
 Tisdale, WL
 Vanvalkenburg, W
 Wright, N

Barrons, KC
 Colby, RW
 Lynn, GE
 Boundy, RH
 McIntyre, HH
 Perkins, RP

General Subject Matter

Results of range finding toxicological tests on Forron brush killer (M-1368) (T2.30-123-1)

Results of range finding toxicological tests on M1413, formulation of Dowanol Ester 245T made for Stull Chem. Data sheet of properties, health hazards and precautions for safe handling of

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>

0767417- 0767418*	590506	Dow McCollister, DD Wolf, MA	

0767419- 0767421*	590202	Dow Hoyle, HR McCollister, DD Wolf, MA	

0767422- 0767930*	590202	Dow Hoyle, HR McCollister, DD Wolf, MA	

1-1
1-1
1-1
1-1
1-1

Distributees

Hart, A
Wright, N
Hammer, OH
Hymas, TA
Jones, GD
Gay, HH
Tisdale, WL
Luce, EN
Green, LM
Stenger, LM
Scoles, G
Gray, HE
Kilial, DJ
Elshere, D
Kagy, JF

General Subject Matter

materials

Results of range finding toxicological tests on M-1447 and M-1433 weed killer formulations (Similar to Esteron 245 OS and Esteron Brush Killer respectively)

A concentrate formulation of 245T Dowanol 97B70 Ester data sheet of properties, health hazards and precautions for safe handling of materials

Barrons, KC
Boundy, RH
Colby, RW
Dow
Elshere, D
Gay, HH

A concentrate formulation of 24D and 245T Dowanol 97B70. Esters data sheet of properties, health hazards and precautions for safe handling of materials

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>

0767431 *	590127	Dow	
0767432 *	581120	Dow Wade, J	
0767433 *	581121	Dow Vanvalkenburg, JW	Dow Olson, KJ
0767434- 0767439*	581120	Dow	
0767440- 0767441*	590506	Dow McCollister, DD	

11275

Distributees

General Subject Matter

Gray, HE
Greene, LM
Hammer, OH
Hart, A
Hymas, TA
Jones, GD
Kagy, JF
Kilian, DJ
Luce, EN
Lynn, GE
McIntyre, HH
Perkins, RP
Stenger, VA
Tisdale, HH
Vanvalkenburg, W
Wright, N

M-1433 Toxicology work sheet

A concentrate brush killer formulation of 31b. 24D and 31b. 245T acid equiv per gal. based on Dowanol 97B70 Esters. Request for screening or application testing

Coulter, LL
Dow
Heath, SB

M-1433 and M-1447, formulations

M-1433 eye contact test

Results of range finding toxicological tests on M-1447 and M-1433

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>

Wolf, MA

0767442-
0767444*

590202

Dow
Hoyle, HR
McCollister, DD
Wolf, MA

0767445-
0767453*

590202

Dow
Hoyle, HR
McCollister, DD
Wolf, MA

0767454 *

590127

Dow

11276

Distributees

General Subject Matter

weed killer formulations (Similar to Esteron 245 OS and Esteron Brush Killer OS respectively)

M-1447 A concentrate formulation of 245T Dowanol 97B70 esters. Data sheet of properties, health hazards and precautions for safe handling of materials

M-1433 A concentrate formulation of 24D and 245T Dowanol 97B70 esters. Data sheet of properties, health hazards and precautions for safe handling of materials

Barrons, KC
Boundy, RH
Colby, RW
Dow
Elshere, D
Gay, HH
Gray, HE
Greene, LM
Hammer, OH
Hart, A
Hymas, TA
Jones, GD
Kagy, JF
Kilian, DJ
Luce, EN
Lynn, GE
McIntyre, HH
Perkins, RP
Stenger, VA
Tisdale, WL
Vanvalkenburg, JW
Wright, N

M-1447 toxicology work sheet

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
0767455- 0767456*	581120	Dow Vanvalkenburg, JW	
0767457- 0767462*	581120	Dow	
0767463- 0767464*	590202	Dow Hoyle, HR McCollister, DD Wolf, MA	
0767465- 0767466*	700709	Dow	
0767478- 0767479*	590713	Dow McCollister, DD Wolf, MA	
0767480- 0767485*	590414	Dow McCollister, DD Peterson, JE Wolf, MA	

11377

Distributees

General Subject Matter

M-1447 request for screening or application testing

M-1447 acute oral toxicity

M-1433 A concentrate formulation of 24D and 245T Dowanol 97B70 esters. Data sheet of properties, health hazards and precautions for safe handling of materials

Dowanol 97 B-70 medical information

Results of range finding toxicological tests on Forron 235T

Barrons, KC
Boundy, RH
Colby, RW
Dow
Elshere, D
Gay, HH
Greene, LM
Hammer, OH
Hart, A
Hymas, TA
Jones, GS
Kagy, JF
Kilian, DJ
Luce, EN

Forron 245 M-1456 data sheet of properties, health hazards and precautions for safe handling of materials

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
0767486 *	590319	Dow	
0767487 *	590127	Dow	
0767488 *	590113	Dow Vanvalkenburg, JW	Dow Olson, RJ
0767489- 0767493*	590127	Dow	
0767494 *	000000	Dow Wolf, MA	
0767495- 0767497*	590610	Dow McCollister, DD Peterson, JE Wolf, MA	
0767498 *	590722	Dow Olson, K Oyen, F	

11278

Distributees

General Subject Matter

Lynn, GE
McIntyre, HH
Perkins, RP
Stenger, VA
Tisdale, WL
Vanvalkenburg, W
Wright, N

M-1456 (Forron 245T) toxicology
work sheet

M-1456 (Contains K-7756) (Forron
245) Request for screening of
application testing

Coulter, LL
Dow
Heath, SB

Formulation M-1456

M-1456 acute oral toxicity

Suggested precautionary labeling
for Forron 245

Forron 245 (M-1456) Data sheet of
properties, health hazards and
precautions for safe handling of
materials

Results of range finding toxicolo-
gical tests on M-1459. Formulation
of K-7797 and K-7856

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
0767499- 0767504*	590702	Dow Hoyle, HR Olson, KJ Oyen, F	
0767505 *	590618	Dow	
0767506 *	590216	Dow	
0767635- 0767637*	590901	Dow Olson, K Oyen, F Scoles, GE	

11279

Distributees

General Subject Matter

Athay, RM
Barrons, KC
Boundy, RH
Colby, RW
Dow
Elshere, D
Gay, HH
Gray, HE
Greene, LM
Hammer, OH
Hart, A
Hymas, T
Jones, GD
Kilian, DJ
Lynn, GE
Martin, D
McIntyre, HH
Perkins, RP
Scoles, GE
Stenger, VA
Tisdale, WL
Wright, N

M-1459 formulation of K-7797 and
K-7856

M-1459 Toxicology work sheet

M-1459 formulation of K-7797 and
request for screening or applica-
tion testing

Barrons, KC
Boundy, RH
Colby, RW
Dow
Elshere, D

Results of range finding toxicolo-
gical tests on M-1586 (Formulation
containing Dowanol 97B70 Esters of
24D and 245T) (T2.30-156-1)

Dow Number

Date

Author

Recipient

0767638-
0767639*

590811

Dow
Hoyle, HR
Olson, KJ
Oyen, F

0767640 *

590729

Dow
KO

0767641 *

590611

Dow
Scoles, G

0767642 *

590610

Dow
Scoles, GW

Dow
Olson, KJ

11880

Distributees

General Subject Matter

Gay, HH
Greene, LM
Hammer, OH
Hart, A
Hymas, TA
Jones, GD
Kagy, JF
Kilian, DJ
Leasure, JK
Luce, EN
Lynn, GE
McIntyre, HH
Perkins, RP
Scoles, GE
Stenger, VA
Tisdale, WL
Wright, N

M-1586 (Data sheet of properties,
health hazards and precautions for
safe handling of materials)

M-1586 (Toxicology work sheet)
(T2.30-156-1)

Coulter, LL
Dow
Scoles, G

Formulation containing the Dowanol
97B70 Esters of 24D and 245T
(M-1586) (Request for screening or
application testing)

Coulter, LL
Dow
Dosser, RC

Improved Esteron formulation

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
0767643 *	590710	Dow Greenhoe, NC KO	
0767644- 0767646*	590721	Dow Greenhoe, NC KO	
0767647- 0767649*	590727	Dow Greenhoe, NC KO	
0767650- 0767652*	590811	Dow Hoyle, HR Olson, KJ Oyen, F	
0767767- 0767780*	600331	Dow Olson, KJ Scoles, G	

1
 2
 3
 4
 5

Distributees

Heath, SB
Maddox, JF
White, LC

General Subject Matter

M-1586 (Acute oral toxicity)
(T2.30-156-1)

M-1586 (Eye contact test)
(T2.30-156-1)

M-1586 (Skin contact irritation)
(T2.30-156-1)

M-1586 (Data sheet of properties,
health hazards and precautions for
safe handling of materials)

Barrons, KC
Boundy, RH
Colby, RW
Dow
Elshere, D
Gay, HH
Greene, LM
Hammer, OH
Hart, A
Hymas, TA
Jones, GD
Kagy, JF

Results of range finding toxicological tests on agricultural chemical formulation M-1639 (Veon brush killer type)

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>

0767792- 0767793*	600128	Dow Hoyle, HR Olson, KJ Oyen, F	

0767794 *	600313	Dow	

0767824 *	600216	Dow Olson, KJ Oyen, F	

11
11
11
11
11

Distributees

General Subject Matter

Kilian, DJ
Luce, EN
Lynn, GE
McIntyre, HH
Oyen, F
Perkins, RP
Scoles, G
Stenger, VA
Tisdale, WL
Wright, N

M-1639 (Veon brush killer type)
(Data sheet of properties, health hazards and precautions for safe handling of materials)

M-1639 (Veon brush killer type),
Safety data sheet

Barrons, KC
Boundy, RH
Colby, RW
Dow
Elshere, D
Gay, HH
Greene, LM
Hammer, OH
Hart, A
Hymas, TA
Jones, GD
Kagy, JF
Kilian, DJ
Luce, EN
Lynn, GE

Results of range finding toxicological tests on agricultural chemical formulation M-1683 (Esteron 245 Type)

Dow Number

Date

Author

Recipient

0767825-
0767828*

600223

Dow
Olson, KJ

0767829-
0767830*

600126

Dow
Hoyle, HR
Olson, KJ
Oyen, F

0767831-
0767841*

600000

Dow
EO
NS
O'Connor
Scoles, GW
Torkelson, TR

0767851-
0767852*

600126

Dow
Hoyle, HR

11283

Distributees

General Subject Matter

McIntyre, HH
Perkins, RP
Scoles, G
Stenger, VA
Tisdale, WL
Wright, N

Corrections in biochemical research laboratory reports (T2.30-177-1) Results of range finding toxicological tests on agricultural chemical formulation M-1683 (Esteron 245 Type), Results of range finding toxicological tests on Bis Acetonitrilo Decaborane (Band) (T23.14-94-2); Results of range finding toxicological tests on Alpha Phenoxy Propionic Acid

M-1683 (Esteron 245T) (Data sheet of properties, health hazards and precautions for safe handling of materials)

Toxicology work sheet, acute oral toxicity, eye contact test, skin contact irritation, single vapor exposure record (M-1683)

M-1683 (Esteron 245T) (Data sheet of properties, health hazards and

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
		Olson, KJ Oyen, F	
0767853 *	600212	Dow	
0767854 *	551108	Dow	
0767872 *	600406	Dow Wolf, MA	Dow McIntyre, HH
0767873- 0767875*	600215	Dow Olson, KJ Oyen, F	
0767988- 0767990*	611031	Dow Olson, KJ Oyen, F	
0767994- 0767997*	611106	Dow Hoyle, HR Oyen, F Plomer, ET	
0768010- 0768025*	611117	Dow Olson, KJ Plomer, ET	

11284

Distributees

General Subject Matter

	precautions for safe handling of materials)
	AG chem formulation M-1683
	Esteron 245T, safety data sheet
Dow Sales Wolf, MA	Suggested precautionary labeling for M-1684
Dow Hoyle, HR	M-1684 (Esteron Brush Killer type) Data sheet of properties, health hazards and precautions for safe handling of materials
Dow Hoyle, HR	M-2016 data sheet of properties, health hazards and precautions for safe handling of materials
Dow Hoyle, HR	M-2115 data sheet of properties, health hazards and precautions for safe handling of materials
Barrons, KC Boundy, RH Colby, RW Dow Elshere, D Falkenstein, W Gay, HH Greene, LM	Results of range finding toxicological tests on M-2115, an agricultural chemical formulation containing 245T acid and triethyl amine

Dow Number

Date

Author

Recipient

0768087-
0768103*

611108

Olson, K
Oyen, F
Hoyle, HR
KS
Scoles, GW
Tompson, E

0768104-
0768143*

631129

Dow
Lynn, GE

1
1
2
8
01

Distributees

General Subject Matter

Hart, A
 Jones, GD
 Kagy, JF
 Kilian, DJ
 Luce, EN
 Lynn, GE
 McIntyre, HH
 Oyen, F
 Perkins, RP
 Scoles, GW
 Shrader, Sa
 Tisdale, WL
 Wright, N

Results of range finding toxicological tests on agricultural chemical formulation M-2016 containing 35 percent Dowanol Ester 245T. Material safety data sheet

Boundy, RH
 McIntyre, HH
 Perkins, RP
 Hart, A
 Jones, GD
 Scoles, G
 Gay, HH
 Tisdale, WL
 Luce, EN
 Greene, LM
 Shrader, SA
 Falkenstein, W
 Elshere, D
 Kagy, JF
 Barrons, KC
 Colby, RW
 Kilian, DJ
 Lynn, GE

Results of range finding toxicological tests on Verton T herbicide

Barrons, KC
 Boundy, RH

Dow Number

Date

Author

Recipient

Olson, KJ

0768236-
0768254*

620403

Olson, KJ
Oyen, F
Vanvalkenburg, W

1
1
2
2
2

Distributees

General Subject Matter

Colby, RW
Dow
Elshere, D
Epstein, J
Falkenstein, WJ
Gordon, HL
Greene, LM
Hake, CL
Hart, A
Jones, GD
Kagy, JF
Kilian, DJ
Koerker, FW
Luce, EN
Lynn, GE
McIntyre, HH
Mullison, WR
Norton, TR
Oyen, F
Shrader, SA
Wilson, AW
Wright, N

(M-2137) a formulation containing
Dowanol Ester of 245T

Boundy, RK
McIntyre, HH
Perkins, RP
Hart, A
Wright, N
Lynn, GE
Jones, GD
Barrons, K
Vanvalkenburg, V
Brown, R
Gay, HH

Results of tox. tests on 24D + 245T
dowanol esters in kerosene

Dow Number

Date

Author

Recipient

0768240-
768241*

620323

Olsen, KJ
Oyen, F
Hoyle, HR

0768243-
768244*

611108

Vanvalkenburg, W Olson, KJ

11207

Distributees

Wilson, AW
 Luce, EN
 Greene, LM
 Shrader, SA
 Falkenstein, WJ
 Nash, HA
 Colby, RN
 Kilian, DJ
 Elshere, D
 Kagy, JF

General Subject Matter

Boundy, RH
 McIntyre, HH
 Perkins, RP
 Hart, A
 Wright, N
 Lynn, GE
 Jones, GD
 Barrons, H
 Vanvalkenburg, V
 Brown, R
 Gay, HH
 Wilson, AW
 Luce, EN
 Greene, LM
 Shrader, SA
 Falkenstein, WJ
 Nash, HA
 Colby, RW
 Kilian, DJ
 Elshere, D
 Kagy, JF

Data sheet for M2235

Johnson, JE
 Boundy, RK

Cover letter with sample of M-2235
 for testing

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>

0768262- 0768263*	620323	Olson, KJ Oxen, F Hoyle, HR	

0768264 *	620300	Dow	

0768268- 0768269*	720416	Wolf, MA Hoyle, HR	

0768270- 0768271*	720413	Wolf, MA	

4-4
 4-4
 4-4
 4-4
 4-4

Distributees

McIntyre, HH
Perkins, RP
Hart, A
Wright, N
Lynn, GE
Jones, GD
Barrons, K
Vanvalkenburg, V
Brown, R
Gay, HH
Wilson, AW
Luce, EN
Greene, SA
Falkenstein, WJ
Nash, HA
Colby, RN
Kilian, DJ
Elshere, D
Kagy, JF

General Subject Matter

M-2235 (data sheet of properties, health hazards, and precautions for safe handling of materials)

M-2235 (safety information)

Verton CE (data sheet of properties, health, hazards, and precautions for safe handling of materials)

Verton CE (medical information)

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
0768297- 0768299*	630108	Dow Hoyle, HR Olson, KJ Oyen, F	
0768300- 0768301*	710400		
0768302 *	630507	Dow	
0768303- 0768304*	720328	Dow	
0768305- 0768306*	780401	Dow	
0768680- 0768699*	660526	Dow Stevenson, GT	
0768961- 768962*	610601	Olson, KJ Oyen, F Hoyle, HR	

11289

Distributees

General Subject Matter

M-2422 (Data sheet of proportions
for safe handling of materials)

Esteron 245 concentrate

Esteron 245 concentrate (Sales
specification)

Esteron 245 concentrate brush and
weed killer (Material safety data
sheet)

Esteron 245 concentrate brush and
weed killer (Material safety data
sheet)

Dow
Haagsma, TA
BLS
GTS
KJO

A summary of acute oral toxicity
LD50 studies in poultry from
TOX-37 thru TOX-66 inclusive
(Report GH-A 186)

Prod. Plan Target Team
Mgr.
Robinson, VB
RJS
RMS
RVJ

Safety data sheet for Esteron 245
OS

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
0768963- 768964*	580630	Wolf, MA McCollister, DD Hoyle, HR	
0768965- 768966*	610531	Dow	
0768984- 0769027*	660510	Dow Lynn, GE Olson, KJ	

0769080 *	001216	Dow Getzendaner, ME Herman, JL Moss, RD

11290

Distributees

General Subject Matter

Safety data sheet for Reddon concentrate (M-2157)

Safety data information on Esteron 245 OS

Toxicological properties of herbicide formulation M-2993 containing 4-amino-356-trichloropicolinic acid, isooctyl ester and 245T polypropylene glycol butyl ether ester

Barrons, KC
Boundy, RH
Dow
Elshere, D
Falkenstein, WJ
Hart, A
Holder, BB
Johnston, RV
Jones, GD
Kagy, JF
Kilian, DJ
Luce, EN
Lynn, GE
McCollister, DD
McIntyre, HH
Moss, RD
Mullison, WR
Norton, TR
Pitman-Moore
Shrader, SA
Wilson, AW
Wright, N

Barrons, KC
Bauriedel, WR
Dow
Dowell, FH

A residue study picloram and 245T in grass from application of M-3060 formulation (GH-C 343)

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>

0769081- 0769082*	670410	Dow	
0769083- 0769085*	661205	Dow Olson, KJ Oyen, F Wilson, H	
0769085- 0769087*	661108	Dow Hoyle, HR Olson, KJ Oyen, F Wilson, H	
0769088- 0769094*	660816	Dow Wilson, H	
0769160- 0769162*	670316	Olson, KJ Oyen, F	

1100

Distributees

General Subject Matter

Hanson, RG
 Hymas, TA
 Johnston, RV
 Kagy, JF
 Laning, ER
 Ludwig, PD
 Moss, RD
 Osborne, DW
 Popoff, FP
 Ridner, JM
 Rowe, VK
 Seymour, KG
 Shaver, RJ
 Spalding, JL
 Williams, CS

M-3060, safety data sheet

Dow
 Lynn, GE

Results of range finding toxicological tests on Esteron O.S.
 (M-3094) (T2.3094-1)

Esteron 245 O.S. (Data sheet of properties, health hazards and precautions for safe handling of materials)

Esteron 245 O.S. (M-3094) Toxicology work sheets

Boundy, RH
 Buerge, TE

Toxicological properties and industrial handling hazards of

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>

0769163- 0769179*	660000	Dow Tinker, B Wilson, H	
0769268- 0769271*	671224	Dow McCollister, DD Olson, KJ	
0769272- 0769297*	680104	Dow Lynn, GE Olson, KJ	

11232

Distributees

General Subject Matter

Dean, P
Dow
Elshere, D
Holder, BB
Jones, GD
Kagy, JF
Kilian, DJ
Luce, EN
Lynn, GE
McIntyre, HH
Moss, RD
Sheetz, DP
Shrader, SA
Wilson, AW
Wright, N

Tordon 105 mixture
(T2.M0-3132-1)

Tordon 105 mixture (Toxicology
worksheet)

Tordon 144 mixture data sheet of
properties, health hazards and
precautions for safe handling

Toxicological properties and
industrial handling hazards of
Tordon 144 mixture herbicide

Boundy, RH
Dean, P
Dow
Elshere, D
Holder, BB
Jones, GD
Kagy, JF
Luce, EN
McCollister, DD
McIntyre, HH

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
0769351- 0769352*	690121	Dow Hoyle, HR Norris, JM	
0769353- 0769354*	700130	Bjork, C Dow Gowell, JH JBD Loucks, MF Nagele, RE Newport, JJ Seymour, KG Sheldon, HW Stein, JS Talcott, AT Williams, CS Wolf, MA	
0769355- 0769356*	681213	Dow Norris, JM	
0770043- 0770058*	571122	Dow Olson, KJ	

11293

Distributees

Moss, RD
Olson, KJ
Robinson, VB
Sheetz, DP
Shrader, SA
Wilson, AW
Wright, N

General Subject Matter

M-3199X Tordon 225 mixture herbicide data sheet of properties, health hazards and precautions for safe handling of materials (T2.MO-003199-1)

Tordon 225 herbicide release to sales

M-3199X Tordon 225 herbicide (T2.MO-003199-(1)), safety data sheet

Allinson, RL
Athay, RM

Results of range finding toxicological tests on Brush Killer X,

Dow Number

Date

Author

Recipient

0770044-
0770045*

571115

Dow
McCollister, DD
Olson, KJ
Peterson, JE

0770047-
0770048*

571115

Dow
McCollister, DD
Olson, KJ
Peterson, JE

0770049 *

000000

Dow

10-18
10-18
10-18
10-18
10-18

Distributees

Beshgetoor, AW
Boundy, RH
Colby, RW
Dosser, RC
Dow
Elshere, D
Gay, HH
Greene, LM
Hart, A
Hymas, TA
Jones, GD
Kilian, DJ
Luce, EN
Martin, D
McCollister, DD
McIntyre, HH
Mussell, DR
Perkins, RP
Tisdale, WL
White, LC
Wright, N

General Subject Matter

Weed Killer X and Brush Killer TX

Brush Killer TX (Data sheet of properties, health hazards and precautions for safe handling of materials)

Weed Killer X (Data sheet of properties, health hazards and precautions for safe handling of materials)

Brush Killer X (Data sheet of properties, health hazards and

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
0770050- 0770052*	571115	Dow McCollister, DD Olson, KJ Peterson, JE	
0770059 *	560308	Dow White, LE	
0770060- 0770061*	560424	Dow	
0770062- 0770063*	560521	Dow	
0770064- 0770065*	571115	Dow McCollister, DD Olson, KJ Peterson, JE	
0770665- 0770684*	660526	Dow Stevenson, GT Stock, BL	
0781791- 0781794*	501017	Dow Rowe, VK	Allen, WW Alquist, FC Britton, JW

Distributees

General Subject Matter

precautions for safe handling of materials)

Brush Killer X (Data sheet of properties, health hazards and precautions for safe handling of materials)

Brush Killer TX (Request for application testing).

Brush Killer TX (Eye contact test)

Brush Killer TX (Skin contact irritation)

Brush Killer TX (Data sheet of properties, health hazards and precautions for safe handling of materials)

BLS
GTS
KJO
RJS
RMS
RVJ
TAH
VBR

A summary of acute oral toxicity LD50 studies in poultry from TOX-37 thru TOX-66 inclusive (GH-A 186)

Results of skin irritation and skin sensitization tests conducted on human subjects with Esteron 245

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
			Dosser, RC Dow Dutton, WC Irish, FN Kagy, JF Lynn, GE
0781795 *	500405	Dow REW Streeter, LE	Dow White, L
0781796- 0781810*	530217	Dow Oyen, F	Allen, WW Allinson, RL Alquist, FN Beshgetoor, AW Boundy, RH Britton, EC Britton, JW Collier, B Davidson, JH Dow Dutton, WC Gay, HH Gibson, J Greene, LM Heath, SB Johnson, JE Kagy, JF Kelly, JA Kriner, RR Luce, EN Lynn, GE MacCutcheon, SM Melass, VH

14335

Distributees

General Subject Matter

(New Ester) (T2.30-3-1)

Esteron 245T (Main lab report
sheet)

Results of range finding toxicological
tests on Esteron 245
(T2.30-3-2)

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
			Nation, HA Otis, CE Predergast Southwick, L Sunderland, WW Vanhorn, JC Walker, H White, LC Wright, P Zuhl, HH

0782085- 0782091*	531030	Dow Oyen, F	

0782092 *	530305	Dow Rowe, VK	

11237

Distributees

General Subject Matter

Allen, WW
Allinson, RL
Alquist, FN
Barrons, KC
Beshgetoor, AW
Boundy, RH
Britton, EC
Davidson, JH
Dow
Dutton, WC
Gay, HH
Greene, LM
Kagy, JF
Luce, EN
Lynn, GE
MacCutcheon, SM
Prescott, RF
Sunderland, WW
White, L
Wright, P

Results of range finding toxicological tests on Dow Brush Killer T

Dow Brush Killer T (Request for biological test)

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
		Spencer, HC White, L	
0782093- 0782100*	530000	Dow Wolf, MA Wyse, H	
0782101- 0782103*	530000	Dow Wyse, H	
0782104- 0782112*	530000	Dow Wyse, H	
0782113- 0782114*	700721	Dow HCS	
0782115 *	000000	Dow	
0782116- 0782117*	710714	Dow Hoyle, HR Wolf, MA	
0782118- 0782119*	710920	Dow Wolf, MA	
0782178- 0782198*	560501	Dow McCollister, DD Torkelson, TR	

1138

Distributees

General Subject Matter

Dow Brush Killer T (Acute oral toxicity)

Brush Killer T (Eye irritation)

Brush Killer T (Skin irritation)

Brush Killer T, safety data sheet

Brush Killer T (Medical information)

Brush killer T (Data sheet of properties, health hazards and precautions for safe handling of materials)

Brush Killer T (Medical information)

Allinson, RL
Beshgetoor, AW
Boundy, RH
Britton, EC
Coulter, LL
Dow
Elshere, D

Results of range finding toxicological tests on M-631 (Esteron 245 type formulation) (BC T2.30-67-1)

Dow Number

Date

Author

Recipient

0782199-
0782200*

580916

Dow
Hoyle, HR
Torkelson, TR

0782201 *

560504

Dow

0782202-
0782220*

560409

Dow
McCollister, DD
Wolf, MA

11299

Distributees

General Subject Matter

Gay, HH
Greene, LM
Hart, A
Kilian, DJ
Luce, EN
MacCutcheon, SM
Martin, D
Scoles, G
Sunderland, WW
Wright, N

Esteron 245 type formulation
(M-631) (Data sheet of properties,
health hazards and precautions for
safe handling of materials)

M-631 (Esteron 245 type for-
mulation) (T2.30-67-1), safety
data sheet

Allinson, RL
Beshgetoor, AW
Boundy, RH
Britton, EC
Colby, RW
Dow
Elshere, D
Gay, HH
Greene, LM
Hart, A
Kagy, JF
Kelly, J
Kilian, DJ
Luce, EN

Results of range finding toxicolo-
gical tests on 2 formulations of
Reddon (M-640 and M-713)

Dow Number

Date

Author

Recipient

0782285-
0782306*

560503

Dow
Lockwood, D
McCollister, DD
Torkelson, TR

0782379-
0782393*

560702

Dow
Lockwood, D
McCollister, DD
Olson, KJ

1300

Distributees

General Subject Matter

Lynn, GE
MacCutcheon, SM
Sunderland, WW
Wright, N

Results of range finding toxicological tests on M-697 (Esteron Brush Killer type formulation) (T2.30-66)

Allinson, RL
Beshgetoor, AW
Boundy, RH
Britton, EC
Coulter, LL
Dow
Elshere, D
Gay, HH
Greene, LM
Hart, A
Kilian, DJ
Luce, EN
MacCutcheon, SM
Martin, D
Scoles, G
Sunderland, WW
Wright, N

Results of range finding toxicological tests on Esteron Brush Killer OS (M-726) (T2.30-71-1)

Allinson, RL
Alquist, FN
Barrons, KC
Beshgetoor, AW
Boundy, RH
Britton, EC
Colby, RW
Dow
Elshere, D
Gay, HH
Greene, LM

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
0786942- 0786954*	000000	Dow	
0786955- 0786975*	000000	Dow	
0787000- 0787030*	680122	DeLong, HC	
0890394- 0980398*	000000	Dow	
0970330- 0970343*	700901	Blair, EH Dow	
0979033- 0979047*	691215	Bailey, RE	

1031

Distributees

General Subject Matter

Hart, A
Kagy, JF
Kelly, JA
Kilian, DJ
Luce, EN
Lynn, GE
MacCutcheon, SM
Sunderland, WW
Wright, N

24D Esters-process information

Direct Ester process

Acid Ester operating instructions
489 Bldg

General process description, 24D
process

Chemistry of the Dow agricultural
department

Blair, EH
Fernandez, JB
Johnson, JE
Moss, RD
Chamberlain, LC
Peterson, LI
Strojny, EJ
Tobey, SW
Hillary, BB

Miniplant preparation of 2,4-D and
2,4,5-T

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>

0979188-
0979210*

680000

Dow

0979411-
0979416*

670828

Seidel, EM

0979429-
0979430*

670906

Tacy, W

0979686 *

670915

Seidel, EM

0979732 *

670914

EMS

0979733 *

670914

EMS
WHH

0979734 *

670914

EMS

0979735 *

670914

EMS

1-4
1-4
6-2
6-2
6-2

Distributees

General Subject Matter

Rehurg, CE
Moyer, JR
Pumpelly, CT
Poffenberger, N
Haberstroh, WH
Deline, DD
Ayers, JE
Woodward, RE
Jones, GD
Blue, RD
Vanwestenburg, JA

Historical overview of chloracne experiences, includes process information

Agent Orange related costs and capacity

Process flow chart with recommended raw material unit ratios for Orange

Flow chart with costs and capacity for making Agent Orange

Trichlorophenol plant unit ratios

Dichlorophenol plant unit ratios

Chloroacetic acid plant unit ratios

Crystalline chloracetate acid unit ratios

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
0979736 *	670914	EMS	
0979737 *	670914	EMS	
0979738 *	670914	EMS	
0979883- 0979884*	000000	Dow	
0979885 *	670311	Delisle, NG	
0979886- 0979887*	670829	Delisle, NG	
0979927- 0979934*	670411	Delisle, NG	
0979935 *	670427	Delisle, NG	
0979989- 0979994*	670417	Delisle, NG EMS	
0980024 *	670130	Jossi, JA	
0980085- 0980086*	661227	Gilbert, PW	

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General Subject Matter

Butyl chloroacetate plant unit ratios

Butyl ester 24D plant unit ratios

Butyl ester 245T plant unit ratios

Process flow chart indicating costs and capacity for Agent Orange production

Process flow chart indicating costs and capacity for Agent Orange production

Process flow chart indicating costs and capacity for Agent Orange production

Agent Orange production flow charts showing capacities

Chart showing capacity and costs for Agent Orange production

Flow sheets on 24D butyl ester acid

Orange 24Dichlorophenol block flow sheet

245-Trichlorophenol block flow chart

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
0980089 *	670130	EMS GTG	
0980178- 0980188	690307	Wen, RY	

0980320- 0980341*	660121	Amstutz, FC Highhill, CA Kosinski, JE DeLong, HC	

0980394- 0980398*	000000	Dow	

0980971 *	000000	Dow	

0980994- 0981006*	750000	Dow	

1
2
3
4

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General Subject Matter

Ester production product Orange

Look, AT
Sheetz, DP
Pumpelly, CT
Hennis, HE
Thompson, CJ
DeMott, DN
McGee, TW
Fernandez, JB
Lindy, L
Molehouse, D
Wisner, R
Wen, RY
DeLine, DD
Woodward, RE
Seidel, EM
Thurston, DH
Kellom, DB

Manufacture of 24D, 245T and
2,4,5-Trichlorophenoxypropionic
Acid: a literature survey

Dow customer - Weed killer for-
mulating plant

General process description, 24D
process

Mexico Phenoxy Ester process flow
chart

Cost data, process information

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
0981012- 0981024*	691030	Dow	
0981025- 0981030*	000000	Dow	
0981031- 0981036*	691022	Haberstroh, WH	
0981366- 0981372	620227	Fernandez, JB	
0981474 *	711209	Hoff, RC Williams, CS Chase, FI Woodward, R Blosser, KC Scoles, GW 2 Illegible	
0981484	690227	White, LC DeLong, HC Chase, FI Loucks, MF Hawley, HM Sheldon, HW Talcott, AT Holdeman, GE	

11305

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General Subject Matter

Technology review

Flow chart for 2,4-D process

Projected book costs to 1977 (Dow and 2,4-D) 1969 accomplishments and goals, 1970 G & P

The preparation of Esters of Phenoxy Acetic Acid

Doser, RC
Prescott, RF
Sculati, JJ
Hillary, BB
Johnson, D
Highhill, CA

Hoff, RC
Williams, CJ
Chase, FI
Woodward, R.
Blosser, KC
Scoles, GW
2 Illegible

Brush killer, LV4T, M3508, product specification, 12662

White, LC
DeLong, HC
Chase, FI
Loucks, MF
Scheddel, RT
Sheldon, HW
Talcott, AT
Holdeman, GE
Reigler, PF
McCoy, WJ

24D, Butyl-Isopropyl Esters, 50-50 mix

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
0981538 *	701005	Chase, FI Loucks, MF Tait, SR Woodward, RE Holdeman, GE Hawley, AM Seymour, KG Talcott, AT MacDonald, LA	
0981590	690227	Williams, JL Loucks, MF Stobby, GE White, LC Hawley, HM Sheldon, HW Talcott, AT Holdeman, GE	
0981591	671011	Hawley, HM Sculati, JJ White, LC	
0981596	690227	Williams, JL Loucks, MF Stobby, GE White, LC Hawley, HM Sheldon, HW Talcott, AT Holdeman, GE	

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General Subject Matter

Chase, FI
 Loucks, MF
 Tait, JR
 Woodward, RE
 Holdeman, GE
 Hawley, HM
 Seymour, KG
 Talcott, AT
 MacDonald, LA

Esteron Ten-Ten, M3503, export
 only

Williams, JL
 Loucks, MF
 Stobby, GE
 White, LC
 Hawley, HM
 Sheldon, HW
 Talcott, AT
 Holdeman, GE
 Reigler, PF
 Scheddel, RT

245T - product specification -
 P87523

245T - raw material specification

Williams, JL
 Loucks, MF
 Stobby, GE
 White, LC
 Hawley, HM
 Sheldon, HW
 Talcott, AT
 Holdeman, GE

245T - product specification -
 P87523

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
0981597	671011	White, LC Sculati, JJ Hawley, HM	
0981617- 0981620	680207	Kubiak, CJ	
0981895 *	690227	VanHorn, R	
0981896	671011	White, LC Sculati, JJ Hawley, HM	
0981899	671011	White, LC Sculati, JJ Hawley, HM	
0981900	690227	Williams, JL Loucks, MF Stobby, GE White, LC Hawley, HM Sheldon, HW Talcott, AT Holdeman, GE	
0981901	710316	Gill, HH Reigler, PF	

10-2
 10-2
 10-2
 10-2
 10-2

Distributees

General Subject Matter

Reigler, PF
Scheddel, RT

245T - raw material specification

245T - Butyl Esters - analytical
method - 87554A

M-3393 - 2nd revision

245T - raw material specification

245T - raw material specification

Williams, JL
Loucks, MF
Stobby, GE
White, LC
Hawley, HM
Sheldon, HW
Talcott, AT
Holdeman, GE
Reigler, PF
Scheddel, RT
McCoy, WT

245T - product specification

Gill, HH
Reigler, PF

245T, Butyl Esters production
specification

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>

Loucks, MF
Tait, SR
Chase, FI
Woodward, RE
Hawley, HM
Hoff, RC
Talcott, AT
MacDonald, L
Holdeman, GE

0981901

710316

Gill, HH
Reigler, PF
Loucks, MF
Tait, SR
Chase, FI
Woodward, RE
Hawley, HM
Hoff, RC
Talcott, AT
MacDonald, L
Holdeman, GE

1119499-
1119500

670317

DeLong, HC
White, LC
Hawley, HM

1119595-
1119599*

650315

Anderson, RE
Delisle, NG

HA
HA
CO
CO
CO

DistributeesGeneral Subject Matter

Loucks, MF
Tait, SR
Chase, FI
Woodward, RE
Hawley, HM
Hoff, RC
Talcott, AT
MacDonald, L
Holdeman, GE
Reigler, PF
Scheddel, RT
McCoy, WT

Gill, HH
Reigler, PF
Loucks, MF
Tait, SR
Chase, FI
Woodward, RE
Hawley, HM
Hoff, RC
Talcott, AT
MacDonald, L
Holdeman, GE

245T, Butyl Esters production
specification

N-Butyl 2,4,5-Trichlorophenoxy-
acetate raw material specifica-
tion

Coulter, KE
Graves, HE
Wolf, RR
Goergen, GG
Lueck, A

Trichlorophenol plant scope of
project

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>

1119943- 1119944*	670420	Dow	

1119947- 1119952*	670417	Dow	Nummy, WR

1119953- 1119960*	670410	Dow	

1119961- 1119968*	670419	Dow	

1
 2
 3
 4
 5

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General Subject Matter

Dylewski, S
Trapp, W
Sauers, R
Poffenberger, N
Hutchenreuther, N
Wappenhensch, CA
Morello, VS
Wehn, WR

Staehling, EC
Kennett, WW
Putnam, MS

Agent Orange proposal listing
capacity of non-herbicide product

Pletcher, DE
Bosscher, H
Timm, WC
Coulter, KE
Tacey, WJ
Hensley, EF
Gunkler, AA
Kennett, WW
Deline, DD
Goergen, GG
Carlson, RG
Bender, SL
Putnam, MS

Orange information for development
of reply to H.G. Fredricks letter
dated 670331

Costs and capacity information
about Agent Orange

Costs, capacity and technical
information about the proposed
production of Agent Orange

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
1119969 *	000000	Dow	
1119990- 1119991*	660614	McCoy, WJ	Bryant, CA
1120090- 1120092*	671220	Heath, WO	Koster, W
1124150- 1124160*	650302	Cornell, JL Anderson, RE	

1124977- 1125002*	670420		

1124977-
 1125002*
 670420
 1124977-
 1125002*

Distributees

General Subject Matter

Nielsen, WH
Staehling, EC
Putnam, MS
Vanarsdale, JD

Tetrachlorobenzene capacity
information

Van Arsdale, JD
Gill, WM
Hanson, KY

245T capabilities

Coulter, KE
Dylewski, SW
Goergen, GG
Haberstroh, WH
Lueck, AF
Poffenberger, N
Sauers, RC
Trapp, WB
Wappenhensch, O
West, KD
Wehn, WE
Widiger, AH
Graves, HE
Wolf, RR
Delisle, NG
Hutchenreuther, C
Morello, VS
Beyer, DG
Harris, JS

Project conference 14 million
pounds per year.
Trichlorophenol plant
Job 50175

Dow
Kennett, WW

Defense Dept. Orange Project-
Bases for Dow Proposal

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>

1127397- 1127398	641208	Johnson, D	

1232117- 1232129*	570806	Dow McCollister, DD Wolf, MA	

1232130- 1232143*	600331	Dow Olson, KJ Oyen, F	

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12
13
14
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DistributeesGeneral Subject Matter

Putnam, MS
Staehling, EC

Denisik, R
Hay, JM
Hillary, BB
LeSueur, RW
Maunder, WG
Morrison, JA
Mulholland, RS
Smart, JL
Smy, KG
Sundberg, FA
Veach, RH
Young, DM

Condensation of Butyl
Dichloroacetate with Sodium
24-Dichlorophenate

Results of range finding toxicological tests on M1086 (A 245T and 24D alkyl amine formulation)

Barrons, KC
Boundy, RH
Colby, RW
Dow
Elshere, D
Gay, HH
Greene, LM
Hammer, OH
Hart, A
Hymas, TA
Jones, GD
Kagy, JF
Kilian, DJ
Luce, EN

Results of range finding toxicological tests on agricultural chemical formulation M1639 (Veon Brush Killer type)

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>

1232355- 1232378*	571122	Dow McCollister, DD Olson, KJ	

1284728- 1284733	650622	Tiffany, PA Gill, HH	

11312

Distributees

General Subject Matter

Lynn, GE
McIntyre, HH
Scoles, G
Stenger, VA
Tisdale, WL
Wright, N

Allinson, RL
Allison, WE
Athay, RM
Beshgetoor, AW
Boundy, RH
Colby, RW
Dossier, RC
Dow
Elshere, D
Gay, HH
Greene, LM
Hart, A
Hymas, TA
Jones, GD
Kilian, DJ
Luce, EN
Martin, D
McIntyre, HH
Mussell, DR
Perkins, RP
Tisdale, WL
White, LC
Wright, N

Results of range finding toxicological tests on Brush Killer X, Weed Killer X and Brush Killer TX

Analytical method for determination of TCDD in 2,4,5-T by GLC

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
1288153- 1288155*	700130	Ridner, JM Williams, CS Loucks, MF Wolf, MA Seymour, KG Bjork, C Talcott, AT Lynn, GE Stein, JS Newport, JJ Nagele, RE Howell, JH Williams, R 1 Illegible	
1288420- 1288422*	660218	Saunders, E Loucks, MF Wolf, MR Van Valkenberg, W J.R.B. Sachs, SB Lynn, GE Branuman, J Gill, WM Highhill, CA Amstutz, FC Wiltse, ML Illegible	
1288423 *	660218	Van Valkenburg, W	
1295043*	000000	Dow	

11313

Distributees

General Subject Matter

Tordon 225 - Release to Sales

Tordon 105 - Release to sales

Memo - Release to Sales-Tordon 105

Block flow sheet Tordon Ester
form

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
1298263- 1298290*	670000	Dow	
1298297- 1298299*	741204	Dow JNJ	
1298300 *	640921	Dow EMS	
1298301- 1298302*	000000	Dow	
1298303 *	000000	Dow	
1298304- 1298305*	681030	Dow Erickson, AC	
1298306 *	741202	Dow JNJ	
1298307- 1298309*	730315	Dow	
1298310- 1298312*	490720	Dow BFW WJC Luce, EN Walting, BF	Dow Schrauf, B
1298313- 1298315*	680826	Dow JJ	

11314

Distributees

General Subject Matter

Direct nuclear chlorination of
phenoxyacetic acid, benzene
Research lab

2-(2-4 dichlorophenoxy) proprionic
acid (Physical properties data
sheet)

Dowanol Ester of 245T (Physical
properties data sheet)

Silvex (Physical properties data
sheet)

24D NA salt monohydrate (Physical
properties data sheet)

245-Trichlorophenol (Physical pro-
perties data sheet)

245T (Physical properties data
sheet)

Freezing point molten 24D H₂O

24D report sheet (Main lab No. SSR
146-851)

Colby, A
Dow

Herbicides, vapor pressure data
(Analytical laboratories report

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
		RH Stobby, G	
1298316- 1298320*	731128	Dow Messing, S	Dow Hart, JP
1298321- 1298322*	670327	Dow Stull, DR Walker, LC	
1298323- 1298326*	691022	Dow Sinke, GC Stull, DR	
1298328 *	710917	Dow Gilbert, PW Hawley, HM Holdeman, GE Loucks, MF MacDonald, LA	

11315

DistributeesGeneral Subject Matter

Holdeman, GE
 Kiley, L
 Shrader, S
 Wengert, GB

AL 79-202)

Arestin,
 Bleiweiss, J
 Chase, F
 Dhingra, Y
 Dow
 Haberstroh
 Jones, W
 Lafevor, D
 Manfrom, R
 Martin, R
 Miller, B
 Mintz, M
 Morehouse, DS
 Yeager, L

24D acid ester process
 solubilities

Dow
 Fernander, J

Thermal data for process steps in
 synthesis of 24D (HL-304)

Holdeman, GE

Heat of reaction of dimethylamine
 and 24D (HL-527)

Dow
 Gilbert, PW
 Hawley, HM
 Holdeman, GE
 Loucks, MF
 MacDonald, LA

2,4-Dichlorophenol, technical
 (product specification)

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
		Reigler, PF Talcott, AT	
1298329 *	720615	Blosser, KC Chase, FT Dow Flannery, RF Fraser, JM Gill, HH Hoff, RC Holdeman, GE Talcott, AT Woodward, R	
1298330 *	720615	Dow	
1298331 *	710118	Chase, FI Dow Hawley, HM Holdeman, GE Loucks, MF MacDonald, LA Reigler, PF Seymour, KG Tait, SR Talcott, AT Woodward, RE	
1298332 *	730412	Blosser, KC Chase, FI Dow Flannery, RF	

11316

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General Subject Matter

Reigler, PF
Talcott, AT
Tree, RM

245T propylene glycol butyl ether
esters (Product specification)

Blosser, KC
Chase, FT
Dow
Flannery, RF
Fraser, JM
Gill, HH
Hoff, RC
Talcott, AT
Woodward, R

245T propylene glycol butyl ether
esters (Sales specification)

Chase, FI
Dow
Hawley, HM
Holdeman, GE
Loucks, MF
MacDonald, LA
Reigler, PF
Seymour, KG
Tait, SR
Talcott, AT
Woodward, RE

Formula 40 Weed killer M-3604
(Product specification)

Blosser, KC
Chase, FI
Dow
Flannery, RF

DMA-6 unsequestered M-2255
(Product specification)

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
		Fraser, JM Hoff, RC Holdeman, GE Seymour, KG Talcott, AT Woodward, RE	
1298333 *	710601	Chase, FI Dow Hawley, HM Holdeman, GE Loucks, MF MacDonald, LA Reigler, PF Seymour, KG Tait, SR Talcott, AT Woodward, RE	
1298334 *	000000	Dow	
1298335 *	000000	Dow	
1298336 *	000000	Dow	
1298337 *	000000	Dow	

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Distributees

Fraser, JM
Hoff, RC
Holdeman, GE
Seymour, KG
Talcott, AT
Woodward, RE

General Subject Matter

Chase, FI
Dow
Hawley, HM
Holdeman, GE
Loucks, MF
MacDonald, LA
Reigler, PF
Seymour, KG
Tait, SR
Talcott, AT
Woodward, RE

DMA-6 sequestered M-3637 (Product specification)

Propylene glycol butyl ether esters of Silvex (Physical properties)

Isooctyl esters of 245T (Physical properties)

Low volatile esters of 245T Dow sales grade 245T, propylene glycol (C3H6O to C9H18O3) butyl ether esters (Physical properties)

Isooctyl esters of 24D (Physical properties)

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
1298338 *	000000	Dow	
1298339 *	000000	Dow	
1298340 *	710316	Dow	
1298341 *	720117	Blosser, KC Chase, FI Dow Flannery, RF Gill, HH Hoff, RC Holdeman, GE Scoles, GW Talcott, AT Woodward, RE	
1298342 *	000000	Dow	
1298343- 1298344*	611017	Dow Hoyle, HR Olson, KJ	
1298345 *	000000	Dow	

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Distributees

General Subject Matter

N-Butyl ester of 24D (Physical properties)

24D Butyl esters (Physical properties)

24D propylene glycol butyl ether ester (Product specification)

24D (Product specification)

Blosser, KC
Chase, FI
Dow
Flannery, RF
Gill, HH
Hoff, RC
Holdeman, GE
Scoles, GW
Talcott, AT
Woodward, RE

Tordon 101 mixture (Data sheet of properties, health hazards and precautions for safe handling of materials)

Dowanol PIB mix ester of 24D (Data sheet of properties, health hazards and precautions for safe handling of materials)

245-Trichlorophenol (Data sheet of properties, health hazards and precautions for safe handling of materials)

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
1298346- 1298347*	570927	Dow Hoyle, HR Peterson, JE	
1298348- 1298349*	000000	Dow	
1298350 *	741202	Bethke Boust, HF Dersnah Dow Jones, W	
1298351 *	750109	Dersnah Dow Fey, K	
1298352 *	700801	Abegg, CF Dow Harris, W Higgins, HS	
1298353 *	741211	Wozniak, LJ	
1298354 *	750123	Dersnah Dow Jones, JN, Jr.	
1298355 *	750123	Dersnah Dow Jones, JN, Jr.	
1298356 *	750123	Dersnah Dow Jones, JN, Jr.	

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Distributees

General Subject Matter

24D (Data sheet of properties, health hazards and precautions for safe handling of materials)

Consequences of overexposure for chemicals in 489 building

Bis-(24D) (Reactive chemical hazard data)

Ethylene Glycol W/ 24D acid; molten 24D process (Reactive chemical hazard data)

24D (Reactive chemical hazard data)

DE waste treatment plant

Waste treatment, butyl ester of 24D, distillation feed (Reactive chemical hazard data)

Waste treatment, butyl ester of 24D solvent (Reactive chemical hazard data)

Waste treatment of butyl ester of 24D tars (Reactive chemical hazard data)

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
1298357- 1298360*	741204	Dow Jones, J	
1298361- 1298362*	710526	Boggs, GU Dow	Dow Dunlap, R Haberstroh, WH Higgins, HS Theis, JM
1298363- 1298369*	730000	Dow Southwick, L	
1298603- 1298605*	000000	Dow	
1298606- 1298607*	650119	Dow Hoyle, HR Olson, KJ Oyen, F	
1298608- 1298609*	650125	Dow Hoyle, HR Olson, KJ	
1298610- 1298611*	740300	Dow	
1298612- 1298614*	780601	Dow	

Distributees

General Subject Matter

Alcohols, and molecular weight
data summary

Direct ester "T" waste 710309 from
489 (Analytical laboratories
report AL28-830)

Kuron Silvex herbicide continues
to gain acceptance (Ind vegetation
mgmt 5(2), 18-24)

Properties and hazards, flash
points of various products

Tordon 50D formulation (Data sheet
of properties, health hazards and
precautions for safe handling of
materials) (T2.MO-2777X-1)

Tordon 101 mixture (Data sheet of
properties, health hazards and
precautions for safe handling of
materials) (T2.MO-2439-1)

Tordon 101 mixture weed and brush
killer (Material safety data
sheet) (Form 336-158-74)

Tordon (R) 101 mixture weed and
brush killer (Material safety data
sheet)

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
1298615- 1298617*	780601	Dow	
1298618- 1298620*	780601	Dow	
1298621- 1298623*	780601	Dow	
1298624- 1298625*	660412	Dow Hoyle, HR McCollister, DD Olson, KJ	
1298626- 1298627*	740300	Dow	
1298628- 1298629*	660201	Dow Hoyle, HR McCollister, DD Olson, KJ	
1298630- 1298632*	780601	Dow	
1298633- 1298634*	671031	Dow Hoyle, HR Norris, JM Olson, KJ	
1298635- 1298636*	760800	Dow	

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Distributees

General Subject Matter

Tordon (R) 101 mixture weed and brush killer private label (Material safety data sheet)

Tordon (R) 101R forestry herbicide (material safety data sheet)

Tordon (R) 155 mixture brush killer (Material safety data sheet)

1 Tordon 155 (Data sheet of properties, health hazards and precautions for safe handling of materials) (T2.MO-2993-1)

Tordon 155 mixture brush killer (Material safety data sheet)

Tordon 202 mixture (Data sheet of properties, health hazards and precautions for safe handling of materials) (T2.MO-2861-1)

Tordon (R) 202C mixture herbicide (Material safety data sheet)

Tordon 212 (Data sheet of properties, health hazards and precautions for safe handling of materials) (T2.MO-3200-1)

Tordon 212 mixture herbicide (Material safety data sheet) (Form 336-161-76)

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
1298637- 1298638*	780601	Dow	
1298639- 1298640*	771001	Dow	
1298641- 1298643*	780601	Dow	
1298644- 1298651*	750811	Dow Gutenkunst, V Porter, DF Skelly, NE	
1298652- 1298653*	700514	Dow Hoyle, HR Norris, JM	
1298654- 1298655*	750600	Dow	
1298656- 1298658*	780601	Dow	
1298659- 1298660*	710422	Dow Hoyle, HR Norris, JM	
1298661- 1298662*	710917	Dow Hoyle, HR Wolf, MA	

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General Subject Matter

Tordon (R) 212 mixture herbicide
(Material safety data sheet)

Tordon (R) 225 herbicide (Material
safety data sheet)

Tordon (R) 225E mixture herbicide
(Material safety data sheet)

Analytical method Tordon 225E mix-
ture herbicide by liquid chroma-
tography (Method 87141)

Tordon 472 herbicide (Data sheet
of properties, health hazards and
precautions for safe handling of
materials) (BC12.MO-3427-1)

Tordon 472 herbicide (Material
safety data sheet) (Form
336-166-75)

Tordon (R) 472 weed killer
(Material safety data sheet)

DMA4 (Data sheet of properties,
health hazards and precautions for
safe handling of materials)
(NB T2.MO-3538-1)

245T Dowanol 97B ester (Data sheet
of properties, health hazards and
precautions for safe handling of
materials) (K-7856 NB725.14-106)

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
1298663- 1298664*	750310	Dow Silverstein, LG Wolf, MA	
1298665- 1298666*	760823	Dow Langner, RR Wroblewski, D	
1298667 *	000000	Dow Lamott, S	Rafos, G
1298668- 1298670*	760800	Dow	
1298671- 1298672*	710917	Dow Hoyle, HR Wolf, MA	
1298673- 1298674*	650125	Dow Hoyle, HR Olson, KJ	
1298675- 1298676*	690909	Dow Hoyle, HR Norris, JM	
1298677- 1298678*	650119	Dow Hoyle, HR	

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Distributees

General Subject Matter

24D Triisopropanolamine salt (Data sheet of properties, health hazards and precautions for safe handling of materials) (K-8866)

DMA-6 (Data sheet of properties, health hazards and precautions for safe handling of materials) (M-3637)

Cover memo for data sheets

Tordon 212 mixture herbicide (Material safety data sheet) (Form 336-161-76)

245T Dowanol 97B ester (Data sheet of properties, health hazards and precautions for safe handling of materials) (K-7856 NBT25.14-106)

Tordon 101 mixture (Data sheet of properties, health hazards and precautions for safe handling of materials) (T2.MO-2439-1)

Tordon 472 herbicide (Data sheet of properties, health hazards and precautions for safe handling of materials) (BC T2.MO-3472-1)

Tordon 50D formulation (Data sheet of properties, health hazards and

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
		Olson, KJ Oyen, F	
1298679- 1298680*	660412	Dow Hoyle, HR McCollister, DD Olson, KJ	
1298681- 1298682*	751009	Dow Hoyle, HR Yakel, HO	
1298683- 1298684*	700319	Dow Hoyle, HR Norris, JM	
1298685 *	750711	Dow Krumel, KL	
1298686- 1298689*	750711	Dersnah, H Dow	Dow Krumel, KL
1298690 *	711116	Brown, M Dow JL Robb, J	
1298691- 1298692*	000000	Dow	

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General Subject Matter

precautions for safe handling of materials) (BC T2.MO-2777X-1)

Tordon 155 (Data sheet of properties, health hazards and precautions for safe handling of materials) (T2.MO-2993-1)

Tordon 212 mixture herbicide (Data sheet of properties, health hazards and precautions for safe handling of materials) (HET M-3179-(2))

Tordon 212 mixture herbicide (Data sheet of properties, health hazards and precautions for safe handling of materials) (T2.MO-3179-1)

24D (Reactive chemical hazard data)

Dust explosion properties of 24D acid (Analytical report)

DMA-6 (unsequestered) (Reactive chemical hazard data)

24D (Summary of chemical reactivity precautions and properties)

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
1298693 *	741031	Dow Hebbourn, R Kerby, JE	
1298694- 1298695*	690716	Dow Dunlap, RL Mandrell, ME	
1298696- 1298697*	690716	Dow Dunlap, RL Mandrell, ME	
1298698 *	750206	Bethke Dersnah Dow Holdeman, G Keeney, N Vanhorn, R	
1298699- 1298700*	691003	Dow Gilbert, PW Mandrell, ME	
1298701 *	710830	Dow CJR JRL RSS	
1298702- 1298703*	690716	Dow Dunlap, RL Mandrell, ME	
1298704- 1298714*	710125	Dow Prophet, H	

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General Subject Matter

24D PGBEE (Reactive chemical hazard data)

Tordon 212 mixture (Summary of chemical reactivity precautions and properties)

Tordon 101 mixture (Summary of chemical reactivity precautions and properties)

Tordon 101 R (Reactive chemical hazard data)

Tordon acid (Summary of chemical reactivity precautions and properties)

Tordon 225 (Reactive chemical hazard data)

Tordon 155 mixture (Summary of chemical reactivity precautions and properties)

Studies of hazardous chemicals and their reactions, kinetics of che-

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
		Stull, DR	
1298715 *	710801	Dersnah, H Dow McCarty, WM	
1298716- 1298717*	690627	Dow Gilbert, PW Mandrell, ME	
1298718- 1298719*	690718	Dow Gilbert, RW Mandrell, ME	
1298726 *	000000	Dow	
1298766 *	000000	Dow	
1299165- 1299169*	000000	Dow	
1299256- 1299265*	000000	Dow	
1299267- 1299270*	000000	Dow	
1339420- 1339423*	650810	Barrons, KC Lynn, GE McCoy, WJ Southwick, L Wolf, MA	

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Distributees

General Subject Matter

mical destruction by burning
(NCT-5007)

Esteron 245 CONC (Reactive chemical hazard data)

Dowanol PIB esters of 245T
(Summary of chemical reactivity precautions and properties)

24D TIPA mix (Summary of chemical reactivity precautions and properties)

Chloro-Pyridines dept.

Block flow H₂O form. Tordon

Formulations, special formulations area

Tordon operations manual

TIPA and TIPA 2D storage and transfer from 489 building

Esteron TR2 (Release to Sales 12)

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
		Vanvalkenburg,W Sachs, SB Branaman, J Gill, WM DeLong, HC Matutz, H Davis, H Corbin, WL Johnson, J CEO DEP	
1341834- 1341853*	700422	Fauver, VA	MacDonald,LA
1410790- 1410792*	701217	Dow Gehring, PJ Norris, JM Williams, CS	

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Distributees

General Subject Matter

Demott, DN
Hanners, HH
Martin, RA
Tree, RM
Deline, DD
Kennedy, TL
Robbins, LA
Plepys, RA
Stamand, VE
Clark, GA
Spencer, RA
Dylewski, SW
Bleiweiss, JC

High purity 245-trichlorophenol,
state of the art review

Barton, J
Blair, EH
Burgert, BE
Clegg, DH
Dow
Edwards, H
Frevel, LK
Gordon, HL

Toxicological properties and
industrial handling hazards of
formulation M-3592 containing the
propylene glycol butyl ether ester
of 245T

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
1410793- 1410794*	701228	Dow Hoyle, HR Norris, JM	
1410795- 1410798	701217	Dow Norris, JM	
1410799- 1410800*	701119	Bourne, JE Dow	
1410801- 1410802*	701228	Silverstein, EH	
1410803- 1410804*	701110	Silverstein, EG	

Distributees

General Subject Matter

Goring, Ca
Holder, BB
Johnson, JE
Kilian, DJ
Kimmel, CE
Lloyd, BH
MacCutcheon, SM
McCollister, DD
McIntyre, HH
Morgan, RW
Morse, D
Pitchforth, L
Robinson, VB
Schwarz, BA
Williams, CS

M-3592 (Data sheet of properties,
health hazards, and precautions
for safe handling of materials)

Acute toxicological properties of
Formulation M-3592 containing the
propylene glycol butyl ester of
245T

M-3592 (Acute oral toxicity)

M-3592 (Acute oral toxicity)

M-3592 (Eye irritation)

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
1410805 *	701106	Silverstein, EH	
1410806- 1410807*	701210	Silverstein, EH	
1410810- 1410811*	701210	Silverstein, EH	
1410812- 1410813*	701210	Silverstein, EH	
1410814- 1410815*	701217	Dow Gehring, PJ Norris, JM Williams, CS	

1410816- 1410817*	701217	Dow Hoyle, HR Norris, JM

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Distributees

General Subject Matter

M-3592 (Primary skin irritation - patch test (household chemical))

M-3592 (Skin contact absorption)

M-3592 (Skin contact absorption)

M-3592 (Skin contact absorption)

Bergert, BE
Blair, EH
Clegg, DH
Dow
Frevel, LK
Gordon, HL
Goring, CA
Holder, BB
Johnson, JE
Kimmel, CE
Lloyd, BH
MacCutcheon, SM
McCollister, DD
McIntyre, HH
Morgan, RW
Morse, D
Pitchforth, L
Robinson, VB
Schwarz, AJ
Williams, CS

Toxicological properties and industrial handling hazards of formulation M-3592 containing the propylene glycol butyl ether ester of 245T

M-3592, (Data sheet of properties, health hazards and precautions for safe handling of materials)

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
1410818- 1410821*	701217	Dow Norris, JM	
1410822- 1410823*	701119	Bourne, JE	
1410824- 1410825*	701228	Silverstein, EH	
1410826- 1410827*	701110	Silverstein, EH	
1410828 *	701106	Silverstein, EH	
1410829- 1410830*	701210	Silverstein, EH	
1410831- 1410832*	701210	Silverstein, EH	
1410833- 1410834*	701210	Silverstein, EH	
1410835- 1410836*	701210	Silverstein, EH	
1410880- 1410902*	630225	Dow Olson, KJ Oyen, F Scoles, G	

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General Subject Matter

Acute toxicological properties of formulation M-3592 containing the propylene glycol butyl ether ester of 245T

M-3592 (Acute oral toxicity)

M-3592 (Acute oral toxicity)

M-3592 (Eye irritation)

M-3592 (Primary skin irritation - patch test (household chemical))

M-3592 (Skin contact absorption)

M-3592 (Skin contact absorption)

M-3592 (Skin contact absorption)

M-3592 (Skin contact absorption)

Barrons, KC
Boundy, RH
Brown, R
Colby, RW
Dow

Results of range finding toxicological tests on agricultural chemical formulation M-2422 containing 91 percent Dowanol PIB ester of 245T (Biochemical Research

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>

1410903- 1410909*	531030	Dreyer, F	

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Distributees

General Subject Matter

Elshere, D
 Falkenstein, WJ
 Gay, HH
 Greene, LM
 Hart, A
 Jones, GD
 Kagy, JF
 Kilian, DJ
 Luce, EN
 Lynn, GE
 McIntyre, HH
 Mullison, WR
 Nash, HA
 Norton, TR
 Scoles, G
 Shrader, SA
 Wilson, AW
 Wright, N

Laboratory)

Adams, EM
 Allen, WW
 Allinson, RL
 Alquist, FN
 Barrons, KC
 Beshgetoor, AW
 Boundy, RH
 Britton, EC
 Davidson, JH
 Dow
 Dutton, WC
 Gay, HH
 Greene, LM
 Kagy, JF
 Luce, EN

Results of range finding toxicological tests on Dow Brush Killer T

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>

1428610- 1428611*	611228	Dow Winston, AW, Jr.	

1431259- 1431263*	000000	Ivon Watkins	

1436354- 1436364*	000000		

1437060- 1437102*	660622	Graves, HH DRE	

1443921- 1443922*	701217	Dow Gehring, PJ	

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Distributees

Lynn, GE
MacCutcheon, SM
Prescott, RF
Sunderland, WW
White, L
Wright, P

General Subject Matter

Fish toxicity of some herbicide
formulations and their ingre-
dients

IWD 245T Esters

Compounds showing toxicity to fish
at 5 MG/L or less

Goergen, GG
Lueck, A
Sauers, RC
Widiger, AH
Tuttle, FC
Poffenberger, N
Wolf, RR
Eigsti, DR
Hillman, RE
Anderson, RE
Graves, HE
Coulter, KE
Snyder, AP
Delisle, NG

Pilot Plant Study of the Caustic
Hydrolysis of 1245 -
Tetrachlorobenzene CF-1043-2

Barton, J
Blair, EH

Toxicological properties and
industrial handling hazards of

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>

Norris, JM
Williams, CS

1443923- 1443924*	701217	Dow Hoyle, HR Norris, JM	
1443925- 1443928*	701217	Dow Norris, JM	
1443929- 1443932*	700000	Bourne, JE Dow Silverstein, EH	
1443933- 1443934*	761110	Dow Silverstein, EH	

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Distributees

Burgert, BE
 Clegg, DH
 Dow
 Edwards, H
 Frevel, LK
 Gordon, HL
 Goring, CA
 Holder, BB
 Johnson, JE
 Kilian, DJ
 Kimmel, CE
 Lloyd, BH
 MacCutcheon, SM
 McCollister, DD
 McIntyre, HH
 Morgan, RW
 Morse, D
 Pitchforth, L
 Schwarz, AJ
 Williams, CS

General Subject Matter

formulation M-3592 containing the
 propylene glycol butyl ether of
 245T

M-3592 (Data sheet of properties,
 health hazards and precautions for
 safe handling of materials)

Acute toxicological properties of
 formulation M-3592T

M-3592 (Acute oral toxicity)

M-3592 (Eye irritation)

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
1443935 *	701106	Dow Silverstein, EH	
1443936- 1443941*	701210	Dow Silverstein, EH	
1511476 *	800506	K&E Wine, LM	Braun, WH Dow
1548652- 1548663*	610124	Strand, D HRH LGS	
1549497- 1549536*	501214	Delisle, NG Strand, D LGS Prior, CA Teal, JL Brittos, WW Arnold, JB DeLong, HC Pott, S Highhill, CA Brown, M	
1549641- 1549693*	700410	Axe, FD Hoyle, HR	

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General Subject Matter

Primary skin irritation patch test
(household chemical) (M-3592)

M-3592 skin contact absorption

Dow
Tucker, M

Oil formulations

24D process

Lynn, GE
Deline, DD
Schmidtke, DJ
Hodson, RE
Miller, DE
Kramer, CG
Holder, BB
Morse, DB
Rowe, VK
Soule, RD

Industrial hygiene survey of 245T

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
1550150 *	710202	Olson, RD Axe, FE Hoyle, HR	
1550401- 1550407*	690930	Mutcher, JE	Tree, RM Plepys, RA Bailey, CE Kramer, CG Morse, DB Stehl, RH Seidel, EM Rowe, VK Snyder, RE Axe, FD
1550424- 1550441*	650716	Dow	
1550444	000000	Dow	
1550445	580807	Bradford, R	
1550446	580805	Bradford, R	
1550447	580808	Bradford, R	
1550448	580806	Bradford, R	

1550448

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Murray, N
Deline, DD
Tree, RM
Bailey, CZ
Seidel, EM
Snyder, RE
Holder, BB
Silverstein, LG

General Subject Matter

Summary of environmental conditions in dowicides plant

Dowicide plant environmental control task force minutes

Dowicides - industrial hygiene job analysis

Flowchart of production of Dowicides

Flowchart - Dowicide B

Flowchart - Dowicide P

Flowchart - Scrubber and Trap Phenol

Flowchart - Monochlorophenol crude production

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
1550449	581015	Synder, RE	
1550455	651007	Krohn, L	
1550456	651007	Krohn, L	
1550457	651007	Krohn, L	
1550458	651007	Krohn, L	
1550459	651006	Krohn, L	
1550460	651007	Krohn, L	
1550464 *	000000	Dow	
1550550	580807	Bradford, R	
1550551	580807	Bradford, R	
1550552 *	580805	Bradford, R	
1550553	580805	Bradford, R Mutchler, J	
1550554 *	651006	Krohn, L	
1550577- 1550579	580807	Bradford, R	
1551589- 1551591*	580417	Dow Stevenson, GT	

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General Subject Matter

Flowchart - Monochlorophenol

Flowchart - Dowicide 6

Flowchart - Dowicide 6

Flowchart - Orthochlorophenol

Flowchart - Dichlorophenol

Flowchart - Dowicide 2

Flowchart - Dowicide DPM

Schematic diagram of 265 Bldg.
processes

Flowchart - Dowicide 1

Flowchart - Dowicide 2S

Flowchart - Dowicide 6

Flowchart - Dowicide 6

Flowchart - Dowicide 7

Dowicide B process

Barrons, KC
Blair, EH
Boundy, RH

Inverton (brush killer) hay spray
cattle feeding test

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>

1556945 *	000000		

1558517 *	671027	Fairey, BP	

1558517 *	670607	Chang, KY Fernandez, JB	

1558518- 1558518A*	790316	Krumel, KL Arnold, RF Howard, AC First, KE Owen, PW	

1558518-
1558518A*

Distributees

General Subject Matter

Colby, RW
 Coulter, LL
 Dow
 Green, J
 Hymas, TA
 Johnson, JE
 Kagy, JF
 Lippie, LJ
 Lynn, GE
 Norton, TR
 Nutting, HS
 Perkins, RP
 Rowe, VK
 Spalding, J
 Vanvalkenburg, JW

Notes on Fort Saskatchewan D
 process, Hooker TCP and Hercules
 MCAA

Laboratory preparation of 24D

Laboratory preparation of 24D

Bumb, RR
 Johnson, SR
 Pruitt, ME
 Ward, WH
 Williams, CS
 Maddox, JF
 Owen, PW
 May, VT
 McGregor, SD

High yield aqueous 24D process
 a study of the modified Brazil
 process.

Dow Number

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Author

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1558519-
1558520

750101

Mintz, MJ
Brust, HF

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Williams, AJ
Tobey, SW
Bohnert, TJ
Morehouse, DS
Buzzelli, DT
Haberstroh, WH
Woodward, RE
Humbert, D
Westover, LB
Jewett, G
Kleidon, D
Fothergill, W
Valcore, D
Mendoza, C
Hormel, T
Kennedy, TL
Aerstin, FG
Manfrom, R
Schloemann, P
Bleiweiss, J
Giebelhaus, L
Dasilva, AA

Blair, EH
Hein, ND
Karwal, JH
Leng, ML
Mintz, MJ
Moss, RD
Pruitt, ME
Sheetz, DP
Theis, JM
Brust, HF
Morehouse, DS

General Subject Matter

Thermal decomposition rate of
bis (24 dichlorophenyl)
acetal of glyoxylic acid (BIS
24D) present in 24D

Dow Number

Date

Author

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1558521-
1558522*

810204

Krumel, KL
Arnold, RF
McGregor, SD

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General Subject Matter

Dhingra, YR
 Messing, SH
 Aerstin, FG
 Yeager, LM
 Bleiweiss, JC
 Kennedy, TL
 Haberstroh, WH
 McCoy, CE
 Woodward, RE
 Lafavor, DR
 Skelly, NE
 Robbins, LA
 Little, DW
 Kern, WG
 Hoffman, RL
 Werling, CL
 Mirsky, MJ
 Jones, WO
 Swogger, KW
 Chase, FI
 Carlson, RG
 Osborne, DW

Gledhill, JR
 Sheetz, DP
 McGregor, SD
 May, VT
 Muench, WC
 Williams, A
 Tobey, S.
 Buzzelli, DT
 Woodward, RE
 Haberstroh, WH
 Gorgacz, S

The continuous preparation of
 24D and 2-methly-4-chloro-
 phenoxyacetic acid (MCPA)

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
1559777 *	671102	Seidel, EM	
1559781- 1559786*	000000	T.A.G.	
1559787- 1559788*	640625	Seidel, EM	
1559789 *	640625	Seidel, EM	
1559790 *	640625	Seidel, EM	
1559791- 1559797*	640618	E.M.S.	
1559798- 1559799*	650118	E.M.S.	
1559800 *	650118	Seidel, EM	
1559801- 1559806*	000000	Dow	

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Hormel, T
Moser, J
Yocum, R
Downs, T
Veurink, G
Westover, W
Pierzinski, B
Dersnah, BE

General Subject Matter

245T process

Direct Ester reaction information
489 bldg. Dichlorophenol Dowanol

Material balance considerations

24D Ester (unit ratios)

245T Ester unit ratios material
balance

Utilities, DE

Utility requirements 489

Utility requirements 260 Bldg. -
Direct Ester

General process description
Direct Ester process

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
1560178- 1560214*	681017	Seidel, EM Gilbert, PW Dunlap, RL	

1560215- 1560237*	681017	Seidel, EM Gilbert, PW Dunlap, RL	

1560238- 1560241*	681111	Seidel, EM Gilbert, PW Dunlap, RL	

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Distributees

Seidel, EM
 Gilbert, PW
 Dunlap, RL
 Bleiweiss, J
 Chase, FI
 Deline, DD
 DeLong, HC
 Jossi, JA
 Rogers, JP
 Schwark, GJ
 Williams, JL
 Woodward, RE
 Fernandez, JB

General Subject Matter

Technical report with information
 about 24D and 245T processes,
 costs, capacity and equipment

Seidel, EM
 Gilbert, PW
 Dunlap, RL
 Bleiweiss, J
 Chase, FI
 Deline, DD
 DeLong, HC
 Jossi, JA
 Rogers, JP
 Schwark, GJ
 Williams, JL
 Woodward, RE
 Fernandez, JB

Technical report with information
 about 24D and 245T processes,
 costs, capacity, plant design and
 equipment

Seidel, EM
 Gilbert, PW
 Dunlap, RL
 Bleiweiss, J
 Chase, FI

Technical report with information
 about 24D and 245T processes,
 capacity, plant design and
 equipment

Dow Number

Date

Author

Recipient

1560242-
1560265*

681111

Seidel, EM
Gilbert, PW
Dunlap, RL

1560266 *

670109

Johnson, RL
Widiger, AH

1560539 *

600324

DeLong, HC

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General Subject Matter

Deline, DD
 Delong, HC
 Jossi, JA
 Rogers, JP
 Schwark, GJ
 Williams, JL
 Woodward, RE
 Fernandez, JB

Seidel, EM
 Gilbert, PW
 Dunlap, RL
 Bleiweiss, J
 Chase, FI
 Deline, DD
 Delong, HC
 Jossi, JA
 Rogers, JP
 Schwark, GJ
 Williams, JL
 Woodward, RE
 Fernandez, JB

Process information and operating
 procedures for 24D Esters

Johnson, RL
 Widiger, AH
 Bender, S
 Bailey, C
 Silverstein, L
 Cobler, J
 Haberstroh, WH
 Sauers, R

Summary of laboratory research on
 temperature control of processes
 related to 24D and 245T formation

Safety precautions

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
1560540 *	491200	Dow	
1560542 *	690722	McKnight, FW	
1560548 *	000000	Kosinski, JE	
1560549 *	000000	Kosinski, JE	
1560550 *	000000	Kosinski, JE	
1560714 *	510228		
1560951- 1561000*	680826	Fernandez, JB Seidel, M Brown, M Highhill, C	
1561307- 1561310*	670329	GMS	
1561311 *	670118	Hartenstein	
1561312 *	670419		
1561343- 1561346*	670316	Hartenstein, P	Sculati, JJ

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1
3
4
3

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General Subject Matter

24D Amine weed killer hazards and precautions

Block flow diagram of Amine formulations

Unit ratios Amine formulation

Cycle times formulating

Cycle times packaging

Raw material specification L2-0-3

Technology review phenoxy & Tordon formulations

Hoff, RC
Bleiweiss, J
Beauchamp, R
Deline, DD
DeLong, H
Dosser, R
Schwark, J
Snodgrass, B
Woodward, D

245T process

245T process

245T material balance

245T centrifuge installation

Deline, DD
Kearney, JK
Delisle, NG

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
1561353- 1561375*	681114	Jossi, JA Seidel, EM Williams, JL	

1561376- 1561397*	681114	Seidel, EM Williams, JL Jossi, JA	

1561695- 1561698*	690417	Dow	

1561699- 1561700*	690413	Wyant, G Brown, M	Charlie

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Chase, F
Jossi, JA
Bleiweiss, J
Haberstroh, W
Williams, L
Marshall, S
Rodgers, J
Schwark, G,
Seidel, M
Snodgrass, W
Woodward, RE
Delisle, NG
Fernandez, JB
Deline, DD

Williams, L
Marshall, S
Rodgers, J
Schwark, G
Seidel, M
Snodgrass, W
Woodward, RE
Delisle, NG
Fernandez, JB
Deline, DD
Chase, F
Jossi, JA
Bleiweiss, J
Haberstroh, W

General Subject Matter

245T, 245T Esters and formulations of Esters technology review

Silvex acid, Dowanol Ester of
Silvex and Isooctyl Ester of
Silvex technology review

Veon 245 process

Veon formulations

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
1561701 *	690709	CAH	
1561702 *	690319	Highhill, CA	Chase, FI
1561703- 1561705*	690417	Dow	
1561706- 1561707*	670700	Dow	
1562177- 1562119*	000000	Dow	
1562341- 1562397*	680711	Delise, NG Schmidtke, DJ Deline, DD	
1562343 *	681024	Delisle, NG	Bleiweiss, JC Pumpelly, CT Deline, DD Rogers, JP Fernandez, JB Schmidtke, DJ Goergen, GG Schwark, GJ Widiger, AH
1562365- 1562383	650000	Harris, JS West, KD	

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General Subject Matter

245T formulation Australia

24D products

Veon 245 process

Esteron brush killer O.S., label &
production specification

Process descriptions

245T technology review

Fernandez, JB
Bleiweiss, JC
Goergen, GC
Haberstroh, WH
Pumpelly, CT
Rogers, JP
Schwark, GJ
Widiger, AH

Corrections for Trichlorophenol
technology review

Trichlorophenol plant

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
		Passmore, L Knopp, DO McClure Owens, B Anderson, RE Cornell, JL	
1562386 *	661212	Johnson, RL	
1562694- 1562695*	000000	Dow	
1562696- 1562697*	000000	Dow	
1564233- 1564240	700209	Schmidtke, DJ	
1568450- 1568452*	641118	Widiger, AH Holmes, RD	Greiss, GA
1568511- 1568513*	640730	Holmes, R	Hoyle, HE

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General Subject Matter

Alcholic caustic hydrolysis of
Tetrachlorobenzene

Block flow H₂O from Tordon

Tordon 10K pellets process

Fernandez, JB
Hanners, H
Tree, R
Fauver, V
DeMott, D
Stamend, V
McDonald, L
Haberstroh, W
Eigsti, D

Routes to higher purity
Trichlorophenol

Goergen, GG

199 building production of Sodium
245 Trichlorphenate

Manufacture of Trichlorophenol at
199 building

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
1568528 *	000000	Dow	
1568532 *	650813	Smith, FB	Goodchild, CD
1568533- 1568534*	650707	Trapp, WB	Merz, H
1568535- 1568537*	650128	Trapp, WB	Merz, H
1568549	000215	Trapp, WB	Doll, O
1568552 *	650401	Trapp, WB	Kooperman, P
1568553- 1568555	650621	Merz, H Deckers Tolkmith, H	Trapp, WB
1568556- 1568557	650312	Trapp, WB	Merz, H

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General Subject Matter

Notes on 245T manufacturing process

Coulter, LL
Trapp, WB
Sinclair, JR
Cessna, OC
Visger, HC
Coon, ET
Walker, E
Farnum, JH

Ivon Watkins Trichlorophenol know-how

Coon, ET
Amos, JL
Koopman, R
Sinclair, J
Coulter, LL
Gill, HH

Analytical methods to determine TCDD in Phenols CTTL

Griess, Ga
Dylewski, SW
Silverstein, L

Summary of phone conversation between Dow employees

245T manufacturing processing contract CTTL

Contract concerning Chloracne

Gas Chromatography analyses CTTL

Grote, M
Amos, L

Analyses of NA Trichlorophenolate Solution and Anisole Oil CTTL

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
1568558	650000	Dow	
1568559- 1568560	650000	Dow	
1568569- 1568572*	650126	Trapp, WB	Chamberlain, LC
1568577- 1568578*	650422	Merz, H Doll, O	
1568579- 1568580*	650422	Merz, H Doll, O	
1568581- 1568582*	650422	Merz, H	
1568583- 1568586*	650409	Trapp, WB	Mertz, H
1568588- 1568589*	650330	Sinclair, JR Trapp, WB	
1568592	650223	Merz, H Gerner	Trapp WB

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General Subject Matter

Silverstein, L
Sinclair, JR

GLC analysis of your
245-Trichlorophenate Solution

Analysis of caustic insoluble oil
and 245 Trichlorophenol for com-
position by gas liquid chroma-
tography

Coulter, KE
Haberstroh, WH
Goergen, GG
Sauers, RC

Trichlorophenol research

245T Contract

245T Contract

245T Contract

Amos, L
Grote

Toxicological studies, Gas
Chromatography and infrared ana-
lyses CTTL

Amos, L
Coon, ET
Koopman, P

245T Contract

Chloroanisole Oil samples CTTL

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
1568593	650205	Trapp, WB	Merz, H
1568594- 1568595	650113	Trapp, WB Farnum, JH	Kudszus, CH
1568602- 1568603	650113	Trapp, WB Farnum, JH	Kudszus
1568604- 1568605	641215	Kudszus Merz Trapp, WB	Dow
1568606- 1568608	641215	Kudszus Merz	Dow
1568609	641217	Merz Jaenicke Boehringer Sohn	Silverstein, I
1568610- 1568613	551005		Weyland
1568614- 1568615*	650129	Trapp WB	Coulter, KE

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General Subject Matter

Griess, GA

Chloroanisole Oil samples CCTL

Griess, Ga
Silverstein, L
Goergen, GG
Lueck, AF
Poffenberger, N
Sauers, RC

Request for Process information

Griess, GA
Lueck, GA
Silverstein, L
Goergen, GG
Poffenberger, N
Sauers, RC

Request for additional information on 245T production

Report on isolation of chlorac-negen sent to Dow

Report on isolation of chlorac-negen sent to Dow

Enclosure letter for rabbit tests conducted in connection with 1955 plant disinfection

Johne
Knecht
Nick
Horner

Rabbit tests conducted in connection with 1955 plant disinfection

Sauers, RC
Haberstroh, WH

C.H. Boehringer Sohn Contract

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
1568622- 1568626*	650105	Poffenberger, N	
1568627- 1568630	641208	Sauers, RC	
1568639- 1568646*	610104	Poffenberger, N	
1568647- 1568664*	641127	Sorge AWB	Sauers, RC
1568666- 1568667	641208	Sorge	
1568666- 1568667	641208	Sorge	
1568687- 1568690*	650105	Poffenberger, N	

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Poffenberger, N
Sauers, R
Trapp, W
Lueck, A
Widiger, A
Bradley, K
Goergen, G
Holmes, R
Delisle, N

245-Trichlorophenol notes, process information and flowsheet

Chronological survey of the first production period of 245T production

245-Trichlorophenol flow sheet

Description and prints for production methods for obtaining 245-Trichlorophenolate solution in Boehringer process

Chronological survey of the first production period of 245T production

Chronological survey of the first production period of 245T production

Poffenberger, N
Sauers, R
Trapp, W

245-Trichlorophenol notes, process information and flowsheet

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
1568691- 1568735	650107	Sorge	
1568736- 1568778	560912	Sorge	
1568779- 1568780	641208	Merz	
1568781- 1568795	641127	Sorge	
1568796- 1568797*	650319	Branch, CB CH Boehringer Sohn	
1568800- 1568801	6503305	Trapp, WB Farnum, JH	CH Boehringer Sohn
1568802- 1568803*	650000	CH Boehringer Sohn	Dow

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General Subject Matter

Lueck, A
Widiger, A
Bradley, K
Goergen, G
Holmes, R
Delisle, N

Attempts to determine the
chloracne inciter in the pro-
duction of 245T

Experiments to determine the
chloracnegens in 245T production

245T production chronology

Trichlorophenol process

Agreement concerning the disclo-
sure of information regarding the
prevention of Chloracne arising
out of the production of Sodium
245-Trichlorophenate

Revision of agreement regarding
disclosure of information con-
cerning 245-Trichlorophenate pro-
cess

Agreement concerning the disclo-
sure of information regarding the
prevention of Chloracne arising

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
1568804- 1568805	650305	Trapp, WB Farnum, JH	CH Boehringer Sohn
1568806- 1568807*	650000	CH Boehringer Sohn	Dow
1568814- 1568815	570222	Smith, FB	CH Boehringer Sohn
1568816	570211	CH Boehringer Sohn	Dow
1568817- 1568818*	570000	Weyland	
1569006- 1569019*	650107	Poffenberger, N	

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General Subject Matter

Amos, L
Doedens, J
Haberstroh, W

out of the production of Sodium
245-Trichlorophenate

Revision of agreement regarding
disclosure of information con-
cerning 245-Trichlorophenate pro-
cess

Agreement concerning the disclo-
sure of information regarding the
prevention of chloracne arising
out of the production of
245-Trichlorophenate

Griswold, AM
Vanderweele, JC
Hoyle
Melching, WA
Knapp
Kleine
Myers, JR
Krahne, O

Preparation of Trichlorophenol to
avoid Chloracne

Chloracne, preparation of
Trichlorophenol

Preparation of 245T avoiding the
formation of Chloracnegens

Sauers, R
Trapp, WB
Poffenberger, N
Widiger, A
Lueck, A

245-Trichlorophenol, outline of
requirements of applying
Boehringer data to Midland
operations

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
1569105- 1569112*	650209	Dow	Anderson Lueck Goergen West Trapp Morello Wolf Widiger Poffenberger
1569137 *	650127	AHW	
1569138 *	641128	AHW	
1569139- 1569140	650127	RAJ	
1569141- 1569142	650310	AHW	
1569143- 1569153	650211	Bradley, KB	
1569154- 1569167*	650107	Poffenberger, N	

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General Subject Matter

Holmes, R
Bradley, K
Goergen, GG
Haberstroh, WH

German TCP process, safety
techniques

245 Trichlorophenol reaction
graph time vs temp

Graph Chloracne exciter vs temp

245 Trichlorophenol reaction
graph conversion vs time at 155½c

Caustic hydrolysis of 1245
Tetrachlorobenzene graphs
conversion vs time at 155½c &
165½c

Data & graphs on hydrolysis of
1245-Tetrachlorobenzene

Sauers, RC
Trapp, WB
Poffenberger, N

245-Trichlorophenol; outline of
batch reaction

Dow Number

Date

Author

Recipient

1569168-
1569176*

650203

Poffenberger, N

1569177-
1569192*

650212

Poffenberger, N

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Widiger, A
Lueck, A
Holmes, R
Delisle, N
Bradley, K
Goergen, GG

Bradley, K
Graves, H
Dylewski, S
Delisle, N
Haberstroh, WH
Sauers, R
Trapp, W
Poffenberger, N
Widiger, A
Coulter, K
Goergen, G
Lueck, A
Staehling, E

245-Trichlorophenol preliminary
process design

Bradley, K
Graves, H
Dylewski, S
Delisle, N
Haberstroh, WH
Sauers, R
Trapp, W
Poffenberger, N
Widiger, A
Coulter, K
Goergen, G
Lueck, A
Staehling, E

245-Trichlorophenol preliminary
process design appendix

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>	<u>Distributees</u>	<u>General Subject Matter</u>
1569195- 1569197*	650311	Graves, HH			Pilot plant preparation of Sodium Trichlorophenate solution
1569209- 1569210*	650518	Trapp, WB	Goergen, GG	Anderson, RE Delisle, NG Lueck, AF Wehn, WE Hillman, RE	TCP Process
1569221- 1569223*	650302	Cornell, JL	Coulter, KE Delisle, NG Dylewski, SW Goergen, GG Hutchenreuther, CO Haberstroh, WH Lueck, AF Poffenberger, N Sauers, RC Trapp, WB Wappenhensch, O West, KD Wehn, WE Widiger, AH Graves, HE Wolf, RR Anderson, RE Morello, VS Beyer, DG Harris, JS Cornell, JL		Project Conference Trichlorophenol plant
1569232- 1569233*	650304	Harris, JS		Coulter, KE Graves, HE Wolf, RR	Notes from 6th Trichlorophenol process review

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Dow Number

Date

Author

Recipient

1569239-
1569243*

650315

Anderson, RE
Delisle, NJ

1569247-
1569250*

650318

Harris, JS

1569251-
1569254*

650317

Anderson, RE

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General Subject Matter

Haberstroh, WH
Dylewski, SW
Trapp, W
Widiger, A
Morello, V
Cornell, J
Goergen, G

Coulter, KE
Graves, HE
Wolf, RR
Goergen, GG
Lueck, A
Dylewski, SW
Trapp, W
Sauers, R
Poffenberger, N
Hutchenreuther, CO
Wappenhensch, CA
Morrello, VS
Wehn, WE

Trichlorophenol plant scope of project

Coulter, KE
Graves, HE
Wolf, RR
Haberstroh, WH
Dylewski, SW
Trapp, W
Widiger, A
Morello, V
Lyon, G
Goergen, G

Notes from 9th Trichlorophenol process review

Trichlorophenol reactor cycle

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
1570156- 1570165*	000000		
1570376 *	000000	Dow	
1570380 *	000000	Dow	
1572316- 1572322*	690310	Jankowski, SJ	
1572429- 1572440*	641110	EMS	
1572730- 1572734*	710202	Theis, JM	
1572735	700914	Knutson, AT Chase, FI Schmidtke, DJ Dorton, RO	
1572736	700924	Knutson, AT Chase, FI Martin, RA Loucks, MF	
1572737	700406	Knytson, AT Dorton, RO Yeager, LM	

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General Subject Matter

Tordon process information

Oil formulations

Phenoxy herbicide formulations

Preliminary investigation of
direct ester expansion
capabilities

Woodward, RE
Marshall, SP
Chase, FI
Gilbert, PW
Snodgrass, WA
Kensicki, RF
Haberstroh,
Jankowski, SJ

Direct ester

24D, alternate facility

Dow raw material specification
2,4-Dichlorophenol

Dow raw material specification
Sodium Monochloroacetate solution

Caustic soda solution raw
material specification

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
1572738	700721	Knutson, AT Kennedy, TL Chase, FI Schmidtke, DJ Martin, RA Landis, CA	
1572739	660923	Hawley, HM DeLong, HC Highhill, CA White, LC Hawley, HM	
1573474*	700915	Haberstroh, WH	Savaso, JC
1573475- 1573482*	700910	Haberstroh, WH Seidel, EM	
1579003- 1579009*	701231	Theis, JM Siedel, M	
1580542- 1580566*	680514	JFL Kern, WG Fernandez Gorgasz Dalman	
1580567- 1580585*	680822	Dow	

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General Subject Matter

Internal Dow raw material specification for Hydrochloric acid

Dow raw material specification
24D

Bleiweiss, JC
Deline, DD
Henry, HE
Hensley, EF
Schmidt, BV
Tefft, TH

24D Capital Estimates

Revision of 24D Capital Estimates

Alkaline hydrolysis of 245T and silvex

Technology review of industrial chloroacetic acid

Dowanol, Butyl & Isooctyl
Chloroacetate technology review

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
1581361- 1581376*	660000	Dow	
1581382- 1581397*	660000	Dow	
1581983- 1582013*	620700	Gilzorrilla, F FGZ CAH	
1582654- 1582657*		McCauley, V Mathew, BA	
1583667- 1583675*	000000	Millhisler, RD	
1583690- 1583691*	721125	Vanhorn, R Bethke	
1630441*	500600		
1630444*	510228	Dupont	
1630446*	501000		
1630447- 1630473*	501000		
1630466	500810	Ott, RC	

Distributees

General Subject Matter

Chlorophenol Prod.

670000 Chlorophenol Research

Preliminary engineering study for
Dow Quimica Argentina, SA

Tordon 105 Manufacture

Tordon 225E

M3990 or Tordon 225E reactive
chemical hazard data

24D Amine Weed Killer
(Raw materials description and
specifications)

Raw material specification

24D Amine Weed Killer
(Raw materials handling &
storage conditions)

24D Amine Weed Killer
(operating directions)

Effect of DMA Concentration on PH
of 24D Amine Weed Killer

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
1630474- 1630478*	491200		
1630479- 1630483*	500201	Jirouch, EA	
1630485*	500510	Dupont	
1630489- 1630490*	491200		
1630491- 1630494*	491200		
1631888- 1631889*	640624	Seidel, EM	
1631901- 1631913*	000000	Seidel, EM	
1642690- 1642691*	000000	JRU	
1645090- 1645098*	550826	Bennett, CM Widiger, A Dugan, G	

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General Subject Matter

24D Amine Weed Killer
(Operational hazards)

Tentative Operating Instructions,
Dimethylamine

24D Amine Weed Killer
Specifications & average analysis

24D Amine Weed Killer
(Labor Required for Operation).

24D Amine Weed Killer
(Production and Yield Accounting
Methods and Information)

Direct Ester Authorization

Handwritten notes concerning
various steps of 245T process

Trichlorophenol Manufacturing

Griswold, A
Williams, WH
Britton, EC
Alquist, FN
Colby, A
Vanarsdale, J
Reese, R
Brainerd, A

Phenol, 245 Tricholor

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
1650079- 1650081*	630429	Barrons, KC Coulter, LL Johnson, JE Lynn, GE Wolf, MA Hunt, M Loucks, MF Vanvalkenburg, W Fayerweather, BL McIntyre, HH Branaman, J Lang, HC Falkenstein, WJ Davis, HW Allen, WW	
1650139- 1650141*	670522	Barrons, KC Byrd, BC Wolf, MA Gowell Loucks, MF Falsey, MP Buerge, TE McIntyre, HH Hammer, OH Gill, WM Highhill, CA Woodward, RE Davis, H Corbin, WF	

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Poffenberger, N
Widiger, A
Dugan, G

General Subject Matter

Verton CE with oil
(Release to Sales)

Tordon 155 Mixture
(Release to Sales 9)

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
		Nummy, WR DEP CJK JLS	
1650146- 1650148*	671009	Dow	Woodward, RE
1650262 1650264*	630517	Barrons, KC Coulter, LL Johnson, JE Lynn, GE Ritty, PM Wolf, MA Loucks, MF Vanvalkenberg, W Branaman, J Lang, HC Falkenstein, WJ Allen Saunders, ES	
1650466- 1650468*	621012	Amstutz, FC Barrons, KC Johnson, JE Lynn, GE Southwick, L Wolf, MA Vanvalkenberg, W McIntyre, HH Branaman, J	

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General Subject Matter

Dosser, RC
Hoff, RC
Matuska, R
Colby, A
Stone, F

Sales Release Tordon 155

Verton T (Release to Sales 16)

Esteron 245 Concentrate
(Proposed Release to Sales 21)

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>

Lang, HC
 Allen, WW
 JLS
 KEE
 ES
 PMR
 Saunders, E

1710838-
 1710856*

740221

Roush, GJ
 Hoyle, HR

1710857-
 1710885*

700410

Axe, FD
 Hoyle, HR

1711008 *

000000

Dow

1718318-
 1718319*

000000

Dow

11363

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General Subject Matter

Winters, RE
Degeer, JL
Williams, FL
Langner, RR
Kelyman, M
Holder, BB
Blair, EH

Wipe test for Tertiary Butyl
Catechol and TCDD in 267 bldg.
prior to demolition

Deline, DD
Hodson, RE
Miller, DE
Kramer, CG
Morse, DB
Soule, RD
Holder, BB
Lynn, GE
Rowe, VK
Schmidtke, DJ

Industrial hygiene survey of 245T
production 267 production

Notes on direct Ester production
of 24D and 245T

IWD 24D & MCPA & 245T esters

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
1718333- 1718335*	000000	Dow	
1719566- 1719572*	000000	Dow	
1724098- 1724104*	690310	Jankowski, SJ	
1726331- 1726333*	000000		
1727967- 1727968*	580630	Dow McCollister, DD Wolf, MA	
1728049- 1728050*	590702	Dow Olson, KJ Oyen, F	
1728053- 1728054*	630108	Dow Olson, KJ Oyen, F	
1728057- 1728058*	621214	Dow Olson, KJ Oyen, F	

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General Subject Matter

Process time cycles

NATCP Solution IWD

Jankowski, SJ
Woodward, RE
Chase, FI
Gilbert, PW
Snodgrass, WA
Marshall, SP
Kensicki, RF
Haberstroh, WH

24D and 245T Esters preliminary investigation of Direct Ester expansion capabilities (ACPD 69-10)

Consequences of Overexposure
For Tordon; 597 Building

Dow
Hoyle, HR

Dow 245T amine weed killer (Data sheet of properties, health hazards and precautions for safe handling of materials)

Dow
Hoyle, HR

M-1459 formulation of K-7797 and K-7856 (Data sheet of properties, health hazards and precautions for safe handling of materials)

Dow
Hoyle, HR

M-2422 (Data sheet of properties, health hazards and precautions for safe handling of materials)

Dow
Hoyle, HR

M-2468 (Data sheet of properties, health hazards and precautions for safe handling of materials)

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
1728059- 1728060*	660412	Dow McCollister, DD Olson, KJ	
1728061- 1728062*	700514	Dow Norris, JM	
1728101- 1728102*	580616	Dow McCollister, DD Wolf, MA	
1728103- 1728104*	580630	Dow McCollister, DD Wolf, MA	
1728167- 1728168*	580514	Dow McCollister, DD Wolf, MA	
1728526- 1728527*	000000	Dow	
1738627- 1738628*	000000	Dow	
1765919*	650919	Sinke, GC	
1766300- 1766308	661104	Widiger, AH Johnson, RL	

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<u>Distributees</u>	<u>General Subject Matter</u>
Dow Hoyle, HR	M-2993 (Data sheet of properties, health hazards and precautions for safe handling of materials). (T2.MO-2993-1)
Dow Falkenstein, WJ Hoyle, HR	M-3427 (Data sheet of properties, health hazards and precautions for safe handling of materials) (BC T2.MO-3427-1)
Dow Hoyle, HR	Reddon (Data sheet of properties, health hazards and precautions for safe handling of materials)
Dow Hoyle, HR	Reddon concentrate (Data sheet of properties, health hazards and precautions for safe handling of materials)
Dow Hoyle, HR	Veon brush killer (Data sheet of properties, health hazards and precautions for safe handling of materials)
	Tordon formulation plant and Tordon pellet plant
	Flow chart for Tordon production
	Heat of reaction data per GC Sinke of the Thermal Lab
Widiger, AH Coulter, KE	Phenol, 245 Trichloro study of Chloracne problem

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>

Dugan, GF

1766309-
1766336*

650203

Poffenberger, N
Bradley, K
Ebert
Warren

1766651-
1766660*

641125

1766681-
1766686*

650107

Poffenberger, N

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Johnson, R
Thurston, D
Dugan, G
Haberstroh, WH
Goergen, GG
Sauers, RC
Bender, S
Wolf, RR
Louck, A
Poffenberger, N
Bailey, CZ
Putnam, MS
Nielson, WH
Staehling, EC

Bradley, K
Graves, H
Dylewski, S
Haberstroh, WH
Sauers, R
Trapp, W
Poffenberger, N
Widiger, AH
Coulter, KE
Goergen, GG
Lueck, A
Redmond, W
Delisle, NG
Staehling, EC

General Subject Matter

Preparation of 245 Trichlorophenol
from Trichlorobenzene

Phenol 245 Trichloro
Preliminary Process Design
Using 100 percent NaOH,
PL2028-4

Trichlorophenol Process

Poffenberger, N
Sauers, RC

245 Trichlorophenol - Outline of
Requirements

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>

1766687- 1766694*	650112	Poffenberger, N	

1766695- 1766698*	650105	Poffenberger, N	

1766704- 1766708*	641120	Holmes, R	

1766713- 1766730*	641224	Sorge	Sauers

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General Subject Matter

Trapp, WB
Widiger, A
Lueck, A
Holmes, R
Bradley, K
Goergen, GG

Poffenberger, N
Delisle, NG
Sauers, R
Trapp, WB
Widiger, A
Lueck, A
Holmes, R
Bradley, K
Goergen, G

Appendix to Report PL2028-3
(245 Trichlorophenol)

Poffenberger, N
Sauers, R
Trapp, W
Lueck, A
Widiger, A
Bradley, K
Goergen, G
Holmes, R

245 Trichlorophenol Process
Information

Hydrolysis of Tetrachlorobenzene
using flake caustic

Description and prints for the
current production methods for
obtaining 245 Trichlorophenolate
solution in building 74 (Report 50)

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
1766734- 1766736*	591212	Widiger, A	Chang, KY

1766739- 1766750*	700720	Chang, KY Tou, JC	

1766760 1766761*	641118	Widiger, AH Holmes, RD	Greiss, GA

1766762- 1766764*	640730	Holmes, R	Hoyle, HR

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Leavittg, FC
Demott, DN
Poffenberger, N
Tree, R
Plepys, RA
Schmidtke, DJ

General Subject Matter

Progress report on research
on blooming of 245 -
Trichlorophenol

Chang, KY
Tou, JC
Look, A
Leavitt, FC
Demott, DN
Poffenberger, N
Gum, WF
Plepys, RA
Pierce, JK
Frevel, LK
Potts, WJ
Westover, LB
Fauver, VA
Kennedy, TL
Widiger, AT
Pews, G
Rodia, RM
Nummy, WR
Blue, RD
Delisle, NG
Sheetz, DP

Oxygen 18 labeling study on
the mechanism of caustic
hydrolysis of 1245 -
tetrachlorobenzene in methanol

Goergen, GG

199 Bldg Production of
Sodium 245 Trichlorophenate

Manufacture of Trichlorophenol at
199 Bulding

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
1766766- 1766769*	641120	Holmes, RD	
1766770- 1766771*	000000	Dow	
1766772*	000000	Dow	
1766773- 1766784*	340905	Prescott, RF	
1766824- 1766825*	000000	Dow	
1766944- 1766948*	000000	Dow	
1768247- 1768249*	650317	REA	
1770187- 1770195*	661104	Widiger, A Johnson, RL Dugan, GF	

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General Subject Matter

Hydrolysis of Tetrachlorobenzene
using flake caustic

TCP Process Flow Sheet

TCP Process Flow Sheet

Manufacture of 245 Trichlorophenol
from 1245 Trichlorobenzol

Dichlorophenol and trichlorophenol
process flow sheet

245 Trichlorophenol operations
804 Building

Trichlorophenol Reactor Cycle

Widiger, A
Johnson, RL
Dugan, GF
Coulter, KE
Thurston, D
Haberstroh, WH
Sauers, RC
Wolf, RR
Poffenberger, N
Goergen, GG
Bender, S
Louck, A
Bailey, CZ
Putnam, MS

Phenol 245 - Trichloro study of
chloracne problem preparation of
245-Trichlorophenol from
Trichlorobenzene, PL 2064-13

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
1770705- 1770709*	700525	Brady, P	
1784663*	000000		
1784664*	000000		
1784665*	000000		
2022398- 2022406*	706217	Liening, EL	
2022407- 2022488*	66000	Dow	
2022489- 2022503*	710324	Dow Kennedy, TL Tree, RM	Dow Bosscher, H
2022504- 2022519*	651012	Anderson, RE Harris, JS	Anderson, RE Lueck, AF Schmidtke, DJ Wehn, WE
2022520- 2022528*	651012	Anderson, RE Harris, JS	Anderson, RE Lueck, AF

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Nielson, WH
Staehling, EC

Schmidtke, DJ
Haberstroh, WH
Williams, L
Vogelsang, P
Chase, FI
Kensicki, RF

Manufacture of Phenoxy Herbicides

Vinyltoluene-Tar Collection
System and Furnace Reboilers
(M-32052M)

245 - Trichlorophenol - New
Facility

245 - Trichlorophenol - New
Production Facilities

Gorgacz, SM
Hicks, GM
Stone

Review of Materials Experience at
the Trichlorophenol Plant, 804
Building, for 1973, 1974 and 1975.

2, 4, 5-Trichlorophenol New Plant
- 1966

Trichlorophenol Plant Cooling
Tower, In-Plant Portion (M-700498)

Trichlorophenol Project-Process
Engineering

Trichlorophenol Project-Process
Engineering

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
			Schmidtke, DJ Wehn, WE
2022520- 2022528*	651012	Anderson, RE Harris, JS	Anderson, RE Lueck, AF Schmidtke, DJ Wehn, WE
2022529- 2022537*	650518	Wehn, WE Anderson, R.E. DeLisle, NG Leuck, AF Georgen, G	
2022548- 2022571*	700400		

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General Subject Matter

Trichlorophenol Project-Process
Engineering

New 245-Trichlorophenol Plant

Arteberry, DG
Barton, JT
Bauman, WC
Bechtold, RF
Bellow, RE
Bernstein, MK
Blair, EH
Blue, RD
Bremmer, BJ
Brown, TE
Brown, WE
Bryant, F
Bugert, BE
Butcher, BB
Byrd, GW
Carlson, RG
Carmouche, LN
Cessna, OC
Chamberlain, M
Christian, CA

Organic Chemicals Department-TS&D
Highlights

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Cocker, WP
Coon, ET
Davis, RH
Davis, RM
Derby, RL
Dilley, R
Dreyer, JW
Dunn, EE
Fay, BW
Fischback, BC
Friedli, H
Gold, WL
Grabiell, CE
Hanners, HW
Hansen, R
Hanson, AW
Heitz, RG
Hickner, RA
Hoblitt, LD
Honea, CR
Johnson, J
Jones, GD
Karns, RE
Kelly, ME
Kuchinic, RM
Langner, RB
Lindy, LB
Litherland, LO
Leavitt, FC
Look, AT
Maasberg, AT
Mackenzie, GF
Mackey, JC
Madison, NL

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Marklewitz, WE
Marks, CD
McClure, HH
McCoy, CE
McDuff, JM
McIntire, OR
Munden, BJ
Nelson, DL
Nielson, JT
Nielson, WH
Neumann, FW
Ohlmann, EO
Palmer, T
Parsons, CP
Pearson, KS
Peterson, LR
Potts, WT
Prince, AK
Pruitt, ME
Rogers, WA
Ruh, RP
Sarge, TW
Schuhmann, JG
Sheehan, TJ
Sheetz, DP
Sienknecht, P
Snyder, IJ
Sorenson, RH
Sparta, TA
Stehling, EC
Trapp, WB
Tucker, JC
Tuttle, FC
Warren, GW

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Yocum, RH
Uoshimine, M

General Subject Matter

Biochemical Research Laboratory.
Quarterly Report April-June 1970

Nummy, WR
Maasberg, AT
Ettinger, MB
Busk, RS
Blue, RD
Peterson, NR
Johnson, JE
Bauman, WC
Boyer, RF
Lindsav, RA
Look, AT
Struthers, JA
Rausch, DA
McCoy, E
Prince, AK
Kimmel, CE
Westveer, WM
Schwarz, AJ
Harrison, RP
McIntire, OR
McIntyre, HH
Gordon, HL
MacCutcheon, SM
Kelly, ME
Bumb, RR
Dean, PE
Johnson, RL
Lake, DE
Meyer, FJ
Erratt, RL
Cheney, GW

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Schaefer, HL
Graham, DL
Flynn, JM
Johnston, RV
Dowell, FH
Bauriedel, WR
Blair, EH
Howe, RG
Barrons, KC
Hymas, TA
Johnston, Chas.
Moss, RD
McCollister, DD
Reifschneider, W
Smith, GN
Osborne, DW
Strycker, SJ
Dunbar, JE
Dorman, LC
Young, AE
Bjork, CK
Johnson, MR
Yates, WM
Post, T
Holder, BB
Kramer, CG
Morse, DB
Shannon, ES
Brower, FM
Englibous, DL
Kiley, LR
Beamer, WW
Muelder, WW
Rabold, GP

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Kagel, R
 Frevel, LK
 Alfrey, T
 Burgert, BE
 Houtman, T
 Murdoch, PG
 Leavitt, FC
 Pumpelly, CT
 Jezic, Z
 DeMott, DN
 Jones, GD
 Axe, FD
 Boeckler, WH
 Branson, DR
 Charm, JB
 Chenoweth, MB
 Dunn, EE
 Dunn, FL
 Gerguson, JT
 Flores, GH
 Gehring, PJ
 Gooch, RM
 Hinman, CW
 Holmsen, TW
 Hoover, WE
 Hoyle, HR
 Humiston, CG
 Kociba, R
 Leong, BK
 McCarty, LP
 McCollister, SB
 McDermott, RD
 Moyle, CL
 Neely, WB

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Norris, JM
Oriel, PJ
Piper, WN
Riley, WH
Rodia, RM
Rowe, VK
Schneider, CW
Schneider, EJ
Schwetz, BA
Silverstein, LG
Sparschu, GL
Spencer, HC
Torkelson, TR
Ts'o, TO
Wolf, MA
Wolf, PA
Wyse, HA
Milch, LJ
Renzi, AA
Barnhart, JW
Robinson, VB
White, HC
Hake, CI
Daniels, ME
Miner, NA
Steward, D
Kilian, DJ
Edwards, HN
Barton, JA
Pruitt, ME
Brown, JH
Ludwig, PD
Heitz, RG

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Kagy, JF
Goring, CAI
Lloyd, BH
Staehling, EC
Biggers, MW
Tobey, SW
Hillary, BB
Skory, L
DeGesero, R
Rinzema, L
Schaffer, A
Thompson, C
Naranjo, P
Maffii, G
Sensi, P
Zeller-Celso, L
Lancini, G
Arrigoni-Martelli, E

Johnson, JE
Nummy, WR
Barrons, KC
Hymas, TA
Kagy, JF
Goring, CAI
Heitz, RG
Bailes, RH
Johnston, H
Johnston, RV
Gowell, JH
Popoff, FP
Dowell, FH
Holmsen, TW
Reifschneider, W

Agricultural Department
Quarterly Progress Report
April - May - June 1970

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202274*

700727

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General Subject Matter

Getzendaner, ME
Lynn, GE
Bjork, CK
Blair, EH
Schwarz, AJ
Ludwig, PD
Moss, RD
McCollister, DD
Osborne, DW
Seymour, KG
Winqvist, ME
Gum, W
Busk, RS
Cheney, GW
Flynn, JM
Kelly, ME
McCoy, CE
McIntire, OR
Prince, AK
Schwarz, AJ
Struthers, JA
Peterson, LI
Johnston, C

Blair, EH
Hinman, CW
Gaska, R
Frevel, LK
Potts, WL
Friedli, HR
Kelly, ME
Bowman, C
Stall, DR
McIntire, OR

Eastern Research Lab
Quarterly Progress
Report - April - June 1970

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Johnson, JE
Blue, RD
Nummy, WR
VanWestenberg, JA
Prince, AK
Maasberg, AT
Peterson, LI
Brower, F
McCay, CE
Engibous, DL
Busk, RS
Sheetz, DP
Cook, P
Hanson, AW
Struthers, JA
MacKenzie, F
Leavier, FC
White, LW
Schwarz, AJ
Burgert, BE
Novak, RM
Flynn, JM
Alfrey, T
Morocci, PG
Houtman, T
Beame, WH
Bache, AF
Griffith, JD
Rosene, R
Biggers, MW
Blake, CL
White, HC
Quinn, H
Thompson, CF

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2022762-
2022801*

691200

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Brown, JH
Ludwig, PD
McClure, HH
Rogers, WA
Pruitt, ME
Heitz, RG
Kagy, JK
Bailes, R
Brown, CF
Mackey, JC

Johnson, JE
Nummy, WR
Barrons, KC
Hymas, TA
Kagy, JF
Goring, CAI
Heitz, RG
Bailes, RH
Johnston, H
Johnston, RV
Gowell, JH
Popoff, FP
Dowell, FH
Holmsen, TW
Reifshneider, W
Getzendaner, ME
Lynn, GE
Spalding, JL
Blair, EH
Schwarz, AJ
Ludwig, PD
Jones, GD
Moss, RD

General Subject Matter

Agricultural Department-
Quarterly Progress Report
October - November - December - 196

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>

2022831- 2022849*	700200	Dow	

2022859- 2022891*	700300	Dow	

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McCollister, DD
Osborne, DW
Seymour, KG
Winquist, ME

General Subject Matter

Organic Chemicals Production
Research - Monthly Summary
February 1970

Agricultural Department
Quarterly Progress
Report - January - February
March 1970

Johnson, JE
Nummy, WR
Barrons, KC
Hymas, TA
Kagy, JF
Goring, CAI
Heitz, RG
Bailes, RH
Johnston, H
Johnston, RV
Gowell, JH
Popoff, FP
Dowell, FH
Holmsen, TW
Reifschneider, W
Getzendaner, ME
Lynn, GE
Bjork, CK
Blair, EH
Schwarz, AJ
Ludwig, PD
Jones, GD
Moss, RD
McCollister, DD

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2022892-
2022972*

700600

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2022973-
2023110

700600

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Osborne, DW
Seymour, KG
Winquist, ME
Gum, W
Busk, RS
Cheney, GW
Flynn, JM
Kelly, ME
McCoy, CE
McIntire, OR
Prince, AK
Schwarz, AJ
Struthers, JA

Radiochemistry Research
Laboratory - Quarterly Progress
Reports - April - May - June
1970

Milch, LJ
Brunton, AM
Dacquisto, MP
Hake, CL
Marshall, FN
Miller, BH
Munden, BJ
Renzi, AA
Robinson, VB
Schell, K
Stavropoulos, WS
White, HC
Shea, PJ
Barnhart, J

Semi-Annual Progress Report-
Human Health Research and
Development Laboratories - January
June 1970

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General Subject Matter

Trepanier, DL
 Kulkarni, A
 Eble, J
 Abdallah, A
 Wagner, E
 Lewis, JE
 Miner, N
 Steward D
 Kenny, M
 Torney, H
 Taylor, H
 Sargent. R
 Broersma, R
 Anderson, JT
 Kammeraad, A
 Zoccolillo, R
 Johnson, JE
 Hinman, CS
 McIntyre, OR
 Peterson, NR
 Reifschneider, W
 Nummy, WB
 Schwarz, AJ
 Rappy, LW
 Johnson, MR
 Blair, E
 Strycker, SJ
 Johnston, RV
 Chenoweth MB
 Neely, WB
 Moss, RD
 Champlain, CE
 CRI
 Peterson, L

Dow Number

Date

Author

Recipient

2023173-
2023219*

700900

Dow

11385

Distributees

General Subject Matter

Johnson, FE
Kagy, JF
Heitz, RG
Mulholland, RS
Zelter-Celso, L
Sensi, P
Maffii, G
Nicolias, FB
Furesz, S
Naranjo, P

Blair, EH
Hinman, CW
Hinman, CW
Gaska, R
Frevel, LK
Potts, WJ
Friedli, HR
Kelly, ME
Bowman, C
Stull, DR
McIntire, OR
Johnson, JE
Blue, RD
Nummy, WB
VanNestenburg, JA
Prince, AK
Maasberg, AT
Peterson, LI
Brower, F
McCoy, CE
Engibous, DL
Busk, RS
Sheetz, DP

Eastern Research Laboratory
Quarterly Progress
Report July - September 1970

Dow Number

Date

Author

Recipient

2023256-
2023386*

701200

Dow

11386

Distributees

General Subject Matter

Look, AT
Hanson, AW
Struthers, JA
MacKenzie, GF
Leavitt, FC
White, LW
Schwarz, AJ
Burgert, BE
Nowak, RM
Flynn, JM
Alfrey, T
Murdock, PG
Houtman, T
Beamer, WH
Griffin, JD
Roche, AF
Rosene, R
Biggers, MW
Hake, CL
White, HC
Quinn, H
Thompson, CF
Brown, JH
Ludwig, PD
McClure, HH
Rogers, WA
Pruitt, ME
Heitz, RG
Kagy, JF
Bailes, R
Brown, WE
MacKey, JC

Milch, LJ
Brunton, AH

Human Health Research and
Development Laboratories

Dow Number

Date

Author

Recipient

11387

Distributees

Dacquisto, MP
Hake, CL
Marshall, FN
Miller, BH
Munden, BJ
Renzi, AA
Robinson, VB
Schell, K
Tedeschi, R
Stravropoulos, WS
White, HC
Shea, PJ
Barnhart, J
Trepanier, DL
Kulkarni, A
Fole, J
Abadallah, A
Wagner, E
Lewis, T
Steward, D
Kenny, M
Turney, H
Taylor, H
Sargent, R
McCarthy, J
Jackson, J
Warner, S
Emerson, J
Molello, J
Gerbig, C
Boerman, R
Anderson, JT
Kammeraad, A
Zoccolillo, K

General Subject Matter

Semi-Annual Progress
Report - July - December 1970

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Date

Author

Recipient

2023387-
2023478*

701200

Anders, OU
Atchison, GJ

11388

Distributees

General Subject Matter

Johnson, JE
Hinman, CW
McIntyre, OR
Peterson, NR
Reifschneider, W
Nummy, W
Schwartz, AJ
Rampy, LW
Bjork, CK
Blair, E
Strycker, SJ
Johnston, RV
Chenoweth, MB
Neely, WB
Moss, RD
Champlain, E
Reitz, R
Dorman, L
Chow, R
Freiter, E
Wysong, D
Tobey, SW
Johnson, FE
Mulholland, RS
Zeller Celso, L
Sensi, P
Maffii, G
Nicolis, FB
Arrigoni-Martelli, E
Nathansohn, G
Silvestri, L
Naranjo, P

Progress Report Covering
October, November, December

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
		Blanchard, FA	
		Doorenbos, HE	
		Harmer, DE	
		Himes, RP	
		Jewett, GL	
		Kamp, AJ	
		Kawahara, Y	
		Kocher, CW	
		Logan, RA	
		Mani, I	
		Muelder, WW	
		Powers, JB	
		Babold, GP	
		Takahaski, IT	
		Wass, MM	
2023557- 2023578*	700615	Dow	

11389

Distributees

General Subject Matter

1970 and Yearly Summary

Barrons, KC
Blair, EH
Bremmer, BJ
Carlson, RG
Dowell, FH
Gantz, RL
Getzendaner, ME
Goring, CAI
Kagy, JF
Gowell, JH
Hanson, RG
Hymas, TA
Jantz, OK
Johnston, C
Johnston, RV
Laning, ER
Library, JC
Little, JC

Agricultural Department
Research and Development
Staff Meeting - June
15, 1970

Dow Number

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Author

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11390

Distributees

General Subject Matter

Ludwig, PD
 Shaver, RJ
 MacLean, GJ
 McCollister, DD
 Lynn, GE
 Moss, RD
 Naegele, RE
 Nyman, FA
 Osborne, DW
 Seymour, KG
 Sheldon, HW
 Gehring, P
 Frevel, LK
 McIntire, OR
 Johnson, RB
 Nummy, WR
 Kelly, ME
 Peterson, LI
 DeMott, DN
 Prince, AK
 Nichols, JL
 Schwarz, AJ
 Sheetz, DP
 Bremner, NW
 Kuyper, CK
 Ferguson, RH
 Saunders, ES
 Dalman, G
 Leavitt, FC
 Cheney, GW
 Bjork, K
 Jones, P
 Spalding, J
 Flynn, JM

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
2023579- 2023975*	690000	Hess, TM	Nummy, WR Frevel, LK Potts, WJ Department File
2023976- 2024000*	691200		
2024001- 2024014*	700109		

11391

Distributees

General Subject Matter

Jones, IC
McClure, HH
Pruitt, ME
Bailes, RH
Johnston, H
Thompson, C

Chemical Physics Research
Laboratory, Yearly Progress
Report and Fourth Quarter
Summary

Organic Chemicals
Production Research -
Monthly Summary

Johnson, JE
Chamberlain, LC
Busk, RS
Bauman, WC
Blue, RD
Klesney, SP
Jowanovitz, LS
Burgert, BE
Jones, GD
Jeitz, RG
Brubaker, RI
Neipert, MP
Myers, JC
Hickey, JR
Rollwage, WA
Williams, EJ
Frevel, LK

Summary of Activities
of the Electrochemical
and Inorganic Chemical
Research Laboratory
(Midland) for the months
October - November - December
1969

Dow Number

Date

Author

Recipient

2024015-
2024023*

700100

11392

DistributeesGeneral Subject Matter

Dale, EM
Houtman, T
Corey, JW
Lindsay, RA
Blackney, WC
Guebert, KW
Hotchkiss, RL
Anderson, DL
McCoy, CE
Neiechterlein, DC
Drake, LR
Murdoch, PG
Wilcox, AC
Engibous, DL
Groves, KO
Gaska, RA
Stuart, GA
Gilbert, JF
Hillary, BB
Matheson, LA
McIntire, OR
Beamer, WH
Lowry, BS
Stenger, VA
Pumpelly, CT
Sarge, TW
Jones, IC
Mod, WA
Bothwell, MR
Thompson, CF

Nelson, DL
Ogden, SO
Parizek, E

Hydrocarbons and Monomers Research
Laboratory - Inorganic and
Hydrocarbons Research Department

Dow Number

Date

Author

Recipient

11393

Distributees

Peterson, LI
Prince, AK
Pumpelly, CT
Putnam, MW
Roche, AF
Ruh, RP
Rausch, D
Skochdopole, RE
Sheetz, DP
Struthers, JA
Sutherland, S
Wegner, ER
Wing, MW
Woodward, GE
Woodward, RE
Hultin, R
Nielsoh, WH
Hammond, D
Chase, F
Shannon, F
Zheitoun, M
Ilgenfritz, BM
Deline, D
Pfrommer, C

General Subject Matter

1969 Fourth Quarter Progress
Report - October -November -
December - 1969

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>
2024024- 2024042*	700100	Dow	
2024081 - 2024139*	700216		
2024140- 2024163*	691200		

11394

Distributees

General Subject Matter

Organic Chemicals Production
Research Monthly Summary

Chemical Physics Research
Laboratory Summary -Progress
Report - October - November
December - 1969

Waste Control Progress Report -
October - November - December
1969

Alexander, HC
Baker, RL
Bek, CM
Brosier, JS
Colbry, RJ
Daniele, SL
Davis, RD
Fox, RD
Hall, JR
Hall, SD
Hamilton, CE
Hintz, MJ
Ilgenfritz, EM
Kraut, DE
Krienke, ME
Lynch, JE
Novak, RG
Pfrommer, C
Putnam, MS
Reinker, RE
Sawinski, RJ
Sercu, CL
Shannon, ES
Shively, JF
Teal, JL

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>

2024167- 2024186*	700300	Dow	
2024187- 2024204*	700416		

11395

Distributees

General Subject Matter

Terryah, GG
Wass, WE
Weburg, AW
Wilson, JD
Zillich, JA
Bublitz, DW
Bauer, DL
Bremner, F
Batchelder, TL
McClure, HH
McIver, JH
Smith, DH
Strahan, JM
Skory, LK

Organic Chemicals Production
Research - March 1970

Radiochemistry Research
Laboratory - Quarterly Summary
Progress Report - January -
February - March, 1970

CRI
Blair, EH
Kiley, LR
Hinman, C
Gaska, RA
Bowman, CM
Maasberg, AT
Nummy, W
Kelley, M
Henson, W
Jones, GD
Tobey, S
Vanwestenburg, JA
Hemwall, J
Johnson, RC
Peterson, LI

Dow Number

Date

Author

Recipient

2024220-
2024239*

700400

2024240-
2024261*

700500

Dow

2024264-
2024275*

700600

17396

Distributees

General Subject Matter

Brower, F
 McCoy, GE
 Engibous, D
 Csaky, E
 Smith, RA
 Bothwell, M
 Busk, RS
 Bauman, W
 Drake, LR
 Pumpelly, C
 Burgert, W
 Rieke, J
 Floria, V
 Flynn, JM
 Murdoch, PG
 Prince, AK
 Wright, ER
 Larson, W
 Brown, JH
 Pruitt, ME
 Prophet, H
 Heitz, RG
 Kagy, JF

Organic Chemicals Production
 Research - Monthly Summary -
 April, 1970

Organic Chemicals Production
 Research - Monthly Summary
 May, 1970

Arcangeli, M
 Bosscher, H

Environmental Research
 Laboratory - Monthly Summary -

Dow Number

Date

Author

Recipient

11397

Distributees

Brubaker, RI
Chase, FI
Clark, GA
Coulter, KE
Deline, DD
Engibous, DL
Ettinger, MB
Fletcher, WH
Griffin, JD
Gunkler, AA
Hammond, DD
Hillary, BB
Jacob, E
Johnson, JE
Kline, C
Kline, PE
Leathers, JM
Leavitt, FC
Look, AT
Lueck, AF
Maasberg, AT
McIlhemy, WF
McKennon, KR
Nielsen, WH
Otis, CE
Peterson, NR
Pfrommer, CP
Prince, AK
Pumpelly, CT
Putnam, MS
Rector, MR
Reinker, RE
Sanders, ME
Sercu, CL

General Subject Matter

June 1970

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>

2024276- 2024288*	700600	Dow	
2024289- 2024359*	700400	Dow	

Distributees

Shannon, ES
Sheetz, DP
Shelton, LG
Sienknecht, PJ
Smart, RC, Jr.
Snyder, RE
Staehling, EC
Struthers, JA
Teal, JL
Tree, RM. Jr.
Wilcox, AC
Woodward, RE
Wuckasch, RF
CRI(4)

General Subject Matter

Research and Development
Monthly Summary June, 1970

Crummett, WB
Kiley, LR
Bowman, CM
Pumpelly, CT
Johnson, JE
Bauman, WC
Nummy, WR
Blue, RD
Nussbaum, E
Rosene, RB
Tobey, SW
Hinman, CW
Coker, WP
Vanwestenburg, JA
Peterson, LI
Engibous, DL

Chemical Physics Research
Laboratory - January - April
1970

Dow Number

Date

Author

Recipient

2024360-
2024381*

701100

11399

Distributees

Look, AT
Sheetz, DP
Leavitt, FC
Burgert, BE
Nowak, RM
Hillary, BB
Spettigue, TE
Griffin, JD
Wright, ER
Pruitt, ME
Yeaman, MD
Heitz, RG

Arcangeli, M
Bosscher, H
Brubaker, RI
Bugg, DA
Chase, FI
Clark, GA
Coulter, KE
Daigre, GW
Davis, RM
Deline, DD
DeMott, D
Engibous, DL
Ettinger, MB
Gunkler, AA
Hammond, DD
Hillary, BB
Hinman, CW
Jacob, E
Johnson, JE
Kearney, JK
Kenaga, EE

General Subject Matter

Environmental Research
Laboratory - Monthly Summary-
November 1970

Dow Number

Date

Author

Recipient

11400

Distributees

General Subject Matter

Kennedy, TL
Kline, C
Laman, JD
Leathers, JM
Leavitt, FC
Lichy, C
Look, AT
Maasberg, AT
Matheson, LA
McClure, HH
McIlheny, WF
McKennon, KR
Nielsen, WH
Otis, CE
Pankratz, PM
Pavlick, J
Peterson, NR
Pfrommer, CP
Prince, AK
Pumpelly, CT
Putnam, MS
Rector, MR
Reinker, RE
Rogers, W
Sanders, ME
Schultz, WD
Sercu, CL
Shannon, ES
Sheetz, DP
Shelton, LG
Sienknecht, PJ
Smart, RC, Jr.
Syyder, RE
Staehling, EC

Dow Number

Date

Author

Recipient

2024382-
2024405*

701100

Dow

2024406-
2024420*

701100

Dow

2024430-
2024439*

701200

Dow

11401

Distributees

Struthers, JA
Teal, JL
Tree, RM. Jr.
Van Westenburg, J
Wilcox, AC
Woodward, RE
Wuckasch, RF
CRI(5)

General Subject Matter

Organic Chemicals Production
Research Monthly Summary -
November 1970

Reserach and Development
Monthly Summary - November
1970

Arcangeli, M
Bosscher, E
Brubaker, RI
Bugg, DA
Chase, FI
Clark, GA
Coulter, KE
Daigre, GW
Davis, RM
Deline, DD
DeMott, DN
Engibous, DL
Ettinger, MB
Gunkler, AA
Hammond, DD
Hillary, BB
Hinman, CW

Dow Number

Date

Author

Recipient

11402

Distributees

General Subject Matter

Holiday, AI
Jacob, E
Johnson, JE
Kearney, JK
Kenaga, EE
Kennedy, TL
Kline, CW
Laman, JD
Leathers, JM
Leavitt, FC
Lichy, C
Rector, MR
Look, AT
Maasberg, AT
Matheson, LA
McClure, HH
Rodgers, W
McIlheny, WF
McKennon, KR
Nielson, WH
Otis, CE
Pankratz, PM
Pavlick, JE
Peterson, NR
Pfrommer, CP
Prince, AK
Pumpelly, CT
Putnam, MS
Reinker, RE
Sanders, ME
Schaffer, AW
Schultz, WD
Sercu, CL
Shannon, ES

Dow Number

Date

Author

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2024441-
2024454*

701200

Dow

2024455-
2024479*

701200

Dow

2024480-
2024518*

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Dow

11403

Distributees

General Subject Matter

Teal, J.
 Sheetz, DP
 Shelton, LG
 Sienknecht, PJ
 Smart, RC
 Schuessler, RG
 Snyder, RE
 Staehling, EC
 Tree, RM
 VanDusen, G
 Van Westenburger, JA
 Wilcox, AC
 Woodward, RE
 Wukasch, RF
 CRI

Research and Development
 Monthly Summary December
 1970

Organic Chemicals Production
 Research Monthly Summary
 December 1970

Alexander, HC
 Baker, RL
 Bek, CM
 Brosier, JS
 Bosscher, H
 Colbry, RJ
 Daniels, SL
 Davis, RD
 Fox, RD
 Gaska, RA

Waste Control Progress Report -
 October - November - December
 1970

Dow Number

Date

Author

Recipient

2024519-
2024553*

701200

Dow

11404

Distributees

Hall, SD
Hamilton, CE
Hintz, MJ
Ilgenfritz, EM
Kaut, DE
Krienke, ME
Lynch, JE
Novak, RG
Pfrommer, C
Putnam, MS
Reinker, RE
Sawinski, RJ
Shannon, ES
Shively, JF
Stielstra, C
Teal, JL
Terryah, GG
Wass, WE
Weburg, AW
Wilson, JD
Zillich, JA
Ludwig, RC

Johnson, JE
Nummy, WR
Barrons, KC
Hymas, TA
Kagy, JF
Goring, CAI
Heitz, RG
Bailes, RH
Johnston, H
Johnston, RV
Gowell, JH

General Subject Matter

Agricultural Department Quarterly
Progress Report October -
November - December 1970

Dow Number

Date

Author

Recipient

2024554-
2024601*

701000

Dow

11405

Distributees

General Subject Matter

Popoff, FP
 Dowell, FH
 Holmsen, TW
 Reifschneider, W
 Getzendaner, ME
 Lynn, GE
 Bjork, CK
 Blair, EH
 Schwarz, AJ
 Ludwig, PD
 Moss, RD
 McCollister, DD
 Osborne, DW
 Seymour, KG
 Winqvist, ME
 Gum, W
 Busk, RS
 Cheney, GW
 Flynn, JM
 Kelly, ME
 McCoy, CE
 McIntire, OR
 Prince, AK
 Struthers, JA
 Peterson, LI
 Johnston, C
 Dishburger, JH
 Gehring, P
 Pruitt, ME

Arcangeli, M
 Bosscher, H
 Briggs, RL
 Brower, FM

Process Engineering Progress
 Report - September - October
 1970

Dow Number

Date

Author

Recipient

11406

DistributeesGeneral Subject Matter

Cermak, RW
Chisholm, DS
Copeland, RA
Costa, JE
Deline, DD
Engibous, DL
Gaska, RA
Graves, HE
Griffin, JD
Jacobs, CE
Kehde, H
Kennett, WW
Larsen, PE
Leathers, JM
Leavitt, FM
Look, AT
Sheetz, DP
Ioranger, HR
Maasberg, AT
Maier, RW
Miller, RE
Murdoch, PG
Otto, KA
Pumpelly, CT
Rousch, WE
Schorr, JF
Scovic, JM
Petrunia, G
Sheffield, PH
Stagg, DM
Szymanski, L
Treibilock, J
Wilcox, AC
Biggers, MW

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2024602- 2024613*	700800	Dow	
2024624- 2024641*	700600	Dow	
2024642- 2024651*	700700	Dow	

11407

Distributees

Dehaven, ES
Herron, RE

General Subject Matter

Research and Development Monthly
Summary August 1970

Organic Chemicals Production
Research - Monthly Summary -
June 1970

Monthly Summary July 1970

Arcangeli, M
Bosscher, H
Brubaker, RI
Bugg, DA
Chase, FI
Clark, GA
Coulter, KE
Daigre, GW.
Deline, DD
Engibous, DL
Ettinger, MB
Fletcher, WH
Griffin, JD
Gunkler, AA
Hammond, DD
Hillary, BB
Holder, BB
Jacob, E
Johnson, JE
Kearney, JK
Kennedy, TL
Kline, C
Kline, PE
Leathers, JM

Dow Number

Date

Author

Recipient

2024652-
2024680*

700300

Dow

11408

Distributees

General Subject Matter

Leavitt, FC
Look, AT
Maasberg, AT
McIlhenny, WF
McKennon, KR
Nielsen, WH
Otis, CE
Peterson, NR
Pfrommer, CP
Prince, AK
Pumpelly, CT
Putnam, MS
Rector, MR
Reinker, RE
Sanders, ME
Sercu, CL
Shannon, ES
Sheetz, DP
Shelton, LG
Sienknecht, PJ
Smart, RC, Jr.
Syyder, RE
Staehling, EC
Struthers, JA
Teal, JL
Tree, RM. Jr.
Wilcox, AC
Woodward, RE
Wuckasch, RF
CRI(5)

Alexander, HC
Baker, RL
Bek, CM

Waste Control Progress Report
January - February - March 1970

Dow Number

Date

Author

Recipient

11409

DistributeesGeneral Subject Matter

Brosien, JS
Colbry, FJ
Daniels, SL
Davis, RD
Fox, RD
Hall, JR
Hall, SD
Hamilton, CE
Hintz, MJ
Filgenfritz, EM
Kraut, DE
Krienke, ME
Lynch, JE
Novak, RG
Pfrommer, C
Putnam, MS
Reinker, RE
Sawinski, RJ
Shannon, ES
Shively, JF
Teal, JL
Terryah, GG
Wass, WE
Weburg, AW
Wilson, JD
Zillich, JA
Bublitz, DW
Bauer, DL
Bremner, F
Batchelder, TL
McClure, HH
McIver, JH
Smith, DH
Strahan, JM

<u>Dow Number</u>	<u>Date</u>	<u>Author</u>	<u>Recipient</u>

2024681 - 2024692*	700700	Dow	

2024693 - 2024730*	700600	Dow	

11410

Distributees

General Subject Matter

Skory, LK
Halphen, CE

Research and Development Monthly
Summary - July 1970

Waste Control Progress Report
April, May, June 1970

Alexander, HC
Baker, RL
Bek, CM
Brosier, JS
Colbry, RJ
Daniels, SL
Davis, RD
Fox, RD
Gaska, RA
Hall, JR
Hall, SD
Hamilton, CE
Hintz, MJ
Ilgenfritz, EM
Kraut, DE
Krienke, E
Lynch, JE
Novak, RG
Pfrommer, C
Putnam, MS
Reinker, RE
Sawinski, RJ
Shannon, ES
Shively, JF
Stielstra, C
Teal, JL
Terryah, GG

Dow Number

Date

Author

Recipient

11412

Distributees

General Subject Matter

Hillary, BB
Holder, BB
Jacob, E
Johnson, JE
Kearney, JK
Kennedy, TL
Kline, C
Kline, PE
Laman, JD
Leathers, JM
Leavitt, FC
Lichey, C
Look, AT
Maasberg, AT
McIlheny, WF
McKennon, KR
Nielsen, WH
Otis, CE
Peterson, NR
Pfrommer, CP
Prince, AK
Pumpelly, CT
Putnam, MS
Rector, MR
Reinker, RE
Sanders, ME
Sercu, CL
Shannon, ES
Sheetz, DP
Shelton, LG
Sienknecht, PJ
Smart, RC, Jr.
Snyder, RE
Staehling, EC

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2024757- 2024775*	700800	Dow	

2024776- 2024787*	700800	Dow	

2024788- 2024799*	700900	Dow	

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Distributees

Struthers, JA
Teal, JL
Tree, RM. Jr.
Wilcox, AC
Woodward, RE
Wuckasch, RF
CRI(5)

General Subject Matter

Organic Chemicals Production
Research - Monthly Summary
August 1970

Research and Development Monthly
Summary August 1970

Arcangeli, M
Bosscher, H
Brubaker, RI
Bugg, DA
Chase, FI
Clark, GA
Coulter, KE
Daigre, GW.
Deline, DD
Engibous, DL
Ettinger, MB
Fletcher, WH
Griffin, JD
Gunkler, AA
Hammond, DD
Hillary, BB
Hinman, CW
Jacob, E
Johnson, JE

Environmental Research Monthly
Summary - September 1970

Dow Number

Date

Author

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11414

DistributeesGeneral Subject Matter

Kearney, JK
Kennedy, TL
Kline, C
Kline, PE
Laman, JD
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General Subject Matter

Research and Development Monthly
Summary - September 1970

Organic Chemicals Production
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Research Monthly Summary -
October 1970

Research and Development
Monthly Summary - October 1970

STATE OF NEW YORK)
) ss:
COUNTY OF NASSAU)

CAROLE BARNES, being duly sworn, deposes and says:

That deponent is not a party to this action, is over 18 years of age and resides in West Hempstead, New York.

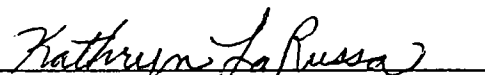
That on the 16th day of November, 1983, deponent served the within Notice of Confidentiality and Updated Index of Confidential Documents of Defendant The Dow Chemical Company

upon the attorneys below set forth representing the parties, as indicated, at the addresses shown, said addresses being designated by said attorneys for that purpose, by depositing a true copy of same, enclosed in a postpaid properly addressed wrapper in an official depository under the exclusive care and custody of the United States Post Office Department within the State of New York.

TO: SEE ATTACHED SERVICE LIST


CAROLE BARNES

Sworn to before me this
day of November 16, 1983.


NOTARY PUBLIC

KATHRYN LARUSSA
NOTARY PUBLIC, State of New York
No. 4470270
Qualified in Nassau County
Commission Expires March 30, 1984

11416

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UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF NEW YORK

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In Re

"AGENT ORANGE"

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Product Liability Litigation
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PLAINTIFFS' MEMORANDUM ON THE
APPLICABILITY OF THE LEGAL THEORIES
OF FAILURE TO WARN, CONCERTED ACTION,
ENTERPRISE LIABILITY AND ALTERNATIVE
LIABILITY

December 1, 1993

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UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF NEW YORK

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In Re

"Agent Orange"

MDL No. 381
(All Cases)

Products Liability Litigation

-----X

PLAINTIFFS' MEMORANDUM ON THE APPLICABILITY
OF THE LEGAL THEORIES OF FAILURE TO WARN,
CONCERTED ACTION, ENTERPRISE LIABILITY AND
ALTERNATIVE LIABILITY

INTRODUCTION

Plaintiffs' Memorandum addresses the issue of whether the legal theories of concerted action, enterprise liability, or alternative liability may be applied here in the absence of evidence enabling plaintiffs to identify which defendants' tortious conduct caused the injuries complained of. However, plaintiffs do not solely rely on the aforementioned theories.

It is plaintiffs' position that: (1) each defendant breached its duty to warn the government of the dioxin hazards to health known or which should have known by it to be associated with its own dioxin contaminated Agent Orange herbicide product and with the dioxin contaminated products sold by the other defendants to the military; (2) that

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each defendant's breach of duty to warn was a substantial factor leading the military to decide to mix and deploy the dioxin contaminated Agent Orange herbicides supplied by defendants, which caused plaintiffs' injuries; and (3) that consequently defendants are liable as tortfeasors jointly and severally for such injuries without any burden on the part of plaintiffs to identify and prove which defendant caused their injuries.

If this Court agrees that the defendants' breach of their duty to warn carries such legal consequences, it need not decide with regard to the failure to warn issue, whether the theories of concerted activities, enterprise liability or alternative liability need to be applied on the identification/causation issue. However, so that the Court may be in a position to consider the legal implications of all these theories, plaintiffs present herein a comprehensive historical record of defendants' conduct in the manufacturing and sale of dioxin contaminated Agent Orange herbicides to the military for use in Vietnam, focusing on the relations between the defendants and with the military and other government agencies during the period of the Vietnam era.

Plaintiffs believe that this historical record fully supports any and all of the theories of concerted activities,

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alternative liability, enterprise liability, and that, should the Court deem it necessary to address the defendant identification causation issue, the defendants may be held jointly and severally liable under any of these three theories.

In the detailed factual background statement which follows, a tragic hitherto unrecorded chapter of the Vietnam war is told of the misdeeds of chemical war contractors which injured American and allied soldiers.

The defendant chemical companies owned or controlled virtually all of the Agent Orange herbicide production capacity.

They supplied to the military, the sole source purchaser over 99% of the herbicides contracted for and received over 99% of the purchase price paid. (Exhibit 1)

Each of the defendant's herbicides was contaminated with dioxin, in varying degrees and violated their contractual obligations to the military. Each defendant knew its product was contaminated and hazardous to human health. Each defendant knew that the other defendants' herbicides were dioxin contaminated and hazardous. Each knew, with varying degrees of expertise, how to eliminate or reduce the dioxin. None ever warned the trusting, less expert, military, or informed it of the dioxin problem and the means of its avoidance or elimination.

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Instead, they conspired secretly and persistently to deceive the military and other government agencies about the matters hereinafter detailed which were of profound importance to the health of American soldiers and to the national security let alone to the American people generally. The defendants used every device available to keep their dioxin problems confined to their inner circle and to keep the military and government agencies in the dark - secret meetings, confidential documents, misrepresentations, half truths, suppression and withholding of data and technology, task and trade association fronts and position papers, ad hoc committees, and a myriad of other regrettable activities, which, if they had not occurred, might have led to military decisions which would have prevented the injuries inflicted by defendants. The full story is now told.

FACTUAL BACKGROUND

In order to address the issues of failure to warn and applicability of the theories of concerted action, enterprise liability and alternative liability, it is necessary to review in historical sequence, the factual record as it has been developed to date. The record is far from complete, but enough is already known upon which the Court may reach a preliminary judgment that the conduct, transactions and relationships between the defendants (horizontal) and between the defendants and the Government (vertical) are such as to warrant a finding that defendants have breached their duty to warn and that one or more of the above theories of liability are applicable in this case. It is likely that additional discovery will, if anything, buttress the appropriateness of applying these theories.

We begin the review of the historical record with an examination of the knowledge and conduct of the defendant Dow Chemical Company, a key player in the events which followed and a linchpin connecting many of the horizontal and vertical relationships between the defendants and the Government in connection with the sale of the dioxin-contaminated Agent Orange herbicides which caused plaintiffs' injuries.

Where necessary to present the full context of factual statements in this part of plaintiffs' memo, a limited number of documents have been appended which have previously been used as exhibits or referred to in plaintiffs' prior submissions or in depositions of the defendants and Government witnesses.

I. DEFENDANTS WERE KNOWLEDGEABLE ABOUT THE
MANUFACTURING PROCESS, DIOXIN AS A CON-
TAMINANT, DETECTION METHODS, RISK REDUCTION
METHODS AND HEALTH HAZARDS ASSOCIATED WITH
EXPOSURE TO DIOXIN.

A. Prior to Becoming a "Government Contractor,"
Dow had Invented, Patented and Sold Commercial
Herbicides Containing a 50/50 Mixture of
2, 4-D and 2,4,5-T

Dow admits to have known about a highly toxic impurity in
2,4,5-T since 1950.^{1/} On April 15, 1970, Julius E. Johnson, Vice-

1/ The record suggests Dow's earlier knowledge.

1. 1937---Four hundred (400) lumber workers using Dowicide H (tetrachlorophenol), some of whom developed among other things, comedones, cysts and pustules (chloracne), urinary disturbances, skin lesions lasting seven years and marked hyperkeratosis;
2. 1937---Twenty-one (21) workers at a Dow plant which manufactured tetrachlorophenol, some of whom developed the same symptoms as the 400 lumber workers;
3. 1949---Ten (10) workers exposed in Nordheim, W. Fahlen in the manufacture of 2,4,5-TCP, some of whom developed neuralgic pains, heart disorders and chloracne;
4. 1949---One hundred seventeen (117) workers exposed in the manufacture of 2,4,5-T and 228 family members and medical personnel dealing with the exposed workers, at a Monsanto plant in Nitro, West Virginia some of whom developed chloracne, liver damage, vomiting, papable liver and tiredness;
5. 1954---Thirty-one (31) workers at a C.H. Boehringer plant exposed in the manufacture of 2,4,5-TCP and 2,4,5-T, some of whom developed liver damage and chloracne;
6. 1956---Twenty-nine (29) workers in a Diamond Alkali (now Diamond Shamrock) plant exposed in the manufacture of 2,4,5-T some of whom developed porphyria cutanea tarda, hyperpigmentation and hirsutism and
7. 1964---Forty (40) plus workers in a Dow plant in Midland, Michigan exposed in the manufacture of 2,4,5-T, some of whom developed chloracne and complaints of tiredness, weakness, and depression with some reduction in hemoglobin and red cell counts. Some workers with metaplastic changes were examined.

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President and Director of Research for Dow, gave a statement before a subcommittee of the United States Senate Committee on Commerce. Mr. Johnson stated:

Since 1950 we have been keenly aware of the possibility of a highly toxic impurity being formed in 2,4,5-trichlorophenol as a side reaction under conditions of elevated processing temperatures...We also knew that if the impurity was present in the 2,4,5-trichlorophenol it could be carried forward to the end product, 2,4,5-T.

A review of Dow's history of 2,4,5-trichlorophenol (hereafter "2,4,5-TCP") and 2,4,5-T production confirms that statement.

Dow began making 2,4,5-TCP in mid-1946. In 1948, Dow registered its first 2,4,5-T product under the Federal Insecticide, Fungicide and Rodenticide Act.

Since 1948, Dow has manufactured a number of products containing by volume (minus inert ingredients) a 50/50 mixture of 2,4,5-T and 2,4-D.^{2/} One such product was Brush Killer 50-50. Absent inert ingredients, that product contained a 50/50 mixture of 2,4,5-T and 2,4-D. In addition to Brush Killer 50-50, Dow also manufactured Brush Killer LV 2-2, Tippon 2-2, Verton CE, and Veon Brush Killer, each of which is approximately a 50/50 mixture of 2,4-D and 2,4,5-T. Dow patented Tippon 2-2 and Brush Killer 50-50.

^{2/} "Agent Orange" was a 50/50 mixture of 2,4,5-T and 2,4-D.

In the manufacture of its commercial 50/50 mixtures of 2,4-D and 2,4,5-T, Dow developed internal specifications. Those specifications dealt with the manufacturing processes and the compositions of the final products. In addition to product specifications, Dow developed "accepted quality control procedures" and "quality requirements."

Prior to selling "Agent Orange" to the United States Military, Dow was thoroughly familiar with commercial 50/50 mixtures of 2,4,5-T and 2,4-D. Prior to selling "Agent Orange" to the United States military, Dow had developed internal specifications and quality control programs for the production of commercial herbicides containing a 50/50 mixture of 2,4,5-T and 2,4-D. As the result of direct manufacturing experience since 1948 of commercial products containing 2,4,5-T, Dow developed a tremendous expertise with respect to that particular phenoxy herbicide.

B. Dow was Knowledgeable About the Manufacturing Process of 2,4,5-T and Its Toxic Impurities

Though Dow has withheld as proprietary and confidential the specific manufacturing processes it utilized from 1948 to 1970, it is generally known that Dow produced 2,4,5-T through the following process:

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1. Caustic Hydrolysis

- a. A solution of caustic (believed to be sodium hydroxide) in methanol was formed;
- b. The caustic and methanol were mixed with tetrachlorobenzene;
- c. The solution of caustic and methanol and tetrachlorobenzene were placed in a reactor under pressure and heat.

2. Preparation of Sodium Salt of 2,4,5-TCP

- a. Distillation of methanol under heat;
- b. Distillation of water under heat;
- c. Driving off of trichloroanisole under heat;

3. Coupling Sodium 2,4,5-trichlorophenolate and Monochloroacetic Ester

In 1945, Dow conducted the first rabbit skin test on the trichlorophenol process material. At that time the caustic insoluble oil from the 2,4,5-TCP process was found to cause acneform dermatitis on the rabbit's skin. As early as 1945, Dow knew that exposure to trichlorophenol process materials could cause acneform dermatitis. In 1952 Dow went from a "batch" process to a "continuous" process. By 1956, Dow learned of the particular substance in the 2,4,5-TCP and 2,4,5-T which was responsible for the acneform dermatitis.

Knowledge of the toxic contaminant in 2,4,5-TCP was learned by Dow from the C.H. Boehringer Sohn Company of Germany. In 1951, C.H. Boehringer began experimenting with the production of 2,4,5-TCP. Between 1952 and 1954, 19 cases of serious

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chloracne appeared at the Ingelheim plant and 18 cases appeared at the Hamburg plant. The problem became so serious that production was halted at the Ingelheim plant in December of 1954. In the spring of 1955, production was halted at the Hamburg plant. The plants were closed.

To test for toxicity in the plants, rabbits were placed on each of the floors with the doors and windows closed. All the rabbits died within five days. Autopsies showed pronounced liver changes and liver necrosis. By June of 1955, Dr. K.H. Schulz of the University Skin Clinic in Hamburg-Eppendorf had found that the "chloracne inciters" were present in the phenol and the 2,4,5-trichlorophenolate solution. Dr. Schulz further determined that the anisole fraction was the carrier of the chloracnegenic substance. In 1956, Dr. Schulz identified the offending substance as 2,3,6,7-tetrachlorodibenzodioxine.

Because C.H. Boehringer was having such difficulty with chloracne in the manufacture of 2,4,5-TCP, it sought outside help. C.H. Boehringer was put in touch with Dow.

On January 27, 1955 Dow wrote to Boehringer, "[E]nclosing a data sheet describing the hazards due to toxicity and precautions for safe handling and use of 2,4,5-trichlorophenol and answered seven specific questions regarding experience in our own plant." In the course of

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attempting to identify the cause of the chloracne, researchers at C.H. Boehringer identified tetrachlorodibenzodioxine in 1956. As a result of C.H. Boehringer's identification of dioxin as the chloracnegenic agent in 2,4,5-TCP, C.H. Boehringer instituted certain process changes to prevent the formation of dioxin.

Since Dow had provided C.H. Boehringer information in 1955 concerning the chloracne problem, C.H. Boehringer sent to Dow, on February 11, 1957, information on the preparation of trichlorophenoxyacetic acid in a manner to avoid the formation of "chlorakne excitors."

information was sent by C.H. Boehringer to all known producers of chlorophenol. ^{3/}

In April, 1957, Dr. Schulz reported his findings with respect to 2,3,7,8-tetrachlorodibenzodioxine together with Professor Kimmig in "Die Naturwissenschaften" 44:337-338 (1957).

In the article, Kimmig and Schulz described the appearance of workers at C.H. Boehringer's plants who had been exposed to the trichlorophenol containing the 2,3,6,7-tetrachlorodibenzodioxine which they believed to be the culprit:

The appearance of the illness was characterized by a scattering of comedones, pustules, small sebum retaining cysts in the regions of the face, neck, breasts, back, and extremities. Damages to liver functioning was determined in individual cases.

^{3/} This suggests that the other defendants knew at the time that Dow did, how to avoid the formation of the toxic impurity that was causing the chloracne problem.

Kimmig and Schulz noted the "high general toxicity" of the compound and found upon autopsy of exposed rabbits "severe necroses as well as diffuse adiposis of the liver." The article states: "It was also possible to isolate a tetrachlorodibenzo-dioxane, identical to the synthesized model substance, from the by-products resulting in the industrial pressure phenol process."

Dow either had a copy of the Kimmig and Schulz article in 1957 or should have had a copy of that article in light of their extensive dealings with C.H. Boehringer. In September, 1962, Dow made a two-week pilot plant run using an approximate 24% caustic solution diluted with water. Again, the temperature was raised.^{4/}

In July, 1963, Dow shut down building 199, where 2,4,5-TCP was manufactured, to install new equipment to increase Dow's capacity to hydrolyze tetrachlorobenzene to 2,4,5-TCP using the 22% caustic solution. After reopening, Dow was "running at the limit of (its) hydrolyzing capacity". Dow was "pushing (the) existing plant to (its) limit." "Whenever production is increased it is usually done by increasing the temperature of the synthesis run."

^{4/} The caustic insoluble oil from the production of 2,4,5-TCP was studied by the Biochemical Research Laboratory of Dow and found to be an active chloracnegen.

On July 3, 1963, an event occurred which illustrates that Dow and the defendant Hercules were both fully aware of the hazards associated with the use of 2,4-D and 2,4,5-T. On that date, Dr. John P. Frawley, Hercules' Chief Toxicologist, wrote to V.K. Rowe, Chief Toxicologist for the Dow Chemical Company, to discuss the hazards associated with the use of 2,4,-D and 2,4,5-T. The letter reads in part as follows:

"Dear V.K.:

Several weeks ago I mentioned to Don McCallister that Dr. Jack Leary of U.S.D.A. has approached Hercules and Monsanto with a request to conduct subacute dermal toxicity studies on at least one chlorinated phenoxy herbicide.

On June 27th, I had an opportunity to review this request with Leary and I will try to report to you the background.

Undoubtedly you have seen the clinical reports of four cases of neuropathy which allegedly have been caused by 2,4-D salts and esters. (Archives of Internal Medicine, Vol. 3, 1963, pp. 133-134; J.A.M.A. November 7, 1959 pp. 1306 to 1389) In addition, I have heard of one previously unreported case involving a product liability claim which was successfully defended by a formulator. To my knowledge, Leary has not heard of this case...

On the basis of these reports Leary feels that the hazards associated with the use of 2,4,-D and 2,4,5-T products should be understood more thoroughly. He specifically wishes to know whether repeated dermal exposure of animals to the free acids and the various salts and esters will cause peripheral neuropathy or the other related symptoms. He plans to make an informal request of each manufacturer to study at least one such product... Frankly I believe Leary's request is reasonable. It could have been made in the form of a demand and not a request, and certainly could have involved far more extensive design. I believe it is desirable for you, Bill Hunt and myself to confer on the desirability of conducting such studies and to consider carefully the design and the selection of minimum number of these products for such study... I also suggest that we handle such discussions by requesting NACA to appoint an ad hoc toxicology sub-committee consisting of the three of us. After we have crystalized our own thinking we can invite others to serve as we see fit and can negotiate with USDA as a technical committee...

Since Dow is generally regarded as the largest manufacturer of phenoxy herbicides, I suggest that you serve as Chairman of this committee...

Sincerely,

John P. Frawley, P.H.D.

Chief Toxicologist..."

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This letter reveals three significant facts. First, the United States Department of Agriculture as early as July, 1963, was relying upon the phenoxy herbicide industry to make the studies necessary to determine whether phenoxy herbicides were toxic to humans. Second, both Dow and Hercules had seminal knowledge of problems associated with consumer use of 2,4,5-T, and third, in order to insure against any adverse findings, NACA (National Agricultural Chemical Association), an industry operated lobbying group would appoint industry representatives to "negotiate" with USDA so that the design and study of toxicity and potential hazards to human health would be minimal and not get out of hand.^{5/}

Incredible as it may seem, given its extensive knowledge of health hazards associated with the use of 2,4-D and 2,4,5-T in 1963, Dow affirmatively misrepresented to the United States military:

(W)e have been manufacturing 2,4-D and 2,4,5-T for over ten years. To the best of our knowledge, none of the workmen in these factories have shown any ill effects as a result of working with these chemicals.

^{5/} From this seminal undertaking later emerged in the years 1965, 1966, and 1967, an industry-wide conspiracy whose sole function was to defraud the military and the government by concealing from them the knowledge which and the phenoxy herbicide industry possessed about dioxin as a contaminant poison in 2,4,5-T and its potential hazards to human health.

Dow made that representation knowing about the prior occupational health problems in its own and other chemical company plants, and knowing about C.H. Boehringer's horrifying experiences with chloracne and liver damage in 1954.

Apparently Dow thought in 1963 that the military would be interested in Dow's industrial health history in the manufacture of 2,4,5-T as a benchmark of safety.

As the result of pushing its production capacities to the limit where the temperatures employed were increased, workers in the Dow plants began to experience chloracne. In August of 1964, Dow utilized vapor phase chromatography to detect dioxin in the waste oils. The waste oils were fractionated, dioxin isolated and identified. Dow then proceeded to synthesize dioxin in the laboratory. In November, 1964 Dow prepared internally a confidential memorandum on an analytical method for "The Determination of 2,3,7,8-Tetrachlorodibenzo-p-Dioxin in 2,4,5-Trichlorophenoxyacetic Acid by Gas-Liquid Chromatography."

The analytical method was for detection of dioxin in 2,4,5-T, the end product and not only for 2,4,5-TCP, the intermediary. Dow apparently thought it was necessary to analyze its end product.

Thus, by November, 1964, the Dow Chemical Company had identified dioxin as the toxic compound causing chloracne, an admittedly hideous disfiguring disease. This identification of dioxin as the causative factor in the known health problems as set forth in the November 30, 1964 memorandum on the stationary of "The Dow Chemical Company", titled "The Determination of Compounds Capable of Causing Chloracne in 2,4,5-Trichlorophenol Process Samples By Gas-Liquid Chromatography." This memorandum describing the methods and means for detecting dioxin was later to be distributed to those attending the secret March 24, 1965 "dioxin" conference, described infra. Dow sought to advise the other manufacturers of 2,4,5-T that Dow knew their products were contaminated.

Dr. R.C. Dosser of Dow pointed out to Mr. E.T. Upton of T.H. (Defendant T.H. Agriculture & Nutrition, Inc.) in a telephone conversation on or before January 12, 1965:

[t]hat if a compound, found in 2,4,5-T acid or its esters, proved to be damaging that this might lead to a flurry of successful claims by users of the herbicide who allegedly had been injured by it.

On February 18, 1965, Dow held an internal "Exciter" Problem, Meeting. Minutes of that meeting state:

Otis introduced the meeting by indicating that recent information indicates "Exciter" components may be present in Dow 2,4,5-trichlorophenol. Bioproducts is concerned about 2,4,5-T acid, esters, formulations, silvex, ronnel, and Erbon. This meeting is to review status of our knowledge of this subject, potential hazards, possible effect on Dow image, legal implications, and need for possible quarantine. These basic decisions are to be made without consideration of economic impact.

As a result of that meeting, Dow determined to meet with the other producers of 2,4,5-T.

In February, 1965, Dr. Frawley, Chief Toxicologist of defendant Hercules learned from V.K. Rowe, Dow's Chief Toxicologist that 2,4,5-T was contaminated with an acnegen. This is the toxic impurity which was more accurately identified by Dr. Rowe at the secret conference called March 24, 1965 at Dow's headquarters in Midland, Michigan.

Prior to March 1, 1965, V.K. Rowe of Dow contacted the Medical Director (Emett Kelly, M.D.) and Assistant Medical Director at Monsanto and the Chief Toxicologist at Hercules (John P. Frawley) concerning dioxin contamination.

On March 19, 1965, Dow entered into a letter agreement with C.H. Boehringer, concerning the disclosure of processes and/or apparatus and/or production information regarding the prevention of incidence of chloracne arising out of the production of 2,4,5-T. The agreement provided for C.H. Boehringer to disclose to Dow technical know-how designed to prevent the occurrence of chloracne. The documentation and information was submitted within a covenant of secrecy. The agreement was to come into force December 7, 1964 and be valid for a period of ten years until December 6, 1974. The importance of secrecy was emphasized in the following provisions:

"You agree to keep any documents concerning the process as well as all verbal or written information and data strictly secret. You will bind your collaborators who get knowledge of this information, documents and data to the same obligation as that assumed by Dow by requiring them to execute an individual commitment.

The obligation of secrecy hereunder shall not apply to any item of information disclosed hereunder which:

1. Dow can demonstrate was known to Dow and in its possession prior to disclosure by Boehringer on or after December 7th, 1964, or
2. Is now or hereafter becomes generally available to the public without fault of Dow, or
3. Dow can demonstrate was obtained by it in good faith from a third party having a bona fide right to make such disclosure."

We do not know at this time whether or the extent to which or at what time if ever, the existence of this agreement was made known by Dow to the other defendant chemical companies or the Government.

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On March 19, 1965, V.K. Rowe of Dow wrote an identical letter to Emmett Kelley, M.D., Dr. J. Wilkenfeld of Hooker Chemical Corporation, Mr. Raymond Verhoeze of Hooker Chemical Corporation, Mr. Francis Kennedy, Plant Manager of Diamond Alkali Company, Dr. Ed Chandler, Technical Services, Diamond Alkali Company, and Dr. John P. Frawley. That letter stated:

[I] am inviting each of you to come to Midland to discuss the toxicological problems caused by the presence of certain highly toxic impurities in certain samples of 2,4,5-trichlorophenol and related materials.

...

Our discussions will deal only with toxicological and analytical aspects of the problem. We will not discuss manufacturing know how, sales, or anything else not dealing with the problems of health.

See, Exhibit 2. The meeting occurred on March 24, 1965.

Present at that meeting were: Dr. Wilkenfeld and Raymond Verhoeze of Hooker Chemical Corporation, Mr. Francis Kennedy and Dr. Edward Chandler of Diamond Alkali Company, and Mr. C.L. Dunn and Dr. John P. Frawley of Hercules Powder Company. At the meeting "V.K. Rowe recapped the Dow situation in terms of the problem and the initial studies by Toxicology and Environmental Research Laboratory regarding the in-plant situation. He expanded this in general terms to the study of end products, ours and other peoples." See, Exhibit 3. A number of the attendees at the March 25, 1965 meeting drafted memos to file. Those memos are worth reviewing in their entirety.

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A memo to file from E.L. Chandler of Diamond Alkali Company notes, among other things:

The Dow people state that they intend to set a limit of zero with sensitivity of plus or minus 1 ppm on this material. They have analyzed materials from other companies, including our company, and have found amounts as high as 10 ppm in 2,4,5-T acid (end product) and 20 to 30 ppm in phenates.

They have made a single application to the ears of test rabbits and have found that 20 ppm will not give folliculitis. Forty ppm does give a slight effect, and 100 ppm is severe. They have made repeated applications of from 10 to 100 ppb, and 25 of these treatments do not cause a response; however, 1000 ppb (1 ppm) gives a slight response with nine applications and a severe reaction with 11 applications.

They conclude, therefore, that 1 ppm with repeat exposure can create a real problem.

See, Exhibit 4 (Emphasis added). It is clear that Dow believed in 1965 that 1 ppm with repeated exposures presented a significant health hazard.

C.L. Dunn of Hercules Powder Company also prepared a memo to file. In that memo Mr. Dunn notes, "Rowe expressed concern that carry-through of toxic materials into final formulated herbicide products may occur unless precautions are taken." See, Exhibit 5, p. 1. On page 2 of that memo to file is found: "Evidence that the chloracnogens may be systemic."; and "Hooker and Diamond people were quite aware of chloroacne. One of the Hooker people said that some cases are believed to relate to exposures occurring 20 years before." On page 4

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of that memo to file Mr. Dunn recorded the detection limits for Dow's gas chromatography: "2,4,5-TCP - 1 p.p.m." and "2,4,5-T acid - 1 p.p.m." See, Exhibit 5 , p. 4. On page 5 is found: "Competitor products - Dow has examined all manufacturer's 2,4,5-T products. Some have "surprisingly high" amounts of chloroacnogens. This defined as 10 p.p.m. in 2,4,5-T acid, and up to 30 p.p.m. in 2,4,5-trichlorophenate." Id., p. 5.

Similarly, J. Wilkenfeld of Hooker Chemical Company recorded the information he had received at Dow on March 24, 1965. Dr. Wilkenfeld noted:

Work with rabbits with washing after exposure, sometimes as soon as 15 minutes after application, did not stop the development of the chloracne and single, oral dose toxicity tests (not (?) m 50) resulted in the death of some rabbits at 17 micrograms per kilo. Peripheral liver cell necrosis occurred in some rabbits where the washing was done.

...

The current inplant working limit is "no response" with less than one ppm by chromatography considered safe. When they were having difficulty, chloracne causers were in the order of 20 - 30 ppm.

See, Exhibit 6 (parenthetical unclear). Not a single government representative was invited to attend the March, 1965 meeting. Dow nor any of the other defendants has produced any evidence suggesting that the information conveyed by Dow to the other defendants at the March 24, 1965 meeting was conveyed to any government representative or more properly, a high-ranking military official.

Defendants other than Dow were also communicating with each other as to their chloracne and dioxin problems.

On April 9, 1965, Dr. Frawley (Hercules) sent a memorandum to Mr. C.L. Dunn. In the memorandum, Dr. Frawley refers to obtaining information from Monsanto,

"...regarding the problems they and Badische have had on chloracne..."

He then goes on to report that,

"...from the data provided, a sample which contained 5 ppm of the Dioxin would be acutely toxic. Whether this refers to death or liver damage is not clear..."

On June 24, 1965, V.K. Rowe of Dow's Biochemical Research Laboratory wrote a letter to Ross Mulholland, Manager, Bioproducts, Dow Chemical of Canada. In that letter, Mr. Rowe stated:

As you well know, we had a serious situation in our operating plants because of contamination of 2,4,5-trichlorophenol with impurities, the most active of which is 2,3,7,8-tetrachlorodibenzodioxin. This material is exceptionally toxic; it has tremendous potential for producing chloracne and systemic injury. If it is present in the trichlorophenol, it will be carried through into the T acid and into the esters and hence into formulations which are to be sold to the public. One of the things which we want to avoid is the occurrence of any acne in consumers. I am particularly concerned here with persons who are using the material on a

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daily, repeated basis such as custom operators may use it. If this should occur, the whole 2,4,5-T industry will be hard hit and I would expect restrictive legislation, either barring the material or putting very ridged controls upon it. This is the main reason why we are so concerned that we clean up our own house from within, rather than having someone from without do it for us. In this way, we can approach the problem in an orderly manner. If the producers and handlers of this material will cooperate, there is no reason why we cannot get this problem under strict control and thereby hopefully avoid restrictive legislation; in other words, let us practice good citizenship.

. . . .

We are not in any way attempting to hide our problem under a heap of sand, but we certainly do not want to have any situations arise which will cause the regulatory agencies to become restrictive. Our primary objective is to avoid this.

. . . .

I trust that you will be very judicious in your use of this information. It could be quite embarrassing if it were misinterpreted or misused.

See, Exhibit 7, (emphasis added). In keeping with the desire to maintain secrecy, V.K. Rowe wrote as a postscript, "under no circumstances may this letter be reproduced, shown, or sent to anyone outside of Dow." Id.

Later, a telephone conversation took place on July 9, 1965 between Dr. John P. Frawley, Chief Toxicologist for Hercules, and Earl Farnham, a Dow Company executive, who, according to this memorandum, was calling Dr. Frawley on behalf of Dow Vice-President, Donald Baldwin. The document dated July 12, 1965, and marked "Confidential", reads as follows: (Exhibit 8)

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On July 9, 1965, Mr. Earl Farnham of Dow Chemical Company telephoned stating that he was calling at the request of Mr. Donald Baldwin, Vice-President of Dow to inquire how serious I considered the chloracne problem in relation to the consumer use of 2,4,5-T. When I suggested that he should discuss this with Hercules management rather than with me, he stated that on the advice of their toxicologists, Dow had gone to great expense to alter their manufacturing conditions in order to produce 2,4,5-T acid which has less than 1 ppm acnegen.

Since several months ago, Dow had made available to all other producers the same data which convinced their toxicologists to set an internal specification of 1 ppm on the acid, they had assumed that the other producers would take similar action. On the basis of their chemical analyses, they are convinced that no one else has done anything to remove the acnegen from their 2,4,5-T and consequently, they wanted my opinion whether they had been misadvised by their own toxicologists.

I advised Mr. Farnham that I did not think this was a proper question for me and that he should seek outside advice from a private consultant if he doubted the advice of his own toxicologists. I pointed out that considerable individual professional judgment would be involved in establishing a specification of this type because all of the important facts are not known.

He then stated that Dow was extremely frightened that this situation might explode. They are aware that their competitors are marketing 2,4,5-T which contains "alarming amounts" of acnegen and if the government learns of this, the whole industry will suffer. They are particularly fearful of a Congressional investigation and excessive restrictive legislation on manufacture of pesticides which might result.

I advised Mr. Farnham that we shared his fear but were not aware of his allegation that the competitors' products were hazardous. He asked if Hercules had established an internal specification. I stated that he should discuss this with someone in our management and referred him to Mr. Copeland.

I reminded him that we had experienced great difficulty in conducting the analyses for the acnegen by the Dow procedure, and that only within the past few weeks, following a visit of our chemists to Midland, have we been able to obtain any useful information. I suggested that if he wanted any additional information on this problem he should talk to Mr. Copeland. He asked that he be transferred to Mr. Copeland.

(After the call was transferred I learned that Mr. Copeland was out of town and Mr. Farnham left word that he would call on Monday, July 12)"

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The documents reveal that the chemical companies were all aware that their dioxin level in Agent Orange was totally unacceptable and a potential health hazard. No such communication or any of the information described above was ever transmitted by any chemical company to the Government or the military, even though the chemical companies knew that the dioxin level of some of the herbicides ranged from 20-140 ppm, and they all knew that their contaminated herbicides were being mixed together in drums before use in Vietnam.

Silence and confidentiality were the code words utilized to conceal the knowledge which these defendants had amassed concerning the potential health hazards associated with the contaminated Agent Orange herbicides.

It is clear from the record that no one in the military was advised of the contamination of the defendants' Agent Orange herbicides with dioxin and of the concomitant health hazards until March 6, 1970.

On that date, representatives of Dow provided a briefing to representatives of the United States military. The subject of that briefing was dioxin as an impurity in 2,4,5-TCP and 2,4,5-T. At that briefing, Dow representatives presented the following information on 2,4,5-T:

Since 1950 it has been known that 2,3,7,8-tetrachlorodibenzo-p-dioxin is an impurity associated with 2,4,5-trichlorophenol (TP). The latter material is used in the manufacture of 2,4,5 T. Dioxin is a highly toxic material...In 1964, Dow closed their plant which manufactured 2,4,5T due to widespread acne among plant workers. Dioxin and other impurities were found in the 2,4,5T. The plant was cleaned and the manufacturing process was changed to eliminate the dioxin and other impurities. The Dow 2,4,5T now contains less than 0.5 ppm of dioxin.

See, Exhibit 9.

The deposition of Dr. Robert Darrow is instructive on the level of the United States military's knowledge with respect to dioxin as late as March of 1970. Dr. Robert Darrow attended the meeting on March 6, 1970 at the Pentagon with Dr. Charles Minarik as representatives of the Crops Division at Fort Detrick. During examination by defendant's counsel, the following transpired:

Question: Can you recall a meeting which took place on or about March 11, 1970, at which various representatives of Dow met with Gen. William Sloan (sic) and various others concerning Agent Orange?

Mr. O'Brien: (Objection)

Mr. Krohley: (question rephrased)

Mr. O'Brien: (Objection)

Answer: I was at a meeting with Dow's representatives but I don't recall the date of it. The name General Sloan doesn't register with me. I'm not sure.

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Question: Do you recall what if anything you said at that meeting.

Answer: I just listened. I didn't say anything.

Question: Do you recall what if anything Dr. Minarik said at that meeting?

Mr. O'Brien: Same Objection.

Answer: The presentation was given by the Dow people. That was it. They presented information.

Question: Anyone at the meeting, Dr. Darrow, did they say in words or in substance to the Dow representatives why didn't you tell us about this before?

Answer: I think the feeling was there but I'm not sure it was said. We were surprised when we got the information at this time.

Question: By "we" who are you referring to?

Answer: Dr. Minarik and myself.

Question: Do you recall what if anything was said in that regard by anyone at the meeting?

Answer: No specific comments, no. In other words, this represented information that we were receiving for the first time in this respect on the dioxin situation.

Question: Where was that meeting held? Do you recall that?

Answer: It was in the Pentagon. It was in Washington, D.C., in the Pentagon.

Without any doubt, Dow and the other defendants in this litigation had conspired to withhold information from the United States military concerning dioxin contamination of the Agent Orange herbicides.

On June 15, 1970, Dow wrote a letter addressed as follows:

The Honorable Melvin R. Laird
Secretary of Defense
The Pentagon
Washington, D.C.

See, Exhibit 10. In that letter, Dow advised the Secretary of Defense that Dow's Agent Orange contained one part per million of dioxin and that "certainly such a product is safer in use than one containing larger quantities".

Thus was culminated a period of relationship between the government and defendants which began with Dow's misrepresentations in 1963 of the safety of its herbicides and ended in 1970 after a continued conspiracy of silence and failure to warn, with admissions of their high toxicity, and the fact higher dioxin levels meant greater safety hazards.

It is clear also that during the period of time of their relationship with the military, the defendants also withheld from the military their considerable knowledge about detection and manufacturing risk reduction techniques.

C. Defendants were Knowledgeable About Detection and Manufacturing Risk Reduction Techniques

Risk reduction requires a problem, method for investigating the problem, remedial action and a method for monitoring to prevent recurrence. The "highly toxic impurity" problem defined itself in 1937 when 400 lumber workers developed chloracne. The method for investigating the problem was animal testing which Dow did not undertake. The remedial action was a change in the manufacturing process. Plaintiffs are unaware whether such a change was made. As of 1941, the method for monitoring to prevent the recurrence was the rabbit skin test.

In 1964, the problem was the same. The method for investigating the problem was gas liquid chromatography and sample preparation techniques. The remedial action, at least with respect to Dow was the purchase and implementation of C.H. Boehringer technology to produce 2,4,5-TCP and 2,4,5-T with less than one ppm of dioxin. The method for monitoring the problem to prevent recurrence was liquid gas chromatography and separation techniques pioneered by Dow.

6/ The C.H. Boehringer technology called for, among other things, reducing the temperature of the reactor (autoclave) to a maximum of 175 degrees centigrade; no more than 20 atmospheres (hereinafter "atms") of pressure in the reactor; rinsing salt deposits from the reactor after each use; cessation of the introduction of sodium hydroxide if the temperature or pressure in the reactor went above the maximum; distillation of methanol under heat and 5 atms until temperature at head has risen to 88-90 degrees centigrade with a cessation of distillation when trichloroanisole appears; maximum temperature of 115 degrees centigrade in the sump phase to prevent excess water evaporation from the phenolate solution; addition of water before driving off the trichloroanisole solution (primary carrier of dioxin) by steam.

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There can be no doubt that Dow was familiar with risk reduction techniques of a detection and manufacturing nature and the Dow had total discretion in the decision of whether to employ those techniques.

The military placed no restrictions on the defendants with respect to their manufacturing processes. Dow had clear discretion in the choice of processes to use. Dow well understood that the process used determined the amount of dioxin in the 2,4,5-T. Dr. B.B. Holder, Medical Director, Medical Department of Dow admitted:

In 1964 at the trichlorophenol production area a process alteration was made changing the temperature and pressure levels previously used. It was well understood by all involved that we had to be extremely careful in process changes to prevent the formation of excessive chlorinated dioxins and similar toxic compounds.

Dow was fully aware of process alternatives. In fact, to lower the dioxin contamination of its 2,4,5-TCP and 2,4,5-T, Dow purchased, in 1965, parts of a 2,4,5-TCP process from C.H. Boehringer. Dow had absolute freedom to do so. Dow was so concerned about end product contamination that on May 4, 1965, it established a specification requiring a gas liquid chromatographic analysis of all 2,4,5-T leaving the plant. Had the military known that different temperatures, pressures, alcohols, and phenolate water content resulted in different levels of dioxin contamination, there can be no doubt, the military would have required the safest method.

Nothing speaks more clearly to the effect of different processes on the level of dioxin contamination and to defendants' knowledge on that subject than the following excerpt from an internal document:

Chlorophenol and derivatives producers are Dow, Monsanto, Hercules, Diamond and Hooker. Dow and Hooker isolate and distill the trichlorophenol prior to sales and use, and analyses of samples of their sales products show no exciter present. It is suspected that Hercules also distills the trichlorophenol as samples of their 2,4,5-T acid shows no exciter. Diamond and Monsanto do not isolate the trichlorophenol to purify it, but make all derivatives from the sodium salt. Analysis of Monsanto's 2,4,5-T acid shows 3 - 8 ppm. exciter, and analyses of Diamond's sodiumtrichlorophenate shows 8 - 24 ppm. exciter.

Clearly, different manufacturing processes resulted in different levels of dioxin contamination and Dow and the other defendants were clearly aware of that fact. Of equal clarity is the fact that the military was ignorant of this matter. The evidence indicates that the military did not know independently and was not informed by the defendants of the relationship between process selected and level of dioxin.

A particularly irrational instance of "cover up" was in the defendants' withholding from the government of the technology necessary to analyze the products and to detect its deadly impurities. The Air Force was working on a method of analysis, gas chromatography which it hoped would prove more effective than the army's infrared spectrography, analysis and preliminary tests looked promising. The government was well behind the defendants in developing this technology, however.

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In a Hercules memorandum marked "confidential" and dated September 5, 1967, from M.A. Taves, Synthetic Research Division, to Mr. J.M. Eagan, Synthetic Department, the government procedure (infrared) was described as "very tedious" and possibly was inaccurate. The report states that "they apparently are not aware of the components which we knew to be present." The memorandum conjectures that the government would probably be receptive to adopting Hercules' analytical method, but Taves cautioned, "we must carefully compare both methods because it is possible that their method may be giving beneficially higher analysis, particularly on 2,4-D, than our own method."

During the years that the defendants supplied contaminated herbicides to the military, Dow was not the only defendant possessed of expertise as to dioxin hazards and means of risk reduction. While their expertise may have varied in depth and time acquired, each of the defendants failed to warn the military of what defendant knew about its and other defendants' products and sooner or later became a party to the conspiracy to conceal or misrepresent the matters which the military needed to know in order to make informed choices and decisions as to herbicide procurement.

We turn next to an historical review of the conduct of the other defendants.

D. DEFENDANT MONSANTO'S KNOWLEDGE ABOUT
MANUFACTURING PROCESS, DIOXIN AS
CONTAMINANT, DETECTION METHODS, RISK
REDUCTION METHODS, AND HEALTH HAZARDS
ASSOCIATED WITH EXPOSURE TO DIOXIN

Perhaps the most malevolent participant in the Chemical Company conspiracy to withhold from the Government and the general public the toxic effects of the dioxin content in their 2,4,5-T is the Monsanto Chemical Company.

It was in 1949, at their Nitro, West Virginia plant that Monsanto was first alerted to the existence of a contaminant present in their 2,4,5-T process. As a result of the "process upset", (Monsanto's term), workers participating in the refinement of sodium trichlorophenol (the precursor of 2,4,5-T) were exposed

to the product. Ultimately, more than 200 workers in the 2,4,5-T department began to develop manifestations of toxic exposure.

Multiple workers' compensation claims were filed in which there were made acute complaints of liver damage, peripheral neuropathy, chloracne and severe systemic effects.

Monsanto's extensive knowledge of the health problems associated with 2,4,5-T exposure is further illustrated by the communication from Elmer Wheeler, a key Monsanto employee, in which he discussed an incident at Badische, the German manufacturer of 2,4,5-T. Referring to a November, 1953 process disruption similar to that of the Nitro incident four years before, Mr. Wheeler acknowledged that approximately 50-60 cases of Badische worker health problems occurred following the incident. Stated the Monsanto hygienist, not only did Badische 2,4,5-T workers show "horrible skin eruptions" but that "In addition to the skin manifestations, their men reported all the additional symptoms as experienced in our workers, i.e. fatigue, vertigo, loss of libido, painful joints, etc."

Through the 1950's Monsanto continued to be alerted to the problem of worker 2,4,5-T exposure. A 1955 confidential memorandum acknowledged widespread employee toxic reaction. It stated, "You also know that the 2,4,5-T problem has not been solved and chloracne remained as the outstanding problem of the Nitro plant in dealing with hourly personnel". (Exhibit 11).

Throughout the '50's, the worker illness problem in the 2,4,5-T plant became so acute that the workers refused to labor in that environment. Monsanto was required to pay an hourly bonus to those volunteer workers who did subject themselves to the health problems which were rampant in the 2,4,5-T factory. In the '60's as production increased, worker health problems became even more frightening. As a matter of fact, James Springgate, who became Plant Manager of Nitro in '64 was required, as part of his job, to review Monsanto worker health complaints and estimated that over 100 workers complained of chloracne during the period from '64 to '68. Significantly, the Plant Manager estimated that there were more 2,4,5-T Monsanto employees who complained of health problems in the period of '60 to '64 than the 100 he estimated in the next four years.

In 1964, Monsanto sent to Dow for analysis, Monsanto's 2,4,5-T. The dioxin content of the sample showed three to ten ppm's. (As high as this amount was, it was nowhere near the huge amount of toxic contamination of the Monsanto product that further analysis was about to reveal.). On the 24th day of February, 1965, the Medical Director, Kelly, spoke to his Dow counterpart, V.K. Rowe. Rowe acknowledged that Dow had 20 cases of chloracne and admitted that he was sure that dioxin was the cause. (Exhibit 11a). The Memorandum clearly reveals that Dow's motivation for its secret March meeting was hardly salutary; since Dow suggested a "crash meeting with all the producers" in

an attempt to eliminate the contamination before the "PHS got into the act." Of course, the Public Health Service couldn't get into the act unless they found out about the toxic contaminant, a discovery that the conspiring chemical companies mightily tried to avoid. It was only one month later that V.K. Rowe wrote the infamous March 19 secret communication to certain 2,4,5-T manufacturers in which he alluded to the dioxin content of 2,4,5-T as "certain highly toxic impurities". (Exhibit 2).

In February of 1965 Monsanto and Dow shared information concerning their mutual problems. By that time, it was known by both companies that dioxin was the contaminant in their product. Therefore, as supported by the sworn admission of Monsanto employees as well as the annexed documentary evidence, Monsanto knew:

- a) of the continuing acute health problems to which their 2,4,5-T employees had been subjected for the past 17 years,
- b) that other chemical companies, both here and abroad had similar pblems, and
- c) that the health problems to which Monsanto had personal knowledge not only included chloracne, but also involved:
 - 1. fatigue
 - 2. vertigo
 - 3. loss of libido
 - 4. painful joints

Monsanto's 2,4,5-T was enormously toxic. In a September 14, 1965 interdepartmental memo which was then filed in the "Confidential Folder," Monsanto admitted that "during April, 1965, production of TDD rose to an all-time high and remained much higher than its previous norm-current - 50 ppm normal - 10 ppm". (Exhibit 11b). That amount was 50 times greater than the one ppm dioxin which Dow claimed was safe (although plaintiff's evidence establishes that even 1 ppm is toxic).

Monsanto did not remove this acknowledged enormously toxic contaminant from its 2,4,5-T. In a confidential communication dated almost four years later, Monsanto acknowledged that their 1968 experience showed a content of 40 ppm and that even in 1969, their contamination ranged from 5 to 7 ppm. (Ex.11c).

So serious was the problem that in 1968, after the medical director was informed that there had been no new chloracne cases since October of the previous year, he responded to that information by asking, "I don't want to be cynical, but are there any employees in the department who don't have chloracne already?" (Ex.11d).

As was reported in the confidential Monsanto final report on 2,4,5-T terminating January of 1969:

"The incidence of chloracne has been almost universal among personnel engaged in the manufacture of 2,4,5-trichlorophenol (TCP) and 2,4,5-trichlorophenoxy-acetic acid (2,4,5-T). The most severe cases have occurred in individuals involved in the clean up of uncontrolled autoclave batches (hydrolysis of tetrachlorobenzene). However, cases of varying severity have occurred consistently among operators primarily employed around the 2,4,5-T work up equipment - filtration, acidification, drying, etc."

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Monsanto was able to isolate dioxin as the toxic ingredient when it first began to produce Agent Orange, and Monsanto knew for 20 years before 1969 that the 2,4,5-T that they produced contained toxic impurities that were clearly and dramatically hazardous to humans. Their knowledge emanated from their own personal experiences, from the reports of industrial problems from other chemical companies producing the same product and from confidential exchanges from the manufacturers.

There is no question that Dioxin was viewed by Monsanto and all other defendants as highly toxic. They knew that the dioxin contaminated 2,4,5-T sold by them to the Government was being mixed together and used in Vietnam. But Monsanto never informed any governmental officer with regard to the risks of dioxin contamination associated with Agent Orange or the methods of dioxin control; nor did Monsanto ever warn the Government with regard to the causal relationship between 2,4,5-T exposure and serious injury. In their Verified Answer to the Plaintiffs' Interrogatories, Monsanto has admitted that they were not responsible for, participated in, or familiar with any warnings to the United States Government with regard to the risks of dioxin contamination associated with Agent Orange, or with the methods of dioxin control.

R.Emmet Kelly, M.D., for many years the Director of the Monsanto Medical Department and the person whose responsibility it was to investigate and supervise Nitro workers' complaints, in his deposition, acknowledged the causal relationship between 2,4,5-T exposure and claims of peripheral neuropathy, nerve demyelination, chloracne, and even "the possibility of liver involvement".

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Thus, Monsanto's conduct clearly marks it as a prime participant with the other defendants in their efforts to conceal and misrepresent the hazards associated with the herbicides they were selling to the Government.

E. DEFENDANT DIAMOND SHAMROCK CORPORATION'S KNOWLEDGE ABOUT MANUFACTURING PROCESS DIOXIN AS CONTAMINANT, DETECTION METHODS, RISK REDUCTION METHODS AND HEALTH HAZARDS ASSOCIATED WITH EXPOSURE TO DIOXIN.

1. Documents submitted by Diamond Shamrock Corporation and testimony of the Defendant's own witnesses graphically demonstrate that there was an enormous amount of information exchanged relating to the contaminant involved herein, its manufacture, its means of analysis, methods of elimination, and last, and perhaps most importantly, knowledge by the defendants of the extent of contamination in the product sold to the government by Diamond.

2. The historical experience of Diamond Shamrock Corporation with 2,4,5-T is encapsulated in communication from Richard W. McBurney, M.D., dated March 27, 1963, addressed to Mr. Frank W. Jarvis, Vice-President of Diamond Shamrock Corporation, labeled Chloracne--Confidential. (Diamond Shamrock, Exhibit 12 This letter refers to a building of ancient vintage where 2,4,5-T acid processing actually takes place and advises that it is in this building that the workers are easily contaminated by vapors in the air. Paragraph 4, page 1, admits:

"As long as this plant has been in operation, there has been a chronic problem in the employees hired--of a condition referred to as chloracne."

At one time, approximately 40 of the 72 workers in the plant were affected by chloracne. Paragraph 5 of page 1 states, "It is my impression and the impression of the management (Newark plant), that these byproducts are those of a chlorinated ether and are a result of the reaction of caustic soda on 1,2,4,5-tetrachloro benzene as used in the making of the 2,4,5-T."

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3. This concern expressed by Dr. McBurney, however, does not begin and end with the problem of chloracne in the production workers. Rather, as may be seen on page 2 of his letter, there was a growing concern about a medical condition known as porphyria cutanea tarda. This is a disease of the blood forming elements of the body in which the hemoglobin of the red blood cells is broken down and, essentially, the spleen, liver, and kidneys are effected to a greater or lesser extent, depending upon the ingestion of such a chlorinated benzene. One of the physicians working on behalf of Diamond Shamrock at the Newark plant, Dr. Bleiberg, conducted a test on four men who had suffered the longest from chloracne only to find that two of these men had positive porphyn reactions in their urine.

4. Eugene Bak in the mid 1960's became production manager of the Diamond Shamrock Newark plant (page 27, lines 17-25). Bak testified at his deposition on January 27, 1983 that he was advised of health problems with the workers in the Newark plant when he first came to Newark and reported to Francis Kennedy, Plant Manager (page 39, lines 16-23; page 21, lines 2-10). He testified that he felt chloracne was a serious health problem when he became production manager (page 40, lines 19-23). He admitted that certainly half the workers in Acid and T-Ester Building were effected by chloracne (page 59, lines 11-25; page 60, lines 1-17). He conceded that the management suspected that the health hazard also included porphyria among the workers at Newark and that there was some positive findings in the urine specimens of these workers (page 66, lines 10-25; page 67, lines 1-25; page 68, lines 1-3). He testified that chloracne and liver problems existed in the Newark plant and he was concerned about it (page 68, lines 4-23). The plant manager for Diamond Shamrock at Newark considered chloracne to be a serious health problem while functioning in that capacity (Deposition of Francis Kennedy, page 48, lines 16-24; page 50, lines 3-8). Mr. Bak admitted that the same products were sold to the public that were suspected to cause chloracne in workers (page 74, lines 15-25; page 75, lines 1-4).

5. Mr. Bak also admitted that these same products were sent overseas as Agent Orange (page 75, lines 5-9). Given the admitted knowledge of Diamond Shamrock's production manager, it is shocking to consider the complete lack of disclosure to the Government of the information possessed by Diamond Shamrock (page 105, line 2): 11461

"Q: At any time during those years 1965 through 1968, did you personally ever advise the United States Army of the contaminant in the TCP process stream?"

A: I have not personally.

Q: Did anyone to your personal knowledge on the part of Diamond Shamrock ever advise the Army of that?

A: I don't know."

6. Having established the existence of and knowledge of health hazards, not only in the production stages of the product, but in the final product itself, consider the interchange of this information between Diamond Shamrock and the other defendants in this law suit. The deposition testimony of Edward Lee Chandler, taken on February 8, 1983, indicates that in 1957, Chandler became manager of the technical service department of Diamond Shamrock which was a liaison between the technical development of products and the sales of same. (pg. 30, lines 19-25; pg. 31, lines 1-2). Diamond Shamrock Exhibit 13 is an interoffice memorandum addressed to Mr. R. A. Guidi, dated ~~July~~ July 9, 1962, from Mr. Edward Lee Chandler. At that time, Mr. Guidi was the manager of the Newark plant. The letter clearly illustrates Diamond Shamrock's concern with the loss of two sizeable customers, Riverdale Chemical and Quaker City Tree, both of whom complained of chloracne problems with the use of the final products sold to them by Diamond Shamrock. The dermatological problem was so severe to the employees of these companies that Diamond lost them as customers.

Diamond's knowledge of the health hazards associated with the use of its products was unquestionably established by a serious outbreak of chloracne among users of their 2,4-D and 2,4,5-T in Columbia, South America. This problem was described by Lex Creamer, Diamond's representative, who forwarded a report to Diamond's New York office on March 18, 1965 (Exhibit 13a). As his report indicates, in one area alone twenty people were affected with most of them being hospitalized for months. He also indicated that the horses were badly affected with loss of hair, skin lesions and in one case death.

7. Considering Diamond Shamrock's concern over the loss of customers because of health hazards and the use of their esters, it is not surprising that we see Francis Kennedy and Edward Lee Chandler on a list of invitees to the now infamous Dow-Midland Conference of March 24, 1965, by letter from V.K. Rowe of Dow Chemical dated March 19, 1965. In that invitation Rowe directly addresses the toxicological problems caused by the presence of certain highly toxic impurities in certain samples of 2,4,5-T. He does not confine these problems to any single company but rather admits that the problem was industry-wide and that the

purpose of the meeting itself was to deal with the toxicological and analytical aspects of this problem. It is indisputable that as of that date, Dow had possessed a method of analysis which it was willing to share with the invitees throughout the industry, but not with the military. Dr. Chandler never denied receiving this letter from Rowe, or in fact speaking to Rowe prior to his attendance at the meeting. He readily admitted attending this meeting. He did, however, deny any accurate recollection of what took place at the meeting in Midland (Chandler deposition, p. 96). In interoffice correspondence from E.L. Chandler to John Cort, Jr. dated March 25, 1965 with carbon copies to Francis R. Kennedy, Manager of the Newark Plant, and others (Exhibit 14), it is obvious first, that Dow Chemical was sharing with the rest of the industry the severe health hazards; secondly, Dow advised the industry that they had identified the causative agent as dioxin; thirdly, Dow had developed a new analytical method with a sensitivity level of 1 ppm; fourthly, Dow advised the industry of its intention to set a limit at that time of 1 ppm dioxin on this material; fifthly, Chandler admits that Dow had analyzed materials from other companies including Diamond Shamrock and found amounts as high as 10 ppm of dioxin in the 2,4,5-T acid. The last paragraph in this exhibit reconfirms the purpose, industry-wide, of the Midland meeting of March 24, 1965, where Mr. Chandler concludes "the purpose of this meeting was designed to help us solve this problem before outsiders confuse the issue and cause us no end of grief. Dow is sending the test results of our material to us incidentally and this will further check our techniques, etc." Having considered the

universality of the health problem of 2,4,5-T esters and the need throughout the industry to cooperate to some extent to alleviate this problem, what steps if any, did Diamond Shamrock take to eliminate the contaminant dioxin from the T ester which comprised half of the Agent Orange product? Kennedy returned to the Newark Plant after attending the Dow conference at Midland on March 24, 1965 with the knowledge that there was a problem involving dioxin that had to be solved (Kennedy deposition, p. 135, line 1-17)

8. The dioxin contamination of Diamond's herbicides caused it to lose customers, in particular, Dow.

On April 6, 1966 the following memorandum was sent from J.C. Kelly, Diamond's sales shipping coordinator in Division headquarters of its Ag-Chem Division in Cleveland, to J.O. King, sales manager in that division, regarding Dow's refusal to purchase Diamond's production:

April 6, 1966

"Mr. J.O. King

Mr. J.C. Kelly

Dow Chemical Company

On March 21, we directed a sample of our Technical 2,4,5-T Acid to subject account. In talking with Ken Hanson on April 4, he advised that they would not be in a market for our material. Apparently, they feel that our material could conceivably re-create a chlor-acne problem at Midland and, as such,

would not entertain the purchase of our present production.

J. C. KELLY

JCK/im

cc. Mr. F.R. Kennedy - Newark

Mr. R.A. Guidi"

9. There is no doubt that Diamond had considerable knowledge of dioxin risk reduction techniques. An interim report, January 9, 1967 of experimental work for TCP purification, reveals their awareness of Dow's studies regarding identification of the compounds causing chloracne and analytical procedures used to quantitatively identify the dioxin contamination. Diamond also knew what needed to be done to eliminate or reduce dioxin, and that this could be accomplished in several ways including alteration of the TCP condensation reaction or utilizing engineering techniques to remove dioxin from process streams after they have been reduced.

10. It is significant that from the time Dow gave Diamond Shamrock the means of analyzing its product in March of 1965, it was not until September of 1967 that a purification column was installed on the production floor and put into use. Despite such installation, and perhaps most significantly, by Diamond Shamrock's own analysis from January to March of 1968, it was running 3.8 ppm dioxin and related compounds in its 2,4,5-TCP. In October through December

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1968, it ran 9 ppm. Nevertheless, production continued, and the product was sold to the government. In the affidavit of Francis R. Kennedy, sworn to March 27, 1980, he speaks eloquently of the government's need for Agent Orange, but is absolutely silent on Diamond Shamrock's need for purification of a contaminated product that it knew that it was selling to the government without disclosure of the contamination problems. What effect, if any, did the performance of Diamond Shamrock corporation have on the defendants? Did the concern expressed by Dow in the Midland meeting in March of 1965 terminate its concern regarding the contaminant which it knew at that time was industry wide? Or in fact did the purported concern for this serious health problem continue among the various defendants well beyond the Dow conference? An answer to that can clearly be seen in a confidential memorandum of J.P. Frawley, dated July 12, 1965, of the Hercules Powder Company which relates to a telephone conversation dated July 9, 1965 with Mr. Earl Farnhan of Dow Chemical Company .

Mr. Farnhan was convinced that no one else in the industry had done anything to remove the contaminant from their 2,4,5-T. Mr. Farnhan further stated that Dow was extremely frightened that this situation might explode. Mr. Frawley quotes Mr. Farnhan as stating that Dow "aware that their competitors are marketing 2,4,5-T which contains alarming amounts of acnegen and that if the government learns of this the whole industry will suffer. They are particularly fearful of a congressional investigation and excessive restrictive legislation on the manufacture of pesticides which might result."

Obviously, it was not the intention of Hercules, Dow and others to disclose a problem of health to its customer, the United States Government, but rather to try and induce the industry at large to "clean-up" ("cover-up?") its product before the government found out about the health hazard. It is hard to conceive of greater evidence of the conspiracy of silence where, as here, the industry admittedly knew of a serious health problem, unknown to the government, than Mr. Farnhan's own words of precaution that Dow is fearful if the government learned of the alarming amounts of acnegen, the entire industry would suffer.

F. T.H. Agriculture and Nutrition Company, Inc.
Knew About Dioxin as a Contaminant in 2,4,5-T
and Knew About Concomitant Health Hazards and
Failed to Warn the Military.

Much of what is known about the defendant T.H. Agriculture and Nutrition Company, Inc., formerly known as Thompson-Hayward Chemical Company, Inc., (hereafter "T.H.") is the result of a deposition of Edwin T. Upton and a review of T.H.'s produced documents. Mr. Upton was deposed on April 7 and 8, 1983 and T.H. produced documents totaling approximately 18,000 pages. Counsel for T.H. represented to counsel for plaintiffs that no confidential or proprietary documents were withheld. Mr. Upton's deposition, in conjunction with the documents, clearly shows that T.H. knew about dioxin in its end product (hereafter variously 2,4,5-T, 2,4,5-T ester and isooctyl ester 2,4,5-trichlorophenoxyacetic acetate) and knew about concomitant health hazards. Mr. Upton's deposition and T.H.'s documents further establish that neither Mr. Upton nor anyone at T.H. warned the military. -40-

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Edwin T. Upton first worked for T.H. on a full-time basis as a chemist beginning in 1946. (Upton Tr. at 27.) From Chemist, Mr. Upton progressed to Chief of the Quality Control Laboratory, Chief Chemist, and finally Laboratory Administrator. Id. at 27, 44. From 1946 to 1947 Mr. Upton worked on formulating usable forms of 2,4,5-T. Id. at 29. In experimenting with formulations, Mr. Upton made an informal literature search resulting in a paper which was presented at a regional American Chemical Society meeting in 1946 or 1947. Id. at 29. In preparing that paper he reviewed a number of patents on the use of phenoxy herbicides. Id. at 30. Those patents were reviewed prior to 1955. Id. at 31. In 1946 or 1947, Mr. Upton developed for T.H., a successful formulation of 2,4,5-T. Id. at 32-33. Between 1946 and 1947, Mr. Upton also worked on products containing a mixture of 2,4,5-T and 2,4-D. Id. at 35.

Through Mr. Upton's efforts, T.H. developed, in the early '50's, a herbicide which was a 50/50 mixture of 2,4-D and 2,4,5-T. That product was called DED WEED 50-50 BRUSH KIL. (Upton Tr. at 36). T.H. also manufactured 3-3 BRUSH KIL. That product was a 50/50 mixture of 2,4,5-T and 2,4-D. (Upton at 41).

T.H. established specifications for 2,4,5-T. Id. at 49. Those specifications were established in the late '40s. Id. Beginning in 1950 or 1951, T.H. began manufacturing 2,4,5-T according to those specifications. Id. at 51. 2,4,5-T was manufactured from approximately 1950 to some time before 1960 at a plant in Kansas City, Kansas. Some time after 1960, a new plant was opened in Turner, Kansas. In manufacturing the end product, isooctyl 2,4,5-trichlorophenoxyacetic acetate, T.H. began with trichlorophenol purchased from the Dow Chemical Company. The 2,4,5-trichlorophenol was converted to sodium 2,4,5-trichlorophenate. In a separate process, monochloroacetic acid was esterified with isooctyl alcohol to make isooctyl monochloroacetate. The two intermediates, sodium 2,4,5-trichlorophenate and isooctyl monochloroacetate were coupled to make the end product, isooctyl 2,4,5-trichlorophenoxyacetic acetate. Id. at 76.

From 1947 when he was a chemist until 1974 when he was the Laboratory Administrator, Mr. Upton remained responsible in a "hands on" or supervisory capacity for the analytical testing of raw materials, intermediaries and finished products. Id. at 44, 81. From 1947 to approximately 1965, T.H. utilized the official Agricultural Chemist Association method (Parr Bomb) for determining gross amounts of chlorine in the 2,4,5-T. Upton Tr. at 82. Beginning in 1964 or '65, T.H. began using an infrared spectrometer for determining the gross composition of its 2,4,5-T. Id. at 84. The infrared spectrometer continued to be used until Mr. Upton left T.H. in 1974. Id. at 85. In 1962 or 1963, T.H. obtained a gas chromatograph. Id. at 87.

From 1963 when T.H. obtained its gas chromatograph until the middle of 1964 that gas chromatograph was not used to determine impurities in 2,4,5-T. Id. at 88,89. From 1963 until the middle of 1964, T.H.'s gas chromatograph was not utilized to determine the amount of inert ingredients in the 2,4,5-T being manufactured by T.H. Id. at 89, 90.

On December 3, 1964, Dr. David Groth of the Regional Health Reserach and Training Facility in Cincinnati, Ohio, wrote to Mr. Upton. In that letter, Dr. Groth indicated that he was interested in the "determination of the toxic compound present in the commercially available 2,4,5-trichlorophenoxyacetic acid which is sold as the iso-octyl ester." David Groth further indicated that Kimmig and Schultz had published a paper "which gave evidence that the skin and liver toxicity were not (emphasis in original) due to the 2,4,5-trichlorophenoxyacetic acid, but probably from some by-product which is present in very small quantities." From his reading of Kimmig and Schultz, Dr. Groth stated that he thought to be the responsible compound and drew a schematic of that compound. Of greatest importance, he noted as a result of his lack of knowledge, "however, there is no conclusive evidence that this, or any other specific compound, is responsible since no one has yet separated the various compounds present in commercial 2,4,5-T." Apparently, in the hope of being able to separate those compounds, David Groth requested E. T. Upton of T.H. to send him samples of isooctyl ester 2,4,5-T manufactured by T.H.

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After letters and conversations with employees of the Dow Chemical Company - which were the direct result of David Groth's letter - E.T. Upton sent samples of T.H.'s 2,4,5-T and Dow's trichlorophenol to David Groth. In a letter of January 14, 1965 which accompanied the T.H. samples, Mr. Upton wrote "we would appreciate very much receiving a copy of your analytical method, which I assume is based on gas chromatography for determining the 2,3,7,8-tetrachlorodibenzo-p-dioxin."

Apparently, Mr. Upton was aware that gas chromatography could be utilized to determine the existence of 2,3,7,8-tetrachlorodibenzo-p-dioxin in the 2,4,5-T.

To assure himself that he would be advised if Dr. Groth discovered anything, Mr. Upton wrote a second letter dated February 17, 1965 in which he stated: "We are very much interested in your study of the toxicity of the by-products present in commercially available 2,4,5-trichlorophenoxyacetic acid esters. For our information, please send us a copy of your analytical method for the determination of the 2,3,7,8-tetrachlorodibenzo-p-dioxin in technical 2,4,5-T esters." See, Exhibit 4 (emphasis added).

Unfortunately, David Groth was never able to determine that, in fact, 2,3,7,8-tetrachlorodibenzo-p-dioxin was the substance in commercially available 2,4,5-T causing liver damage and chloracne. As explained by David Groth in his letter to Mr. Upton of February 26, 1965:

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I had hoped by this time I would have been able to give you some results on our technique. However, due to a shortage of funds we have not yet purchased the thin-layer chromatography apparatus that we plan on using for the separation.

In previous correspondence I mentioned some articles which referred to the toxicity of 2,4,5 trichlorophenoxyacetic acid and possible toxic contaminants. The principal (sic) article is by Kimmig in Dermatologica 115:540-546. 1957. So far, that is the present state of our knowledge on the subject.

Like Kimmig and Schultz in 1957, David Groth was only able to speculate that 2,3,7,8-tetrachlorodibenzo-p-dioxin was the possible toxic contaminant. However, Mr. Upton, others at T.H. and others at Dow Chemical Company were keenly aware that David Groth was groping for answers to a serious industrial and end user health problem. Representatives of Dow, T.H. and of the other defendant chemical companies had the answers Dr. Groth was seeking. Those answers were never provided to him.

Mr. Upton never wrote to Dr. Groth after David Groth's letter of February 26, 1965. Mr. Upton never informed Dr. Groth of information Mr. Upton had concerning 2,3,7,8-tetrachlorodibenzo-p-dioxin, its relationship to 2,4,5-T and intermediaries, and analytical techniques for determining the presence of dioxin. Upton Tr. 225, 226. While David Groth was never able to determine whether dioxin was a contaminant in 2,4,5-T, the same cannot be said for Mr. Upton and others at T.H.

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David Groth's initial letter of December 3, 1964 was the catalyst for a number of events. After receiving David Groth's letter, Mr. Upton discussed the contents of that letter with Lindley S. DeAtley, Vice-President of Research and Development for T.H. ~~Upton~~ Tr. 102. Within a matter of days, Mr. DeAtley wrote a letter dated, December 11, 1964 to Dr. R.C. Dosser, Laboratory ~~Director~~ for the Dow Chemical Company. In that letter, Mr. DeAtley stated: "As we have corresponded and talked about the purity of trichlorophenol and related compounds on several occasions, I thought you would be interested in the attached letter of December 3, from Dr. David H. Groth of the Public Health Service." (Emphasis added.) When Mr. Dosser failed to respond, Mr. DeAtley wrote another letter of December 28, 1964 stating: "... we feel we must reply to the letter of December 3 from David H. Groth ..." (Emphasis added).

Mr. DeAtley never received a written response from Dow. Rather, Dr. R.C. Dosser of Dow called Mr. DeAtley on January 12, 1965 and "pointed out" that:

"[I]f a compound, found in 2,4,5-T acid or its esters, proved to be damaging that this might lead to a flurry of successful claims by users of the herbicide who allegedly had been injured by it. Also, he said that although he did not know our method of processing Dow's tricholophenol, his chemist suspected that by some procedures, the toxic compound might be formed in processing through the sodium salt of the phenol to the sodium salt of the acid.

Dr. Dosser, of Dow, was clearly aware of alleged "user" injuries. T.H. was advised of those end user injuries at this time, if it did not have previous knowledge. Dr. Dosser, of Dow, also informed Mr. DeAtley of T.H., that Dow had developed an analytical technique for detecting dioxin and had been utilizing animal tests (the rabbit ear test) which had a sensitivity of about one part per million. Id. None of this information was conveyed to Dr. Groth at the Public Health Service though he had clearly expressed his interest. Upton Tr. 225, 226. Representatives of Dow and the representatives of T.H. were well aware of his interest.

When Mr. Upton responded to David Groth's letter on January 14, 1965-two or more days after Dosser's conversation with DeAtley - Mr. Upton failed to inform Dr. Groth of the information provided by Dr. Dosser, of Dow, to Mr. DeAtley, of T.H. Upton Tr. 225, 226. As noted earlier, Dr. Groth wrote to Mr. Upton on the 26th of February, 1965 and advised him that due to budgetary constraints, Dr. Groth would not be able to pursue his research. Upon receiving Dr. Groth's letter, E.T. Upton or others at T.H. clearly could and should have imparted to Dr. Groth all of the information they independently possessed and learned from the Dow Chemical Company.

The information which should have been imparted to Dr. Groth and T.H.'s ability to impart that information are clear.

In addition to information provided by Dr. Dosser, of Dow T.H. obtained information from the meeting at Dow. On February 19, 1965, Mr. DeAtley and D.W. Fuhlhage, T.H.'s Supervisor for Process Development, visited Dow headquarters in Midland, Michigan.

Present at that meeting were the following Dow representatives: J.C. Tucker, Product Sales Manager; Mr. Harold Gill, Chromatography Laboratory; Mr. Larry Silverstein, Biochemical Research; and Mr. Harold Hoyle, Biochemical Research.

From minutes made by Mr. DeAtley of the February 19, 1965 meeting, it appears clear that Dow informed representatives of T.H. that Dow had experienced cases of chloracne prior to

December, 1964. At that meeting, Dow's representatives indicated that dioxin was systemic and generally taken into the body by physical contact.

Dow's people noted that they had taken elaborate precautions without consideration of cost to eliminate the health hazard to workers.

Dow's representatives stated that such precautions appeared necessary, in light of the "biological activity which sometimes exceeded expectations" upon conducting tests.

Additionally, it was reported by Dr. Silverstein, of Dow, that lower levels of dioxin when repeatedly applied, even though totaling much less applied material than a single application, could produce extreme reactions.

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As a result of the February 19, 1965 meeting, Dr. Charles E. Lewis, who worked for T.H. as its Industrial Hygiene Advisor, visited Dow. In his alleged Report on the Chloracne Problem, Dr. Lewis noted:

Because of the past experience at Thompson-Hayward it would seem that two general approaches need to be made to the problem. First, because of the use of some material which was probably heavily contaminated with dioxin and other C.A. (chloracne) producing agents, it would seem important to sample (using the wipe sample method) the environment of the synthesis area to make sure that there is no residual contamination with these agents....It would seem highly desirable to go to the use of coveralls and showers as mandatory, as well as monthly inspection of these individuals for skin lesions and on an occasional, perhaps 2 to 3 months, check on blood tests for their liver function.

In discussing this with Mr. Rowe (Chief Toxicologist at Dow) it was also thought that it might be wise to do an occasional sample of the final product of the operation here with V.P.C. (believed to stand for Vapor Chromatography) for dioxin and maybe(?) occasional rabbit test.

(emphasis added except the last; parentheticals added except the last). If the cover letter is an indication, Dr. Lewis' alleged report was written prior to April 26, 1965. Dow and T.H. were clearly concerned about end product contamination and hazards to users.

By February 19, 1965, and certainly by April 26, 1965 T.H. had a store of information concerning dioxin and analytical methodology. Nonetheless, neither E.T. Upton nor any other

representative of Thompson-Hayward Chemical Company wrote to Dr. Groth after his letter of February 26, 1965 in which he indicated an inability to obtain answers to his questions. Upton Tr. 225, 226.

G. The Military Was Uninformed of T.H.'s
Manufacturing Process And Its Capability
For Risk Reduction.

In his first letter to Mr. Upton, Dr. Groth requested "any information you can give us concerning the manufacturing process, ie. starting compounds, reactions and possible by-products." In responding to Dr. Groth's request, Mr. Upton directed Dr. Groth to open literature on 2,4-D manufacturing processes. Mr. Upton did not direct Dr. Groth to open literature on 2,4,5-T manufacturing processes. The inference of conspiratorial silence again arises. In addition, Mr. Upton was undoubtedly reluctant to divulge trade secrets. When Dr. Dosser of Dow requested information on T.H.'s manufacturing process, T.H. again was willing only to direct the inquirer to published literature. From the published literature, neither Dow nor the military could have known T.H.'s manufacturing process.

The military's lack of knowledge as to the manufacturing process is important because "the type of manufacturing process used affected the level of dioxin contamination and that by exercising discretion as to the process, the defendants

controlled the extent of the dioxin hazard." See, In Re Agent Orange, 534 F.Supp. 1046, 1957 (E.D.N.Y., 1982).

By admission, some of the material used in the manufacture of T.H.'s 2,4,5-T was "heavily contaminated" in the mid-'60s.

According to Mr. Upton, by 1970 or '71 tests of T.H.'s 2,4,5-T esters showed a lower level of contamination of up to two parts per million (hereafter "ppm"). Upton Tr. at 143. Samples taken from excess stocks of T.H.'s "Agent Orange" in 1973 from an inventory at Gulfport, Mississippi may belie those low 1970 or '71 figures.

The Gulfport samples showed a contamination level of from 0.7 to 4.1 ppm. Unfortunately, the date upon which T.H. manufactured the Agent Orange samples taken at Gulfport has not yet been determined. From the rate at which Agent Orange was being used, however, the Agent Orange sampled was probably manufactured by T.H. in the late '60s or early '70s.

From the mid-'60s when T.H.'s isooctyl ester 2,4,5-trichlorophenoxyacetic acetate was "heavily contaminated" to the late '60s or early '70s when T.H.'s Agent Orange contained lower but still hazardous levels of up to (and perhaps higher than) 4.1 ppm, Gene Douglas, a T.H. chemist under Mr. Upton, attempted to discover where dioxin was being produced in T.H.'s plant and to remove the dioxin with activated carbon.

Whether an activated carbon clean up process was instituted and the levels of dioxin in this herbicide during 1960-1969, will only be known after plaintiffs have had the opportunity to complete their discovery of T.H..

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In addition to looking at an activated carbon clean up process, Gene Douglas conducted experiments in 1967 to determine the relationship between pressure/temperature and the production and amount of dioxin. From those experiments, Mr. Douglas clearly learned that over a certain temperature, dioxin formed and that the higher the temperature the more dioxin was produced.^{7/} With that knowledge, Gene Douglas would have been remiss if he had not suggested that the sodium trichlorophenate be dried at a lower temperature. He might also have suggested that the wet ester be dried at a lower temperature and that the excess unreacted phenol be driven off with steam instead of heat. Whether those suggestions were made and implemented will also not be known until plaintiffs complete their discovery.

Clearly, T.H. knew of methods for reducing the level of dioxin in its end product. T.H. also knew from 1965 and perhaps before 1965 of the dangerousness of dioxin and T.H. knew that the level of hazard increased with the level of dioxin. There has been no proof, on the other hand, that the military knew about T.H.'s original manufacturing process. There has been no proof that the military experimented with a pressure/temperature dioxin relationship. There has been no proof that the military experimented with an activated carbon clean up process. Nor has there been any proof by T.H. any of the defendants that the military was told about the foregoing.

7/ Whenever production is increased it is usually done by increasing the temperature of the synthesis run." The higher temperature resulted in increased dioxin in the waste and in the end product.

Finally, neither T.H. nor the other defendants has put in any proof that "the government had knowledge equal to theirs (about the above discussed risk reducing techniques) and that even with that knowledge the government imposed no requirement or restriction with respect to the manufacturing process or the level of dioxin contamination." The evidence points instead to T.H.'s failure to disclose these techniques to the military, just as it failed to warn them of the hazards associated with the dioxin contaminated herbicides it was selling to the Government.

H. T.H. Knew of Means For Detecting Dioxin
And Failed To Disclose Those Methods to
the Military.

T.H. clearly learned from the Dow Chemical Company (if they did not already know) how to use gas chromatography for the detection of dioxin in trichlorophenol, sodium trichlorophenate and later 2,4,5-trichlorophenoxyacetic acetate. From discussions with H. Gill of Dow, Mr. DeAtley and Mr. Fuhlhage clearly knew about the use of gas chromatography for detecting dioxin. Mr. DeAtley and Mr. Fuhlhage learned about Dow's detection method prior to February 23, 1965. T.H. never informed Dr. Groth of their knowledge concerning the use of gas chromatography even after Dr. Groth's letter of February 26, 1965 wherein he alerted T.H. that he had not been able to purchase a gas chromatograph and devise a method for separating the compounds. Whether or not T.H. and the other defendants had a duty to test their

products using gas chromatography, they had a clear duty to advise the military of its availability.^{8/}

Use of a gas chromatograph to identify dioxin and determine the levels of contamination is a risk reduction technique. Knowledge of gas chromatography (and the rabbit ear test) before and after 1965 is important. Under the contracts for the procurement of "Agent Orange," the defendant chemical companies were required to utilize the Parr Bomb method and when it became available, mass spectrometry. Upton Tr. 222. Neither of these methods is capable of detecting trace amounts of impurities. Neither of those methods can detect dioxins. Id. at 223,224.

A government inspector was frequently present when T.H. conducted its Parr Bomb and later, mass spectrometry tests. Though present, that inspector could not learn about the presence of dioxin in the 2,4,5-T esters through either the Parr Bomb or mass spectrometry tests. T.H. and the other defendants in similar situations had a clear duty to divulge to those government inspectors the availability of a better method for the detection of dioxin and determination of levels of contamination. That did not occur in T.H.'s case.

During Mr. Upton's deposition, he stated that during the testing of the final 2,4,5-T product, a Mr. Block, who he believed to be a government inspector, was present. Upton Tr.

^{8/} Defendants also had a duty to tell the military about the rabbit ear test which had been in existence since at least 1941 for detecting acnegens to 1 ppm.

at 221. The test method employed was the Parr Bomb. Gas chromatography was not utilized. Though Mr. Block was present during numerous tests of the 2,4,5-T end product, Mr. Upton never told Mr. Block about gas chromatography or the existence of dioxin as a contaminant in 2,4,5-T. Upton at 224, 225. Nor is there any evidence that anyone at T.H. informed the military of gas chromatography as a method for detecting dioxin.

I. T.H.'s Participation In The Conspiracy

The evidence indicates that T.H. entered that conspiracy, as early as December 11, 1965 with Mr. DeAtley's letter to Dow, two years before T.H. produced its first Agent Orange for the military.

Dr. David Groth's letter of December 3, 1964

was the catalyst for a series of meetings and conversations between January and March of 1965 involving most of the defendants in this litigation on the subjects of dioxin and hazards to workers and end users.

T.H. clearly participated in those conversations and meetings. Out of those conversations and meetings came a conspiracy of silence.

Though Mr. Upton had the ability to inform Dr. Groth, of the Public Health Service, of dioxin, gas chromatography, risk reducing manufacturing procedures and health hazards associated with dioxin, he did not do so. Upton at 225, 226.

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Though Mr. Upton had the opportunity on numerous occasions to inform the government inspector, Mr. Block, of dioxin, its hazards and of availability of gas chromatography and alternative manufacturing processes, Mr. Upton did not do so. Id. at 224, 225. Furthermore, the Court should note that T.H. has not produced evidence indicating that anyone at T.H. informed the military of the foregoing. A conspiracy of silence reigned.

J. THOMPSON CHEMICAL WAS KNOWLEDGEABLE ABOUT
THE MANUFACTURING PROCESS, DIOXIN AS A
CONTAMINANT, DETECTION METHODS, RISK
REDUCTION METHODS, AND HEALTH HAZARDS
ASSOCIATED WITH EXPOSURE TO DIOXIN.

Thompson Chemical Company also had far more knowledge about the manufacturing process than military decision makers.

There can be no question that over numerous years as a manufacturer of TCP and 2,4,5-T, T.C. was fully aware of the manufacturing process for those compounds. T.C. knew that in the synthesis of tetrachlorobenzene to TCP, heat and pressure were utilized. T.C. knew that in the distillation of water, alcohol and anisole, heat was employed in the production of 2,4,5-T, the end product. T.C. was thoroughly familiar with the manufacturing process for 2,4,5-TCP and 2,4,5-T.

K. T.C. Knew That A Highly Toxic Impurity Was In Its
TCP and 2,4,5-T

As a manufacturer of TCP, T.C. may have been informed in 1956 by C.H. Boehringer Sohn that a TCP or 2,4,5-T process that used heat or pressure above a certain maximum resulted in a contamination of the TCP and 2,4,5-T with a highly toxic impurity.

C.H. Boehringer Sohn had experienced horrendous outbreaks of chloracne with liver damage in some cases in two separate plants. To assure that other manufacturers of TCP and 2,4,5-T did not experience similar incidences, C.H. Boehringer Sohn sent in 1957, "Information of the reaction conditions under which no chloracne results to all known producers of chlorophenol." Plaintiffs have established that The Dow Chemical Company, as a manufacturer of TCP, received such information from C.H. Boehringer Sohn. As a manufacturer of TCP (a chlorophenol), T.C. probably received the same information in 1957 from C.H. Boehringer Sohn, as to a toxic impurity arising under certain conditions in the manufacture of TCP and 2,4,5-T.

Dr. K.H. Schulz of the University Skin Clinic in Hamburg reported in "Die Naturwissenschaften" 44: 337-338(1957), what he believed to be the contaminant in the TCP and 2,4,5-T being manufactured by C.H. Boehringer Sohn. Had anyone at T.C. read that article, he or she would have been alerted to the possible presence of dioxin in T.C.'s 2,4,5-T and TCP. Though he did not start with T.C. until approximately 1965, Mr. M.S. Buckley may have read Dr. Schulz's article. Thompson Tr. p.43, 50.

Regardless of whether T.C. received information from Boehringer, or the Naturwissenschaften article, T.C. was undoubtedly aware a number of industrial exposure incidents in which workers manufacturing TCP and 2,4,5-T experienced chloracne, liver damage in some instances and maladies involving the nervous system. See, generally, tetrachlorodibenzo-para-dioxin in the Environment, Robert W. Baughman (unpublished dissertation for the Harvard Department of

Chemistry, 1975). An awareness of those incidents would have alerted T.C. to the presence of a highly toxic impurity in TCP and 2,4,5-T.

If T.C. had not learned of the existence of a highly toxic contaminant in TCP and 2,4,5-T through C.H. Boehringer Sohn, Dr. Schulz' article in 1957 or through knowledge of industrial worker exposures, T.C. clearly came to learn about dioxin from its own experiences with employee injury. Some time prior to February 3, 1967, employees at T.C. experienced cases of severe chloracne. For unexplained reason, Mr. M.S. Buckley of T.C. was sufficiently well informed to call The Dow Chemical Company to inquire of recommended treatment for the exposed. Mr. W.J. McCoy of Dow recorded in a memo to file his conversation with Mr. Buckley of T.C.:

Mr. M.S. Buckley of Thompson Chemical phoned Howard Sheldon February 2, indicating that he believed they have a severe chloracne problem with some of their employees. He indicated that they already have two men affected and believe that they may have two more employees that appear to be affected as well. They are using Hooker's tetrachlorobenzene to make their trichlorophenol.

Buckley was asking if Dow would have any recommendations for medical treatment for their employees.

Thompson Tr. 31. Thus, T.C. knew about dioxin as a contaminant in TCP and 2,4,5-T as early as 1956 and certainly no later than the end of 1966.

The military placed no restrictions on T.C. with respect to its manufacturing processes. T.C. had clear discretion in the choice of processes to use. See, Thompson, TR. 38. T.C. well understood that the process used determined the amount of dioxin in the 2,4,5-~~3~~. When M.E. Buckley of T.C. called Dow to discuss T.C.'s chloracne problem, Mr. Buckley "started talking about the chemistry of this material. Apparently, Mr. Buckley knew the chemical origins of dioxin and knowing that, knew that alternative manufacturing processes existed

T.C. was fully aware of process alternatives. T.C. had absolute freedom to select the manufacturing process. Had the military known that different temperatures, pressures, alcohols, and phenolate water content resulted in different levels of dioxin contamination, there can be no doubt, the military would have required the safest method.

As previously shown, different manufacturing processes resulted in different levels of dioxin contamination and while T.C. and the other defendants were clearly aware of that fact, the military was ignorant of this matter because T.C. did not warn the military of the relationship between process selected and level of dioxin. Thus, T.H. also was part of the conspiracy of silence to conceal from the military. The facts of presence of dioxin, associated health hazards, and risk reduction processes.

L. HERCULES INCORPORATED WAS KNOWLEDGEABLE
ABOUT THE MANUFACTURING PROCESS, DIOXIN
AS A CONTAMINANT, DETECTION METHODS, RISK
REDUCTION METHODS, AND HEALTH HAZARDS
ASSOCIATED WITH EXPOSURE TO DIOXIN.

Hercules sold the product known as "Agent Orange" to the military beginning sometime in July, 1965.

The "orange" was a mixture composed of equal volumes of 2,4-D and 2,4,5-T.

Sometime in February, 1965, Hercules learned from another defendant, Dow Chemical Company, that a previously identified acnegen (chloracnegen) was a contaminant in 2,4,5-T (Frawley dep. 35)

That beginning sometime in June, 1965, Hercules knew that the 2,4,5-T which it was selling to the military was contaminated with dioxin (Frawley depo. 24; 67).

Hercules learned from Dow in March, 1965 that the acnegen was dioxin (Frawley depo. 37), and that dioxin had the capacity to produce physiologic and systemic injury at a very low dosage (Frawley depo. 47).

Hercules knew that unless dioxin was removed from intermediates such as trichlorophenol it would carry through to the finished product. (Frawley depo. 65, 70).

Hercules produced dioxin contaminated herbicides which were ultimately sold to the military for use in Vietnam. Although the evidence as to the dioxin content of Hercules' herbicides is disputed by Hercules, it was sufficient to persuade this Court to recently reconsider and deny Hercules' Motion for Summary Judgment. The evidence included:

1. The Hercules internal memorandum (Ex.14a), reporting that Dow's sampling showed an excess of 2 ppm. dioxin in Hercules product as late as 1966;
2. The fact known to Hercules that Dow was purchasing Hercules' contaminated 2,4,5-T for sale to the military in order to fulfill Dow's contracts for delivery of Agent Orange;
3. The Gulfport, Mississippi sampling which revealed that 5 - 10% of the Hercules samples tested contained dioxin in the range of 14 - 16 parts per million;
4. Hercules knowledge since the 1950's of dioxin formation in its 2,4,5-T and 2,4-D manufacturing process;
5. Hercules knowledge of chloracne problems experienced by its plant employees during the period 1950 - 1959.

Hercules never informed any agency or department of Government, particularly the United States military to whom it sold "orange", that the product it was selling to the military was contaminated with dioxin.

That Hercules never disclosed to any agency, or any department of Government much less did it notify the military to whom it was selling the dioxin-contaminated "orange" the information it had obtained both from industry and independent sources concerning the toxic effects of exposure to dioxin and its potential hazard to human health including disfiguring skin diseases, liver damage and systemic diseases. (Frawley depo. 78-79; 87-88; 90-91; 93-94; 95; 104-107; 110-111; 113-114; 115; 130-133; 138).

Hercules processes for manufacturing 2,4,5-T were at all times proprietary. (Frawley depo. 71-72).

Hercules never disclosed the details of its manufacturing process to the military or to any agency of government at any of the times relevant to this litigation. (Frawley depo. 28).

II. DEFENDANTS' MISREPRESENTATIONS OF
THE SAFETY OF THEIR HERBICIDES TO
OTHER GOVERNMENT AGENCIES

Concurrently with their conspiracy of concealment and failure to warn the military, defendants also attempted to silence any criticism of dioxin contaminated 2,4,5-T and to obtain the United States Governments' approval of the contaminated herbicides which they were selling to the military. Defendants formed what came to be known as a "joint industry task force on phenoxy herbicide tolerances" whose sole purpose was to persuade the pesticide regulation division (PRD) of the United States Department of Agriculture (USDA) to declare various phenoxy herbicides, including 2,4,5-T, as toxicologically safe. The technical term used was "negligible residue tolerance."

On or about August 23, 1966, the Task Force held its first meeting at the Madison Hotel in Washington, D.C.

Members of the Task Force included representatives of Defendants Diamond-Shamrock, Hercules, Inc., Monsanto Co., Dow Chemical Co., and Thompson-Hayward, later to be joined by Thompson Chemical Corporation and Uniroyal, Inc.

The Task Force was convened under the aegis of the National Agricultural Chemicals Association, a chemical industry activist organization owned, operated, managed and controlled by the chemical industry.

Mr. George E. Lynn, an executive of Dow Chemical Company was elected Chairman while Mr. C.L. Dunn, an executive of Hercules, was elected Vice-Chairman.

The minutes of the August 23, 1966 meeting revealed that the National Agricultural Chemicals Association had called the meeting at the request of an unidentified member company. The purpose of the meeting as set forth in the minutes was to ascertain if the companies present wished to form a Task Force and work jointly in an effort to secure negligible residue tolerances for phenoxy herbicides. Put another way, its purpose was to persuade the United States Department of Agriculture to declare phenoxy herbicides such as 2,4,5-T safe (nontoxic to humans and animals), notwithstanding the mass of information which each other concerning the toxicity of 2,4,5-T to humans.

The member companies meeting decided that the task force would be foremd,

"...to work with the Food and Drug Administration and the United States Department of Agriculture for the purpose of securing the establishment of tolerances for existing no-residue registrations of phenoxy herbicides (--2,4,5-T--)."

One of the activities delineated in the minutes is as follows:

"--2 Each member of the task force will compare and submit to the Chairman a listing of the toxicological and residue information which his company has on each of the herbicide chemicals involved..."

The next meeting of the task force which occurred on September 27, 1966 at the Jefferson Hotel in Washington, D.C. was attended for the first time by a representative of Thompson Chemical Corp. Consequently by September 27, 1966, defendants Dow Chemical Co., Thompson Chemical Corp., Diamond-Shamrock, Monsanto Co., Thompson-Hayward, and Hercules, Inc.

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were now members of the industry Task Force. Significantly, by this time, all defendants were aware of dioxin contamination of 2,4,5-T and the fact that it carried through to the end product posing a hazard to consumers. Hercules Chief Toxicologist, Dr. John P. Frawley, had by this time not only received information from Dow, but also from Monsanto and Badische in Europe concerning their problems with dioxin contamination arising out of the manufacture of trichlorophenol.

They were also aware of potential hazards to human health based upon the March 24, 1965 dioxin conference (supra) as well as the subsequent contacts by Dow with other companies to inform them of the frightening implications of their continued manufacture of dioxin contaminated 2,4,5-T as per the Frawley memorandum dated July 12, 1965.

At the September 26, 1966 meeting, the subject of "toxicological and residue data" arose and it was decided

"--that each member of the task force is to send to Dr. Popham, any and all toxicological and residue data which he may have relative to phenoxy herbicides. . ."

The Task Force engaged a Dr. Popham whom later minutes would describe as formerly with the Agricultural Research Service of the United States Department of Agriculture. He was, in effect, to become the Task Force's point man for purposes of deceiving the government concerning the nature and extent of the toxicological data which was locked within the phenoxy herbicides industries' confidential files.

On October 25, 1966, the Task Force again met, this time at the offices of the National Agricultural Chemicals Association in Washington, D. C.

The minutes reflect that the

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Agricultural Research Service of the United States Department of Agriculture, appointed Dr. L.L. Danielson of the Crops Research Division "--to work with the Task Force --" The minutes further describe that Dr. Danielson

"--is going to search the USDA files for any residue data that is available and Dr. Popham will work with him to collate it with what the Task Force already has. --"

Dr. Danielson was to search the USDA files to determine whether those files had any information on the toxicity of the herbicides under consideration including 2,4,5-T. What Dr. Danielson and his superiors at the USDA did not know was that current toxicological data on the toxicity of 2,4,5-T was safely reposing within the Task Force companies who had solicited the USDA's "assistance." As will be seen (infra) the USDA had not an inkling of the problem of dioxin contamination of 2,4,5-T as the Task Force conspirators well knew.

The minutes of the January 18, 1967 meeting of the Task Force reveal that Dr. L.L. Danielson of the Agricultural Department had, by that time, been apparently retained as a part-time "consultant." How this squared with his duties at the US Department of Agriculture and a possible conflict of interest is unclear. It seems not to have presented any problem to the task force.

At that meeting the committee "discussed" the fact that a point needs to be made with both the FDA and PRD/USDA that there is considerable public interest involved in the continued use of 2,4-D, etc., (including 2,4,5-T) and that in view of all the data now available, the agencies should extend themselves to consider and act favorably on the Task Force's proposition that the negligible residue tolerances should be established for all current registered uses.

None of the data obtained by Hercules or any of the other producers from Dow concerning the toxicological hazards associated with the use of the product and the adverse impact upon laboratory animals as reported by Dow at the March 24, 1965 conference

and in the other communications between the defendants ever found its way into the petition.

On March 28 of 1967, Mr. George E. Lynn, an executive of Dow Chemical then Chairman of the industry Task Force composed a report detailing the activities of the Task Force including the individuals who would be cooperating with it in establishing a negligible residue tolerance. The report shows that several representatives of the USDA including the Administrator of the Agricultural Research Service were invited to cooperate with the Task Force.

The report further indicates that Dr. George W. Irving, Jr., administrator of the Agricultural Research Service of the USDA and Dr. James L. Goddard, Commissioner of Food and Drugs, were invited to "cooperate" with the Task Force in this project "by supplying such technical assistance and data as would be appropriate with the public interest."

The report further shows that the committee in the presence of representatives of the USDA and the Food and Drug Administration made it a point to stress:

"that in view of the wide use of these herbicides by the American farmer for food production, the Task Force felt the USDA and the FDA also had a vital interest in the continued availability of these essential herbicides... ."

One of the objectives of the Task Force as described in the memorandum was to:

"collect all available data from private and published sources with respect to toxicity . . . pertinent to the use of any and all phenoxy herbicides--"

--The probable sources of such data being

- (a) Agricultural Research Service, USDA;
- (b) industry (data used in support of no residue registrations);
- (c) state experiment stations;
- (d) scientific literature;
- (e) Food and Drug Administration, USDHEW.

Significantly, the kind of "industry" data to be supplied was not left to speculation. It was to be only that data which could be "--used in support of no residue registrations --" As will be seen, any belief that the U. S. Department of Agriculture or the Department of Health, Education and Welfare might have had about industry supplying its current data or directing USDA to its scientific literature would at the time of submission of the petition turn out to be a sham. As will be further seen (infra), not only did industry not report the state of its current knowledge about dioxin contamination of 2,4,5-T, but deliberately submitted antiquated literature none of which was critical of 2,4,5-T much less containing any mention of an acnegen or a chloracnegen and certainly not dioxin.

By the time of the April 20, 1967 meeting, as reflected in the minutes, the Task Force learned that

" . . . the FDA's concept of a negligible tolerance is in a range of 0.1 ppm but 0.2-0.3 ppm is not out of line if data justifies it. . . ."

Of course, the 0.1 ppm etc., has no reference to dioxin contamination since the USDA at that juncture has absolutely no knowledge from the Task Force about the problem of dioxin contamination of 2,4,5-T. One would expect that, given defendants claimed knowledge by USDA, FDA and HEW of the dioxin contamination problem and its potential to human health, at least one of these

minutes would have shown some discussion and perhaps even a disclosure to these agencies or their representatives at the meeting about the potential hazards. The minutes contain no such reference.

The minutes contain a schedule of the different phenoxy herbicides and opposite 2,4,5-T all defendants, except Uniroyal appear to have contributed towards the fee for putting the petition together and the filing. They each appear to have been assessed the sum of \$1,100.00.

On May 11, 1967, the National Agricultural Chemicals Association on behalf of the task force informed Hazelton laboratories by letter, that it had been selected to prepare the petition to have 2,4,5-T declared safe to humans, animals and crops. The fraud and deception continued with the following empty promise described in the third paragraph of the letter to Hazelton:

"The industry Task Force will turn over to Hazelton all of the information on the above mentioned phenoxy herbicides which it has gathered from various sources with respect to animal toxicity and crop residues..."

An examination of the studies concerning animal toxicity submitted with the petition reveals in substance that 2,4,5-T is as safe as drinking water. Of course, the V.K. Rowe studies of 1950 were included, showing 2,4,5-T to be safe while the V.K. Rowe studies of 1965 showing toxicity to humans and animals as discussed at the secret March 1965 dioxin conference were conspicuously absent.

The Task Force minutes of October 17, 1967 report

"considerable discussion was given to possible handling of the use of these herbicides on rangeland. The high application rates involved, up to 6 pounds per acre, could result in high residues on the treated forage immediately after application. . ."

Significantly, the military only used 3 pounds per acre in Viet Nam. The Committee then had to consider the problems associated with application of 6 pounds per acre of 2,4,5-T. The minutes reflect that there was discussion of possible approaches such as

". . . requesting a sufficiently high numerical tolerance, requesting that the use be declared a "non-food use," and using label statements specifying a minimal time interval for grazing the treated range and/or for slaughtering cattle which have grazed the land. . ."

The Committee then decided as a better solution

". . . to list this use under a new heading "Forest Grass, Pasture, Range. . ."

It was also decided to include in the

. . . petition the notation which appears in the 2,4-D entry in the USDA summary of registered agricultural pesticide chemical uses under the "Pasture: Clover, Grass" item to the effect: "Do not graze dairy animals on treated areas within seven days after application."

Nothing appears to have been beyond the imagination and ability of this resourceful group of conspirators. With a spray rate of 6 pounds per acre the only way to overcome the toxic residue was to have the USDA increase the tolerance level. Of course, at this point there is still no mention by industry of dioxin contamination to the product and its potential hazard to human health. The fact that the Task Force did not wish to permit the dairy animals to graze on treated areas for at least seven days after application demonstrates some consideration for animals when weighed against the fact that no one told the military to keep the soldiers out of the sprayed areas for at least one week.

The minutes further reflect that at 12:00 noon, Drs. L.L. Danielson and D.L. Klingman of the Agricultural Research Service of the USDA joined the group. Dr. Klingman is quoted as discussing the spraying of range lands with herbicides and that many more acres would

be benefited if they were sprayed. He is further quoted as urging

" . . . that the task force sought to obtain clearance for this use so that farmers and ranchers could continue to utilize these valuable tools. ."

However, his associate from the USDA, the occasional part-time consultant to the task force, Dr. Danielson, went even further when he

"promised to assist the task force in every way possible and proper in obtaining regulatory clearance for these materials so as to keep them available. Specifically, he and Dr. Klingman promised to consult their files in an effort to locate any pertinent data which would be helpful to the task force in its efforts to obtain tolerances."

It is clear that the minutes do not reflect any knowledge by the USDA, FDA, HEW that any of these phenoxy herbicides, including 2,4,5-T are toxic.

Significantly, for the first time, Uniroyal Chemical joined the Task Force by E.A. Hafner in attendance.

On November 27, 1967 on the stationery of Hercules, Inc., C.L. Dunn, Chairman of the industry Task Force wrote to Dr. Harry A. Hayes, Director of the Pesticide Regulation Division of the United States Department of Agriculture. In substance, he stated that the National Agricultural Chemicals Association Industry Task Force on phenoxy herbicide tolerances had assembled petitions requesting tolerances to cover uses previously registered on a "no-residue" basis. What this means is that previously, the phenoxy herbicides had been registered with the USDA as having a no residue toxicity. Now, the industry was seeking by its petition, to establish a toxicity tolerance for these very same herbicides.

Mr. Dunn went on to misrepresent on page 1 of the letter:

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"There is no hazard to animals as evidenced by the extensive use of these materials for more than a decade, nor is the presence of residues in meat or milk a regulatory problem..."

Nothing was said in that letter about the animal studies conducted by Dow; nor that Dow had determined that dioxin was a contaminant in 2,4,5-T which carried through unless extracted, carried through to the end product, nor that Dow had alerted all producers of 2,4,5-T to the potential hazards associated to humans exposed to dioxin contaminated 2,4,5-T; nor that Dow had set an internal specification of 1 ppm of dioxin contamination based upon their experience with laboratory animals; nor that Dow had expressed to the producers at the March 24, 1965 meeting that their analysis of their competitors 2,4,5-T showed what fate described as "surprisingly high amounts of the acnegen" which they identified as dioxin; nor was there any mention of the telephone call of the substance of knowledge gained by Dr. Frawley from the telephone call received from Earl Farnham of Dow Chemical Company on July 9 of 1965 alerting Dr. Frawley to the fact that Dow was frightened that the whole industry might explode and that there might be governmental intervention by way of a Congressional investigation and a banning of pesticides because of what Dow perceived as "alarming amounts of acnegen" in their competitors' 2,4,5-T; nor any disclosures by Mr. C.L. Dunn who attended the secret dioxin conference with Dr. John Frawley on behalf of Hercules and was copied on the memo Dr. Frawley wrote recounting his conversation with Farnham of Dow. At no time did the so-called industry Task Force on phenoxy herbicides

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make disclosure to the USDA or FDA people in attendance at their meetings of the common knowledge which they had all acquired beginning in November, 1964 when Dow had devised a means for the identification of dioxin in 2,4,5-T.

On November 27, 1967 on the stationery of Hercules, Inc. Mr. C.L. Dunn, acting in his capacity of Chairman of the Task Force wrote to Dr. Harry Hayes, Director of the Pesticide Regulation Division of the United States Department of Agriculture informing him that the industry Task Force had assembled petitions requesting tolerances on the phenoxy herbicides. The fourth paragraph of Mr. Dunn's letter continues the misrepresentation and fraud when he states:

"there is no hazard to animals as evidenced by the extensive use of these materials for more than a decade --"

On that same date, November 27, 1967, Mr. Dunn wrote to the Task Force informing them that both he and Don McCollister (Dow) were discouraged by the apparent unconcern of the USDA

"for the farmer users of phenoxy herbicides. In addition, Dr. Anderson seemed quite opposed to a cooperative program. He expressed sensitivity to criticism by G.A.O. Investigators who recently complained about USDA developing data subsequently used by a manufacturer for registration purposes. --"

On December 8, 1967, the conspirators submitted to the petition control branch of the Food and Drug Administration of the Department of Health, Education and Welfare a petition to have 2,4,5-T declared safe. The cover letter is on the stationery of National Agricultural Chemicals Association, signed by C. L. Dunn, Chairman. The petition consists of seven sections,

a-g. Section C reads as follows:

"full reports of investigations made with respect to the safety of the pesticide chemical. --"

An examination of the bibliography in support of the Task Force claims a lack of toxicity shows that not one study critical of 2,4,5-T was cited.

Instead, these defendants submitted to the unsuspecting, gullible and ingenuous USDA, Food & Drug Administration, and HEW studies by V. K. Rowe, McCollister and Spencer of Dow Chemical Company dated 1950, all of which had been negated by Dr. Rowe's "startling" confirmation of dioxin as the toxic chloracneogen in November, 1964 and Dow's subsequent experimentation with dioxin contaminated 2,4,5-T upon laboratory animals, none of which work found its way into the open scientific literature much less into the FDA petition.

Subsequently, the Task Force received a letter dated April 8, 1968 from the Department of Health, Education and Welfare to Mr. C. L. Dunn, Chairman of the Task Force, informing Mr. Dunn that the toxicology data submitted by the industry was insufficient especially with respect to the fact that there would be a carry over into meat and milk.

The petition was subsequently withdrawn along with the petition which sought to have 2,4-D declared safe also.

Defendants' efforts to disparage any claims of the toxicity of dioxin did not cease, however. When the National Cancer Institute which commissioned the so-called "Bionetics Report" released its findings concerning the potential health hazards of dioxin contaminated 2,4,5-T, Dr. John Frawley, Chief Toxicologist of Hercules, sought to belittle the ignorance of the National Cancer

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Institute about the toxicity of dioxin. In a letter dated November 25, 1970 responding to a letter from his counterpart in England, Dr. John C. Higgins, of the Hercules Powder Company of England, Dr. Frawley made the following caustic and critical disparagement of the National Cancer Institute's knowledge of dioxin and its toxicity:

"--- the Government Agency sponsoring the study (NCI) was not familiar with the toxicity of the dioxin and allowed publicity on the results without consultation with better informed government or industrial scientists. ---"

He reserved his most severe criticism for the surgeon general when, in that same letter to Dr. Higgins, he wrote:

"---on the basis of this single observation in mice, the Surgeon General (who has never in the past gotten involved in safety evaluations) declared before a Congressional Committee that even pure 2,4,5-T presented an imminent hazard to the health of the public. This triggered the banning of 2,4,5-T for all household and several industrial uses ..."

It was not until 1979 that the Environmental Protection Agency (hereinafter "EPA"), although knowing that some manufacturers produced 2,4,5-T with less than 1PPM, instituted deregistration proceedings against 2,4,5-T. The EPA's Prehearing Brief on The Risk Associated with the Registered Uses of 2,4,5-T and Silvex concludes:

"In sum, the data on toxic effects in animals and humans together with the data on exposure potential establish that the continued use of 2,4,5-T and Silvex contaminated with TCDD (dioxin) pose risks of adverse effects on human health. (parenthetical added).

Though the EPA is undoubtedly concerned with the health hazard dioxin in 2,4,5-T presents to those who manufacture it, the focus of EPA's concern is the user, the innocent bystander and the environment. Since EPA apparently believes that less than 1PPM is unsafe. The inescapable inference is that defendants' conspiratorial conduct, misrepresentations and failure to warn were responsible in substantial measure for the EPA's delay in commencing deregistration proceedings.

III. THE DEFENDANTS SUPPLIED DIOXIN CONTAMINATED HERBICIDES WHICH WERE MIXED TOGETHER BEFORE BEING SPRAYED IN VIETNAM MAKING IMPOSSIBLE IDENTIFICATION OF WHICH DEFENDANT'S HERBICIDE CAUSED INJURIES TO PLAINTIFFS.

The defendants' dioxin contaminated herbicides were supplied in drums not bearing the defendants' corporate name. They were mixed together before spraying. A description of "standard operating procedures" is contained in an official U.S. Air Force Technical Report^{9/}, (pp. I-15, 15).

Each of the 11 different companies that manufactured military herbicides packed them in new 1CC 17C 55-gal 18 gauge steel drums for shipment to Southeast Asia.

Each herbicide drum was marked with a three-inch color-coded band around the center to identify the specific military herbicide. This marking was initially a 12-inch band, but was changed to a 3-inch band in March 1966.

About 10 out of every 10,000 drums shipped were received in a damaged or defective state. This represented a damage rate of 0.1 percent. About 50 percent of these damaged drums leaked as a result of punctures or split seams. There were caused by improper loading and defective drums. Forklifts operated by Stevedores also caused punctures. Redrumming was accomplished at the ports.

About 65 percent of the herbicide was shipped to the 20th Ordnance Storage Depot, Saigon, and 35 percent was shipped to

^{9/} "The Toxicology, Environmental Fate and Human Risk of Herbicide Orange and its Associated Dioxin" Alvin L. Young, et al., October 1978.

the 511th Ordnance Storage Depot, Da Nang. Under the normal handling procedures, drums were unloaded at Da Nang and Saigon from the cargo vessel directly into semi-trailers and were placed in an upright position. The trailers were driven to the various units of the 12th Air Commando Squadron (primarily at the bases of Da Nang, Phu Cat, or Bien Hoa) for disposition. Normally the contents of the drums were transferred into blocked F-6 trailer tanks through a suction tube without removing the full drums from the semi-trailers. Each F-6 trailer held 4,298 gal or about 78 drums of herbicide.

When the herbicide was pumped from the drums into the F-6 trailers about 0.5 to 1.5 gal remained in the drum. Hence the drum was placed on a drain rack and the "drippings" were collected from many drums in a pan-type receptacle and used for spraying base perimeter areas.

IV. DEFENDANTS' JOINT ACTION TO PREVENT
GOVERNMENT PRODUCTION OF 2,4,5-T AND
2,4-D

The defendants together comprised virtually the entire 2,4-D and 2,4,5-T industry. As we have demonstrated, they acted conspiratorially or in concert to conceal from or misrepresent to the government the hazards associated with their products. In addition, to guard their dominant market position, they acted jointly to prevent the government from constructing and placing in operation at Weldon Springs, a plant for the production of 2,4,-D and 2,4,5-T. This is evidenced by a document authored by M. F. Wilkerson, Diamond's Marketing Manager, reflecting the industry decision taken by the defendants at a meeting October 4, 1968 of the Task Force created by the National Agricultural Chemical Association (NACA), attended in person or by representation by defendants, Monsanto, Hercules, Diamond, Dow & Thompson-Hayward.

The document reviewed the industry capacity "as secretly submitted", to produce both 2,4-D and 2,4,5-T as opposed to the purchase patterns of the military.

Although the production data submitted by each defendant was coded to preserve secrecy, Mr. Wilkerson estimated their respective capacities:

"A bit of upside-down reading gave the following breakdown of the participating members' capacities. These were coded but are exact. I have attached Company names which may or may not be, with the exception of Diamond, associated correctly with the capacity number.

<u>2,4-D</u>	<u>2,4,5-T</u>
5.0 MM - Hercules	5.5 MM - Hercules
12.0 MM - Diamond	3.0 MM - Diamond
40.0 MM - Dow	12.0 MM - Dow
24.0 MM - Monsanto	7.2 MM - Monsanto
<u>14.0 MM - Chipman</u>	<u>4.5 MM - T-Hayward</u>
TOTALS 95.0 MM	32.2 MM

T-Hayward acknowledged they produced no 2,4-D as did Chipman for 2,4,5-T.

This group's best estimates for total annual domestic requirements of D and T were:

2,4-D - 55 MM lbs.
2,4,5-T - 18 MM lbs.

Hooker acknowledged they now have TCB capacity to supply all producers, on the basis of these estimates, except for Dow (who produce their own) and T-Hayward (who are presently being supplied TCP by Dow.)"

The task force then adopted the following position:

"SUMMARY OF POSITION

The group of phenoxy herbicide producers at their meeting of October 4, 1968 after estimating the capacity of the domestic industry to produce 2,4-D and 2,4,5-T; after estimating as accurately as possible the domestic civilian consumption of these products and the military requirement based upon the stated needs and current delivery schedules, concluded that there is sufficient domestic production of 2,4-D to fully meet both the civilian and military requirements, and that the production of 2,4,5-T would meet a substantial part of both the civilian and military need. It was concluded that the questions which prompted the Government Officials to make the decision to construct and place in operation a plant at Weldon Springs to produce both 2,4-D and 2,4,5-T have changed, and that the industry should request an opportunity to explore these data with the Government.

It was further concluded that even if it is assumed that the military will require the full amount of its needs as heretofore estimated, that there would be a very substantial over-production of both 2,4-D and 2,4,5-T if the Weldon Springs plant is operated at full capacity. This raised questions of serious import to the domestic industry which should be thoroughly explored with the Government.

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V. THE MILITARY WAS NOT AS KNOWLEDGEABLE
AS THE DEFENDANTS ABOUT THE MANUFAC-
TURING PROCESS, DIOXIN AS A CONTAMINANT,
DETECTION METHODS, RISK REDUCTION
METHODS AND HEALTH HAZARDS ASSOCIATED
WITH EXPOSURE TO DIOXIN

The disparity of knowledge between the defendants and the military was enormous. It is a significant factor giving rise to the defendants' duty to warn the military of the hazards accompanying use of their herbicides known to the defendants, and the duty to inform the military of the means of risk elimination or reduction as this Court noted in 534 F. Supp. 1046, 1055:

"A supplier should not be insulated from liability for damages that would never have occurred if the military had been apprised of hazards known to the supplier. A supplier, therefore, has a duty to inform the military of known risks attendant to a particular weapon that it supplies, so as to provide the military with at least an opportunity fairly to balance the weapon's risks and benefits."

The good sense of imposing a duty to inform is readily apparent. Such a duty does not interfere with the military's prerogatives by requiring suppliers and courts to second-guess the military's decisions. Indeed, it enhances those prerogatives by helping to ensure that suppliers will share their knowledge and expertise with governmental decisionmakers. Nor does such a duty cause delays in supplying needed ordnance - the suppliers are obligated merely to share knowledge and expertise already in hand.

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In order for knowledge about hazards to have helped the military "fairly to balance a weapon's risks and benefits," it must have been possessed by individuals who were in positions of sufficient authority and responsibility to act on that knowledge. If the decisions in question were those regarding whether and how to deploy Agent Orange in Southeast Asia and which of the various forms of the Agent to employ, knowledge about hazards must have been possessed by a decisionmaker relatively high up in the chains of command and authority. Moreover, for the knowledge to have informed that relevant decisionmaker, it must have been possessed by him in a cohesive manner so that he would be in a position to integrate it into a meaningful whole.

It is not sufficient for military contractors to share information with anyone at all or with individuals so far down the relevant chains of command and authority as to render the information useless as a means of increasing the rationality of the policy decisions being reached by the appropriate decisionmaker at the appropriate level in the chain of authority.

Nor is it sufficient if the information consists of isolated bits and pieces of knowledge, scattered both vertically and horizontally throughout the governmental bureaucracies and shared in piecemeal fashion, with one person in government being informed as to another aspect. The first of these threats to rational decisionmaking might be termed the threat of vertical nonintegration. Both defeat the objective of rational

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decisionmaking by preventing knowledge about hazards from being available to those attempting, in the Court's words, "fairly to balance the risks and benefits."

In their prior submission, "Plaintiffs' Memorandum Concerning the Government Contract Defense Phase of the 'Agent Orange' Products Liability Litigation: A Management Plan for the Discovery Phase", June 8, 1982, plaintiffs addressed the legal implications of the question of who in the government must have known, and noted that under the relevant case law, including that of the product liability field, the following rules apply in determining the issue of knowledge imputation or information transference:

1. Inter-Agency imputation of knowledge is wholly impermissible and intra-agency imputation use narrowly limited (pp. 22-68).

2. Information transference must be targeted to the appropriate decisionmaker and focused to alert to danger (pp. 22-31).

It is clear from the record that judged by these standards, the defendants have breached their duty to warn and inform the responsible governmental decisionmakers.

Apart from the question of who (ie. the high level rational decisionmaker) in the government should have possessed the information defendants had and withheld, is the issue of what information would rational governmental decisionmakers have wanted the chemical companies to share with them in order to be "fairly to balance the risks and benefits," given the

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implications of such a massive military deployment of a toxic herbicide, known by the suppliers to be hazardous to human health, but capable of eliminating or reduction such hazards.

We submit that there were at least four types of information in the possession of the defendant chemical companies that rational governmental decisionmakers would have wanted those companies to share with them so that the government could undertake its own risk-utility assessment in the context of the entire war effort: First, information relating to factual, historical experiences with dioxin contamination -- eg., occupational related injuries to workers following exposure to dioxin contaminated materials in manufacturing facilities -- that would have led a rational person to suspect that exposure to such materials may be harmful to humans; Second, dioxin information, contamination levels and variables determining levels of dioxin in the chemical herbicide manufacturing process; Third, information relating to dioxin contamination levels in the herbicides manufactured for use in Vietnam and the extent to which levels of dioxin contamination could be reduced by the use of appropriate analytical and detection procedures, alternative methods of manufacture or quality control and the cost thereof and Fourth, information in the form of judgments and assessments of the risks to health already arrived at by the chemical companies themselves. The first, second and third types of information are essentially factual, the first focusing on the risks of injury and the second focusing on the dioxin forming process and contaminant

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levels, and the third focusing on risk avoidance. The fourth type of information is more judgmental than factual, consisting of the conclusions, however, that the chemical companies had reacted regarding the risks presented by Agent Orange.

Finally, there is the question of "when?" -- ie., the relevant time frame within which the government must have had knowledge about the hazards associated with Agent Orange?

Consistent with the concept of informed and rational decisionmaking, the crucial time for the government to have had knowledge of the hazards was the time during which decisions were made regarding the purchase and deployment of Agent Orange in southeast Asia. The key to understanding the relevant time frame is the objective that the military not be forced unnecessarily to act on inadequate information. Thus, suppliers of the chemical herbicides were obligated to share whatever relevant information they possessed at the time of sale and were obligated to share additional information as it became available to them throughout the period during which those herbicides were being used by the government.

The discovery to date establishes that these chemical companies were in a position, at little or no cost, and indeed had the duty, to draw the hazard and risk avoidance pieces together and timely warn and share them with the responsible government authority who made the decisions that directly and drastically affected the welfare of the plaintiffs. The defendant companies

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failed to do this. Defendants' elaborate discovery of hundreds of officials have at most produced bits and pieces of information about the hazards of dioxin in general scattered uselessly across the length and breadth of various federal bureaucracies. Thus, defendants have also failed in their duty to warn and inform the responsible governmental decisionmaker as to the specific facts the military needed to know in order to make an informed decision.

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VI. UNDER THE PRECEDING FACTS AND CIRCUMSTANCES, EACH DEFENDANT'S BREACH OF ITS SEPARATE DUTY TO WARN MAY BE CONSIDERED THE "CAUSE IN FACT" OF PLAINTIFFS' INJURIES, AND THE PROBLEM OF SEPARATE DEFENDANT IDENTIFICATION THEREFORE DOES NOT EXIST; BUT IN ANY EVENT, THE DEFENDANTS MAY BE HELD JOINTLY AND SEVERALLY LIABLE UNDER THE THEORIES OF CONCERTED ACTION, ENTERPRISE LIABILITY AND ALTERNATIVE LIABILITY

Because of the manner in which the defendants sold Agent Orange to the Government, and the manner in which the Government then utilized it so as to expose the plaintiffs to its effects, it is unlikely, no matter how firmly it is established that Agent Orange in fact caused the plaintiffs' injuries, that any plaintiff will be able to identify with certainty which one or more of the defendants actually produced the specific batch of Agent Orange to which he was exposed, to his detriment. Rather, because the defendants put no company-identifying marks on the barrels of Agent Orange they sold to the Government, and the Government treated the product generically, the most that plaintiffs will be able to prove is that they were all injured by Agent Orange, virtually all of which was produced by the defendants. To go further than this, and to require each plaintiff to identify the specific defendant or defendants whose Agent Orange caused his injury, would present impossible problems of proof.

At one time in the law, perhaps, such problems of proof might have been fatal to a plaintiff's case. The demands of modern society, however, have brought change to the law of causation and liability. The courts have clearly recognized

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that if they are to continue to serve the ends of justice in an evolving society, the rules of law they apply must also evolve. As the Supreme Court of California put it, in considering the similar problems of proof of causation and liability facing a plaintiff in a products liability action involving the drug DES:

"In our contemporary complex industrialized society, advances in science and technology create fungible goods which may harm consumers and which cannot be traced to any specific producer. The response of the courts can be either to adhere rigidly to prior doctrine, denying recovery to these injured by such products, or to fashion remedies to meet these changing needs. Just as Justice Traynor in his landmark concurring opinion in Escola v. Coca Cola Bottling Company (1944) 24 Cal. 2d 453, 467-468, 150 P.2d 436, recognized that in an era of mass production and complex marketing methods the traditional standard of negligence was insufficient to govern the obligations of manufacturer to consumer, so should we acknowledge that some adaptation of the rules of causation and liability may be appropriate in these recurring circumstances ... "

Sindell v. Abbott Laboratories, 607 P.2d 924, 926 (Cal. 1980).

Or, as Judge Meyer of the New York Court of Appeals more succinctly put it in another products liability action involving DES, "Products liability law cannot be expected to stand still where innocent victims face 'inordinately difficult problems of proof.'" Bichler v. Eli Lilly & Co., 55 NY2d 576, 580; 450 NYS2d 776, 779 (N.Y. 1982).

Thus, Court as well as commentators have proposed means which permit recovery by plaintiffs under circumstances such as these, where the conduct or product of a specific defendant out of a group of potentially liable defendants cannot be identified as the "cause in fact" of the plaintiffs' injuries. Such proposals involve application of principles of "concerted action", "enterprise liability", "alternative liability", and, more recently, "market share liability".^{10/}

^{10/} The Court in Sindell v. Abbott Laboratories, 607 P.2d 924 (Cal. 1980) developed the market share liability theory as a specific modification of the alternative liability theory to surmount the rational difficulties in applying the alternative liability theory in cases where not all or substantially all potentially liable parties are named as defendants. Since, as Exhibit 1 to this Memorandum clearly demonstrates, virtually all potentially liable parties are named as defendants here, the problems presented in Sindell, and the specific solution of market share liability devised by the Sindell Court to overcome them, do not apply. Plaintiffs, therefore, do not discuss the market share liability in this memorandum.

Plaintiffs believe that the lengthy factual statement fully supports the theories of concerted action, enterprise liability and alternative liability. These arguments will be addressed seriatim. However, there is good reason to examine at the outset the implications of the failure to warn theory as it has developed in this case. On its own it is dispositive of the problem of defendant identification.

The plaintiffs have presented facts in this case establishing that the defendant chemical companies failed to warn the government about a broad range of risks related to the use of Agent Orange. Plaintiffs submit that the very special nature of the breach of the duty to warn issue as it arises in this case moots the issue of causation as it relates to the identification of which defendant should be deemed responsible for which plaintiff's harm. As we shall demonstrate, each defendant individually in the truest sense of the word was a "cause in fact" of the entirety of the harm.

It will be helpful to focus on the nature of the failure to warn claim. Plaintiffs contend that each of the defendants failed to warn of risks which they either knew or should have known about. These break down into various categories. First, plaintiffs contend that the defendant failed to share with the

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United States Government information concerning the possible hazards attendant to the use of dioxin contaminated Agent Orange. What suspicions did they harbor or should they have had that the herbicide caused a broad range of diseases? The defoliation project subjected soldiers to doses and exposure to the herbicide heretofore unknown to mankind. This was not spraying a bush in one's backyard. Thousands of gallons of the defoliant were to be sprayed from the air to defoliate jungles. Thus, any test results, experiments, suspicions and conclusions however tentative should have been shared with the government with total candor. Plaintiffs have shown that this did not occur. Second, there was a long history of industrial accidents that indicated that problems of dioxin contamination were related to the manufacturing process. These accidents took place over a rather long period of time. Some were of considerable severity. They have been noted in the factual introduction to this memorandum.

The disastrous results of these industrial accidents caused the defendants to discuss the need for extraordinary precautions in the cleanup to assure that dioxin was avoided or removed from the workplace and to protect the workers in the cleanup process. There was no assurance that the dioxin which was the cause of these industrial catastrophes was avoided or removed from the final product. Plaintiffs have demonstrated

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that defendants failed to fully inform the government of these industrial accidents, the precautions and methods discussed or used to avoid the formation of or rid the plants of dioxin and most important of the terrible consequences to those injured as a result of exposure to the dioxin.

Finally, plaintiffs have shown that defendants had information concerning their ability and non-ability to determine the level of dioxin contamination in the final Agent Orange product. Some defendants knew much about their ability to test for dioxin and their ability to control its presence. Others knew that they were unable to test for the presence of the dioxin contaminant and that their quality control techniques were erratic at very best. The evidence establishes that the defendants failed to inform the government about their analytical and testing capabilities and the methods available to them to control the risk by instituting alternate methods of manufacture that would significantly reduce or eliminate the dioxins or their inability to control the risk in that their quality control techniques were such that they did not know how to evaluate or control the dioxin level that was in their product.

At first blush, it would appear that plaintiffs are presenting a classic failure to warn case that would require conformance to normal causation principles. However, on reflection it is clear that there is something very different about this failure to warn case. Warnings serve two purposes. The standard failure to warn case serves the purpose of risk reduction. Most products raise the spectre of some element of danger if the products are not used properly. A warning can reduce the probability of harm (thus effecting the risk-utility balance) by alerting the user to risks that may eventuate should the user not follow the prescribed instructions. Alternately, a warning may inform a user that he belongs to a special class of persons who should not utilize a product at all or utilize it with special precautions. This form of warning is very common in drug cases. Both forms of warnings are designed to achieve a reduction of risk since they permit the user to intelligently respond to risks that attend the use of the suspect product.

There is, however, another category of failure to warn cases. In that type case, the contention is not that the defendant failed to warn so that risk could be reduced, but that the risk level is constant and there is little that can be done by the user to reduce the probability of harm. The function of the warning in this second genre of product cases is to inform

the user of risks attendant to the use of a product so that the user can decide whether he/she wishes to expose himself/herself to an irreducible risk. This class of failure to warn cases is very closely analogous to the informed choice medical malpractice case. The issue in those cases is not the conduct of the defendant per se, but rather the failure to give the patient sufficient information so that the patient can make an informed and knowledgeable choice as to whether to expose himself to a given therapeutic procedure. See e.g. Canterbury v. Spence, 464 F. 2d 772 (DC Cir) cert denied 409 US 1064 (1972); Cobb v. Grant, 8 Cal 3d 229, 104 Cal Rptr. 505, 502 P. 2d 1 (1972).

The product liability analogue to these informed choice medical malpractice cases is exemplified by such well known cases as Davis v. Wyeth Laboratories, 339 F. 2d 121 (9th Cir. 1968); Reyes v. Wyeth Laboratories, 498 F. 2d 1264 (5th Cir. 1974) cert denied 419 US 1096. Cunningham v. Charles Pfizer & Co. Inc., 532 P. 2d 1377 (Okla. 1974). In these cases use of polio vaccine was attended with a small but irreducible risk-level which could not be affected by production. In Davis v. Wyeth Laboratories, Judge Merrill recognized that he was faced with this problem:

"There are many cases, however, particularly in the area of new drugs, where the risk, although known to exist, cannot be ... narrowly limited and where knowledge does not yet explain the reason for the risk or specify those to whom it applies. It thus

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applies in some degree to all, or at least a significant portion, of those who take the drug. This is our case; there seems to be no certain method of isolating those adults who may be affected adversely by taking Type III Sabin vaccine.

In such cases, then, the drug is fit and its danger is reasonable only if the balance is struck in favor of its use. Where the risk is otherwise known to the consumer, no problem is presented, since choice is available. Where not known, however, the drug can properly be marketed only in such fashion as to permit the striking of the balance; that is, by full disclosure of the existence and extent of the risk involved." 399 F. 2d 121, at 129.

The function of the warning in this case the court concluded was not to reduce the risk but instead to provide the plaintiff with the opportunity to decide whether to expose himself to a risk which could not be further reduced by any action on his part. The Court noted:

"When, in a particular case, the risk qualitatively (e.g., of death or major disability) as well as quantitatively, on balance with the end sought to be achieved, is such as to call for a true choice judgment, medical or personal, the warning must be given." Id. 399 F. 2d at 129-130 (emphasis added)

Also see Model Uniform Product Liability Act. Sec. 104 (c) (3), Twerski, Old Wine in a New Flask-Restructuring Assumption of Risk in the Products Liability Era, 60 Iowa L. Rev. 1, 44-46 and Twerski, Weinstein, Donaher and Peehler, The Use and Abuse of Warnings in Products Liability - Design Defect Litigation Comes of Age, 61 Cornell L. Rev 495, 517-521 (1976).

The importance of the stated distinction is that it affects the causation issue in a most interesting fashion. If

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the question is asked how responsible is each defendant for not sharing the totality of all the risk information which it knew or should have known about, the answer is clear. The failure of each defendant to warn the government was responsible for the ignorance of the government and contributed, not only to the use of each defendant's product, but to the very decision to use Agent Orange as a defoliant at all.

That decision was not a divisible one. There is thus joint and several liability in the most classic and traditional sense. The reason that this informed choice argument resolves the identification problem is that the focus has switched from the nuance of each defendant's product to the defendants' collective and individual responsibility for failing to inform the government so that it could make a decision with all the information before it. Since the decision was non-divisible and was contributed to by everyone's failure to warn, the liability ought to be joint and several as well. As long as the failure to deliver the requisite information was a substantial factor leading to the decision to deploy Agent Orange, the plaintiffs have fully discharged their burden on causation. Concurrent tortfeasors do not have the luxury of the but-for argument in this context. See, Anderson v. Minneapolis St. P. & St.

M.R.R. Co., 146 Minn. 430, 179 N.W. 45 (1920), Kingston v. Chicago & N.W.R. Co., 191 Wis. 610, 211 N.W. 913 (1927).

The facts of this case support the conclusion that the failure to discharge one's own duty to warn must be viewed in the context of the government's decision to utilize Agent Orange as a defoliant. The defendants were not lone rangers in this case, totally unaware of each others activities. The facts point to a heavily concentrated industry with a high degree of special expertise with regard to the manufacture and use of herbicides. This highly concentrated industry dealt with a dizzying array of government agencies. From time to time bits and pieces of knowledge were in the possession of one person or another in one government agency or another. The information that was available to the defendants was or should have been put together by the defendants in a coherent fashion so that the responsible persons in the responsible government agencies were delivered the total risk picture. We shall demonstrate at trial that this was never accomplished. The defendants had full knowledge that the Agent Orange that went to Vietnam was to be loaded in planes to be mixed and sprayed without discrimination as to which defendant's product was being utilized. The consequences of the dangers if the suspicions and fears about dioxin turned out to be true were staggering. Hundreds of thousands of soldiers would be exposed to the risk. If we hypothesize that a government well aware of the risk would have or well might have decided against the defoliation then it would seem clear that the aforementioned

facts, if proven, strengthen the argument that each bears some responsibility for that final decision. The relationships between the manufacturers and their knowledge of how the product was to be deployed add to the strength of the argument that they cannot easily separate themselves into fragments for the purpose of causation. Whether or not the aforementioned facts do or do not amount to concerted action they are clearly a predicate for the proposition that the breach of the duty to warn cannot be isolated.

Finally, and as a separate argument, plaintiffs note that several defendants had specific knowledge not only of the dioxin contamination of their own product but of the rather substantial problems that other defendants had with the dioxin content in their product. So much so that defendants were called together to discuss the problem. The government was the conspicuous uninvited guest to that meeting. Once the defendants became aware of the problems that existed with regard to the manufacture of dioxin contaminated Agent Orange the question is did they have a duty to warn the government not only about their own product but the problems that were being faced industry wide. An argument could be made, given the long standing relationships between such defendants as Dow and Hercules with the government, that even if they had decided not to manufacture and sell Agent Orange to the government they would have had a duty to disclose to the government the information that they had

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before the court and social policy questions always underlie the duty issue." Prosser, Wade and Schwartz p. 404 (Sixth Ed. 1976)

The court thus must determine whether the conditions in this case support the imposition of such a duty. We believe that given the relationship between the government and the defendants, the high foreseeability that danger to hundreds of thousands of soldiers would result if the information was not shared, the common use of the Agent Orange in Vietnam through indiscriminate mixing, and the highly specialized knowledge that existed within the chemical industry that a duty to inform the government of the other defendant's problems is established beyond peradventure. When one adds to this the "take charge" aspect of Dow and other defendants with regard to the information that was to be disseminated and the attempt to jealously guard it from public view, the duty issue simply disappears. Once a defendant has decided not to stand aside but to act affirmatively, the duty to act reasonably under the circumstances is firmly established. Restatement (Second) of Torts Sec. 32; Parvi v. City of Kingston, 41 NY2d 553, 362 NE2d 960 (1977).

The implications for the causation issue once a duty has been established to warn the government of the dioxin contamination that existed in other defendants' products is obvious. If the duty to warn is as we have set forth, then there can be no argument that responsibility should be limited to the individual defendant. By hypothesis the breach of the

duty to inform the government was specifically directed to the highly toxic product of a co-defendant. It was that very product which was deployed in Vietnam. There is thus no causation issue left to decide. The very product which caused the harm was allowed to be deployed because the defendants not only failed to warn of the dangers which were indigenous to their product but that which the entire industry was selling. Once the duty issue is resolved causation is resolved as well. Each defendant who did not reveal that which it should have revealed bears direct responsibility for the harm caused by the product of the other defendants which they knew to be more highly toxic than their own.

Should the Court require still further grounds for holding the defendants jointly and severally liable, however, ample such grounds exist under any or all of the theories of concerted action, enterprise liability and alternative liability, discussed seriatim below.

A. The Facts and Circumstances
Warrant Application of the
Concerted Action Theory as
a Basis for Defendants' Joint
and Several Liability

Concerted action among two or more defendants resulting in injury to a plaintiff is a fact situation under which joint and several liability has historically been imposed. Hall v. E.I. DuPont de Nemours & Co., Inc., 345 F.Supp. 353, 371 (E.D.N.Y. 1972);

1 Harper & James, The Law of Torts §10.1 at 697-98 (1956); Prosser, Joint Torts and Several Liability, 25 Calif. L.Rev. 413, 429 et seq. (1937); See also In re Beverly Hills Fire Lititgation, Civil Action No. 77-79, Order 215, p.8 (S.D. Ohio, filed November 14, 1979) (Order attached as Exhibit 16 ; hereinafter referred to as "Beverly Hills"). The elements of the concerted action theory are prescribed in Section 876 of The Restatement of Torts, which provides in part as follows:

For harm resulting to a third person from the tortious conduct of another, a person is liable if he . . . (b) knows that the other's conduct constitutes a breach of duty and gives substantial assistance or encouragement to the other so to conduct himself, or (c) gives substantial assistance to the other in accomplishing a tortious result and his own conduct, separately considered, constitutes a breach of duty to the third person.

With respect to this theory, Prosser states that:

"(T)hose who, in pursuance of a common plan or design to commit a tortious act, actively take part in it, or further it by cooperation or request, or who lend aid or encouragement to the wrongdoer, or ratify and adopt his acts done for their benefit are equally liable with him. (P) Express agreement is not necessary, and all that is required is that there be a tacit understanding . . ."

Prosser, Law of Torts §46, p.292 (4th Ed. 1971); See also Sindell v. Abbott Laboratories, 607 P.2d at 932 (Quoting Prosser);

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and Hall v. DuPont, 345 F.Supp. at 371 (Quoting Prosser).

Three elements are necessary to prove a case of joint and several liability for concerted action in a products liability case.

First, plaintiffs must establish a causal relation between the plaintiffs' harm and the targeted defendants.

Second, the plaintiffs must prove that defendants in the group participated by cooperative or concerted activities to cause this harm.

Third, plaintiffs must show that the defendants in the group have by their actions or omissions contravened a legal standard of care. See Hall v. DuPont, 345 F.Supp. at 371; Beverly Hills, Order at pp. 8-9.

Expanding upon these elements somewhat, and considering ^{them each in turn,} it is clear from the Sindell and Hall cases that plaintiffs are not required as part of their proof of causation to identify the injury-producing party. In Hall v. DuPont, for example, the Court noted that "the issue of who 'caused' the injury is distinctly secondary to the fact that the group engaged in joint hazardous conduct." 345 F.Supp at 372.

Of course, the plaintiffs must still identify the injury-producing product, but under the concerted action theory, the tortious event is considered to be the express or tacit agreement among the defendants to commit a culpable act. Beyond identifying the injury-producing product, plaintiffs must only

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show that each defendant was a substantially contributing factor in producing, promoting and placing the defective product into the stream of commerce. Sheiner, DES and a Proposed Theory of Enterprise Liability, 46 Fordham L.Rev. 963, 983 (1978). This proof links the harm done to a particular defendant. Thus, the fact that a specific injury-causing party is unknown does not prevent a plaintiff's recovery. Beverly Hills, Order at pp. 10-11.

To establish that defendants are a substantial factor in plaintiffs' injuries, therefore, it is necessary for plaintiffs to show that all defendants in the group manufactured and promoted similar defective products. Id., at p. 11; Hall v. DuPont, 345 F.Supp. at 374.

By placing a defective product into the stream of commerce and promoting it, the manufacturer increases the public usage of the product. This, in turn, compounds the chance of injury caused by the product. Thus, each defendant who produced and promoted the defective product in concert with others shares in the responsibility for plaintiffs' injuries. Id.

Under the facts and circumstances of the present case, it is evident that if plaintiffs can identify Agent Orange as the defective and injury-producing product, and further establish concerted action among the defendants with respect to its production and promotion and to failure to warn the government

of the risks attending its production and use, then there will be little if any remaining question regarding causation. No defendant disputes, for example, that it supplied Agent Orange to the government during the relevant period. We will turn our discussion, therefore, to the more substantial matter of concerted activities.

In addition to satisfying the causation requirement, plaintiffs must also establish that the targeted defendants acted by cooperative or concerted activities before the theory of concerted action will be imposed. Hall v. DuPont, 345 F.Supp. at 371; Beverly Hills, Order, p. 11.

Generally, all this means is that there must be at least some tacit agreement or understanding among the defendants. Prosser, Law of Torts, §46 at 292. In the products liability arena, and in this case, the tacit agreement or understanding among the defendants must be to market and promote a defective product, or to fail to warn of undue risks or dangers known to or foreseeable by them. Beverly Hills, Order at p. 13; Hall v. DuPont, 345 F.Supp. at 372.

The preceding factual materials, together with the Exhibits attached to this Memorandum, clearly establish the existence, not just of concerted activity or tacit agreement, but of an actual, ongoing and pervasive conspiracy among the defendants to market and promote Agent Orange, a product known

by them to be dangerous and defective, and to actively conceal such dangers and defects from both the government and the general public. The evidence further discloses substantial sharing among the defendants of information relating to the risks and dangers attending the production of and exposure to Agent Orange.

To briefly recapitulate some of this substantial evidence of conspiracy and cover up, the plaintiffs would direct the Court especially to the long history of industrial accidents involving Agent Orange-related materials; Dow's 1963 misrepresentation to the military that it was unaware of any problems associated with the production or use of Agent Orange; the March 24, 1965 conference among the defendants at Dow headquarters in Midland, Michigan, at which the defendants were all in attendance or upon which they were briefed; the N.A.C.A. task force formed by the defendants to study the production methods and effects of exposure to Agent Orange-related products; the Ad Hoc Committee formed by Dow and Hercules to, in effect, lobby the government in favor of Agent Orange-related products; the Boehringer agreement; the sharing among the defendants of analytical and dioxin detection knowledge; Dow's sampling and testing of other defendants' products, and reporting to them of its results; the withholding from the government of effective analytic techniques for testing for toxic contamination of Agent Orange, despite the knowledge that the government's techniques were insufficient; the successful drive by the defendants to

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block government efforts to build its own Agent Orange production facilities at Weldon Springs; the failure of any of them to disclose to the government the known fact of dioxin contamination of the Agent Orange produced by them and the concomitant risks of serious injury; and the absolute secrecy and confidentiality from the government and outsiders with which all of the foregoing acts were committed. These, moreover, are just the highlights. The objective factual situation points clearly to the existence of knowledge among the defendants of the existence of undue risks associated with Agent Orange, the failure of any of them to take reasonable steps to eliminate such risks through proper testing and production methods or, alternatively, warning the government of such risks, and an absolute conspiracy of silence among the defendants to prevent such risks from becoming known.

Under the circumstances, therefore, plaintiffs have alleged and substantiated an ample basis for permitting them to proceed with their claims upon a theory of concerted activity.

The third element of the concerted activity theory requires proof that the defendants in the group have by their acts or omissions breached a standard of care as to these plaintiffs. Beverly Hills, Order at p. 13; Hall v. DuPont, 345 F.Supp. at 371. Since this Memorandum deals with the question of the defendants' joint and several liability, and not specifically with the substance of plaintiffs' product liability

claims, this element will not be discussed at length here. Plaintiffs would only refer the court here to the somewhat novel aspects of their failure to warn claims, discussed more fully in Section VI of this Memorandum above. In other respects, their product liability claims parallel those in the more typical products liability case. Suffice it to say that, for present purposes, the matter of the defendants' breach of some applicable standard care, whether that standard be of strict liability, negligence, or conduct warranting imposition of punitive damages, will not be a stumbling block to imposing liability upon the defendants under the theory of concerted activity.

The plaintiffs have therefore alleged and substantiated an ample basis for invoking the concerted activity liability doctrine against the defendants, and for holding them jointly and severally liable to the plaintiffs.

B. The Facts and Circumstances
of this Case also Warrant the
Imposition of Liability Upon
the Defendants Under the Theory
of Enterprise Liability

The facts and circumstances of the present case also warrants application of the theory of enterprise liability as a means of bridging the gap of causation between the injury-causing product and the particular defendants.

Enterprise liability blends the theories of concerted activity, discussed supra, and alternative liability, discussed infra, although it is based primarily on the latter of these. Sheiner, supra, 46 Fordham L.Rev. at 974:

"Under enterprise liability, the plaintiff must prove there is a high probability that (his) injury was caused by the tortious behaviour of some one of the defendants—a modification of alternative liability. In addition, (the plaintiff) must show that defendants concertedly adhered to a dangerous, industrywide safety standard in their manufacture of the injury-producing product. Evidence of these two elements will shift the burden of proof on causation to the defendants.

Enterprise liability would impose joint and several liability in a situation which occurs with increasing frequency in our highly industrialized society. Fungible products with delayed and dangerous effects cause injury, but the instrumentality and agent producing the specific injury are unidentifiable.³⁶ Id.

The theory of enterprise liability was suggested by the Court in Hall v. DuPont, 451 F.Supp. 353.

The theory of enterprise liability proceeds from a determination of fairness: as between an innocent victim and members of an industry who are negligent or who have joint control of the risks, the latter should bear the cost of the injury. Enterprise liability is proposed as an equitable method of allocating these risks in a manner both affording the plaintiffs an opportunity to recover and protecting the defendants against unjust loss.

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In the Fordham Law Review article, Schiener suggests seven requirements for imposition of enterprise liability. These requirements are as follows:

1. There existed an insufficient, industry-wide standard of safety as to the manufacture of the product.
2. Plaintiff is not at fault for the absence of evidence identifying the causative agent, but rather, this absence of proof is due to defendant's conduct.
3. A generically similar defective product was manufactured by all the defendants.
4. Plaintiff's injury was caused by this defect.
5. Defendants owed a duty to the class of which plaintiff was a member.
6. There is clear and convincing evidence that plaintiff's injury was caused by a product made by one of the defendants. For example, the joined defendants accounted for a high percentage of such defective products on the market at the time of plaintiff's injury.
7. All defendants were tortfeasors.

Scheiner, supra, 46 Fordham L.Rev. at 995. Once plaintiffs prove these things, the burden of proof as to causation shifts to defendants, each of which can exonerate itself only by showing that its product could not have been the one which injured the particular plaintiff. Id.

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Plaintiffs submit that each of these seven requirements are met here, and that imposition of enterprise liability upon the defendants is therefore proper.

First, there was no real industry standard of safety for the manufacture, testing and use of Agent Orange-related products. Certainly, knowledge of the danger of dioxin contamination was there, as was the technological ability to detect and reduce the magnitude of its incidence. But these cannot be considered "standards" in any real sense, for the reason that the defendants largely ignored them. Even those defendants who apparently did make some efforts to monitor and reduce the incidence of dioxin contamination in their products cannot be considered to have formulated or adhered to an adequate standard of safety, for the evidence suggests that any level of dioxin contamination can have serious effects when exposure is prolonged or repeated. And for the infantry in Viet Nam, prolonged, repeated exposure was probably the norm. No adequate standard of safety therefore existed.

Second, the plaintiffs are not at fault for their inability to pinpoint which defendant, or defendants caused their specific injuries. This inability is due, rather, to the manner in which Agent Orange was distributed to and utilized by the government. Whether or not the defendants are at fault in this regard, as between plaintiffs and defendants, the latter should bear this risk. See, e.g., Sindell v. Abbott Laboratories, 607 P.2d at 936.

Third, the requirement that a generically similar defective product be manufactured by all the defendants is met in this case. All the defendants manufactured generically similar Agent Orange-related products; all of their products suffered from dioxin contamination to one degree or another; none of the defendants labeled their containers, making it impossible to tell one defendants' product from another's once delivered into the government's possession; and the government in fact treated the products generically, mixing the products indiscriminately. The requirement of a generically similar defective product is therefore met.

Fourth, there is substantial evidence both that plaintiffs' injuries were caused by the dioxin contaminated Agent Orange, and that the government utilized this contaminated product in consequence of the defendants' failure to warn. The fourth requirement is therefore met.

Fifth, as discussed more fully above, the defendants both owed and breached their duty of care to the plaintiffs, those ultimately and foreseeably exposed to Agent Orange, in failing to remedy or warn of the known dangers of dioxin contamination. The fifth requirement of enterprise liability is therefore satisfied.

Sixth, there is clear and convincing evidence that the plaintiffs' injuries were caused by a product made by one of the defendants. Exhibit 1 to this Memorandum establishes that

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defendants accounted for over 99% of the Agent Orange market, both in terms of gallons and dollars sold. This case is therefore distinguishable from Sindell, in which the Court declined to apply either enterprise or alternative liability theories because of the absence as parties of significant members of the affected industry, and the sixth requirement of enterprise liability is easily met.

Seventh, all defendants are tortfeasors in the present case. All of them manufactured defective products; all of them knew the others' products were similarly defective; all of them knew the government and the public were unaware of the existence of the defects; all of them knew the government relied upon their collective and individual representations as to the product's safety; yet none of them effectively eliminated or warned of the known defects, as a consequence of which the plaintiffs were injured.

Thus, all of the requirements for imposition of enterprise liability outlined by Scheiner have been met in the present case. Considerations of fundamental fairness require that the culpable defendants, having control of the risks, and not the innocent plaintiffs, bear the consequences of plaintiffs' inability to identify with specificity the defendants which caused their respective injuries. Imposition of enterprise liability upon the defendants fulfills such considerations of fundamental fairness, and application of enterprise liability in this case is therefore warranted.

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C. THE FACTS AND CIRCUMSTANCES OF
THIS CASE ALSO WARRANT THE
IMPOSITION LIABILITY UPON THE
DEFENDANTS UNDER THE THEORY OF
ALTERNATIVE LIABILITY.

One final theory of liability advanced by the plaintiffs is that of alternative liability. The theory of alternative liability applies "where negligence on the part of [several] defendants is clear, and it is only the issue of causation which is in doubt, so that the choice must be made between letting the loss due to failure of proof fall upon the innocent plaintiff or the culpable defendants." Prosser, Law of Torts, §41, p. 243 (4th Ed. 1971). The theory of alternative liability is adopted in Section 433 B(3) of the Restatement of Torts, which provides that:

Where the conduct of two or more actors is tortious, and it is proved that harm has been caused to the plaintiff by only one [or more] of them, but there is uncertainty as to which one [or more] has caused it, the burden is upon each such actor to prove that he has not caused the harm.

Thus, as under the enterprise liability theory, where the alternative liability theory is applicable, the burden of proving causation shifts to the independently acting defendants.

The classic case applying the alternative liability theory is Summers v. Tice, 33 Cal. 2d 80, 199 P. 2d 1 (1948). In Summers, the plaintiff was injured when two hunters negligently shot in his direction. It could not be determined which of them had fired the shot which actually caused the injury

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to the plaintiff's eye, but both defendants were nevertheless held jointly and severally liable for the whole of the damages. The California Court reasoned that both were wrongdoers, both were negligent toward the plaintiff, and that it would be unfair to require plaintiff to isolate the defendant responsible, because if the one pointed out were to escape liability, the other might also, and the plaintiff-victim would be shorn of any remedy. In these circumstances, the Court held, the burden of proof shifted to the defendants, "each to absolve himself if he can." Id., p. 86, 199 P.2d p. 4. The Court stated that under these or similar circumstances a defendant is ordinarily in a "far better position" to offer evidence to determine whether he or another defendant caused the injury, or, if not, then as between the defendants and the innocent plaintiff, it is the former who should bear the consequences of any lack of evidence concerning causation.

Relying principally upon the ruling in Summers, the Plaintiffs in Sindell v. Abbott Laboratories likewise sought to impose alternative liability upon the defendants for their manufacture of the defective product DES. The District Court, however, rejected plaintiffs' claims in this regard and refused to apply the theory of alternative liability upon the facts before it, distinguishing the holding in Summers from the case before it as follows. In Summers, all the parties who were or could have been responsible for the harm to the plaintiff were joined as defendants. In contrast, the Plaintiffs in Sindell,

named only five of the approximately two hundred manufacturers of DES as defendants. Thus, while on the one hand, there was certainty in Summers that the defendant who actually caused plaintiff's injury was among those to be held jointly liable, and a fifty percent probability that either of the defendants was responsible for plaintiff's injuries, on the other hand, there was no rational basis in Sindell upon which to infer that any of the five named defendants caused plaintiff's injuries, since any one of the two hundred companies which manufactured DES might have made the product which injured the plaintiff. Accordingly, the Court in Sindell refused to apply the theory of alternative liability.

The clear implication of the Court's analysis in Sindell is that if the market in that case had been smaller and more cohesive, and if all or practically all potentially liable manufacturers had been joined as defendants, the case would have fallen squarely within the holding in Summers v. Tice and the theory of alternative liability would have applied. In this regard, the present case is far more analogous to the situation in Summers than in Sindell, for here, virtually all potentially liable manufacturers are named as defendants. As in Summers, the question in this case is simply which of the named defendants caused plaintiff's injuries. Unlike the situation in Sindell, the possibility that the named defendants will be held liable for the acts of those outside the group and not named as defendants

is remote to non-existent. For the foregoing reasons, therefore, application of the theory of alternative liability is warranted and the defendants may be held jointly and severally liable on such grounds.

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CONCLUSION

The reasons for defendants' conduct are not yet fully clear. Was their failure to act as they should have due to a desire to maximize profits?

What additional costs, if any, were necessary to eliminate the dioxin contaminant from their product? Why didn't defendants who had cost plus contracts with the military, spend whatever sums were necessary to eliminate the dioxin from their products?

The discovery that remains to be completed may answer these questions. What is clear, however, is the "cover up" mentality that pervaded defendants' activities during the Vietnam era, and well beyond.

We append hereto as Exhibit 15 , a letter dated September 15, 1977 from the President of Dow Chemical to all Dow U.S.A. supervisors. The letter speaks for itself and provides further evidence of the continuing conspiracy of silence. That letter states the fundamental corporate position with respect to its responsibility to outsiders, to a great portion of whom that company sells products for profit.

That position is one of silence. It is one of avoidance with respect to the dissemination of any information which might be subject to an interpretation which is critical either of the products or the policies of the company. The bottom line is "when in doubt, throw it out".

Plaintiffs believe that such policy pervaded the attitudes of all of the defendant war-time contractor-manufacturers of Agent Orange and the other phenoxy herbicides supplied during the Vietnam era. We believe that that policy continues today. Under these circumstances, there is much reason and authority for proceeding against these firms under any of the three legal theories discussed. There is also much justification for the imposition of punitive damages in such cases. We respectfully urge the Court to recognize the applicability of such theories.

Dated: December 1, 1983.

Respectfully Submitted,

Stephen J. Schlegel, Esq.

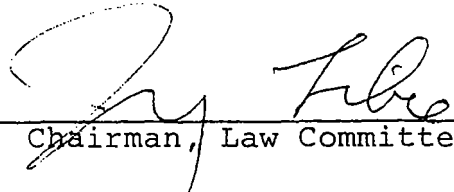
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Chairman, Law Committee

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CERTIFICATE OF SERVICE

On the 1st day of December, 1983, a copy of Plaintiffs' Memorandum On the Applicability of the Legal Theories of Failure to Warn, Concerted Action, Enterprise Liability and Alternative Liability was caused to be served upon all attorneys of record as per the attached list by depositing same in a postpaid properly addressed wrapper in a post office official depository under the exclusive care and custody of the United States post office department within the State of New York.

Dated: December 1, 1983



IRVING LIKE, ESQ.

AGENT ORANGE SERVICE LIST

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is this paper and author
and date.

is working copy

SAN ANTONIO AIR LOGISTICS CENTER
DIRECTORATE OF ENERGY MANAGEMENT
KELLY AIR FORCE BASE, TEXAS

USE OF HERBICIDES IN SOUTHEAST ASIA

History prepared as an active duty assignment by:

DOROTHY A. CRAIG
Lt Col, USAFR

1 August 1975

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800602

Gals. + price by Manufacturer

Herbicide Producers

All herbicide products were produced in the United States. The products showing total amount produced of each by manufacturers and costs are shown below: (Reference individual contracts)

	<u>Orange</u>		
	<u>Gallons</u>	<u>Price</u>	<u>Average</u>
2. Monsanto	3,561,040	\$23,259,233.74	\$6.53
3. Hercules	2,406,041	\$15,947,155.01	\$6.63
5. Diamond Alkali	696,685	\$ 4,689,671.25	\$6.73
6. US Rubber	694,802	\$ 4,730,447.60	\$6.81
1. Dow	4,002,534	\$23,028,212.16	\$7.00
8. Agriseet	100,028	\$ 653,682.98	\$6.53
4. Thompson-Rayward	1,036,475	\$7,317,513.50	\$7.06
7. Thompson	323,685	\$ 2,347,566.10	\$7.04
9. Hoffman Taff	<u>22,440</u>	<u>\$ 159,324.00</u>	<u>\$7.10</u>
Total	12,853,730	\$87,132,806.34	\$6.78

	<u>Blue</u>		
Ansul	1,581,859	\$ 7,113,907.00	\$4.50
Diamond Shamrock	<u>26,370</u>	<u>77,688.60</u>	<u>\$2.98</u>
Total	1,607,929	\$ 7,191,595.60	\$4.47

	<u>White</u>		
Dow	5,764,215	\$39,724,653.81	\$6.89

TOTAL PROGRAM	20,225,914	\$134,049,055.80	\$6.63

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THE DOW CHEMICAL COMPANY

MIDLAND, MICHIGAN 48640

March 19, 1965

000379

Emmet Kelly, M.D.
Medical Director
Monsanto Chemical Company
800 North Lindbergh Boulevard
St. Louis 66, Missouri

Mr. Francis Kennedy
Plant Manager
Diamond Alkali Company
80 Lister Avenue
Newark, New Jersey

Dr. J. Wilkenfeld ✓
Technical Superintendent
Hooker Chemical Corporation
Niagara Falls, New York

Dr. Ed Chandler
Technical Service
Diamond Alkali Company
300 Union Commerce Building
Cleveland, Ohio

Mr. Raymond Verhoeze
Hooker Chemical Corporation
Niagara Falls, New York

Dr. John P. Frawley
Chief Toxicologist
Hercules Powder Company
Delaware Trust Building
Wilmington 99, Delaware

Gentlemen:

I am writing this same letter to each of you. I have talked with some of you and you have indicated the other persons within your own organizations who should be present.

As per these telephoned conversations, I am inviting each of you to come to Midland to discuss the toxicological problems caused by the presence of certain highly toxic impurities in certain samples of 2,4,5-trichlorophenol and related materials.

As I told all of you with whom I have talked, we have been doing analytical and toxicological research on this problem and wish to share our findings to date with all the producers of 2,4,5-trichlorophenol for the sole purpose of lessening any hazards to health that might be attributed to this and related products.

Our discussions will deal only with the toxicological and analytical aspects of the problem. We will not discuss manufacturing know-how, sales, or anything else not dealing with the problems of health.

It is our hope that through this meeting, we will acquire a better understanding of the problem and that each company

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March 19, 1965

will then proceed independently as it sees fit to institute such self-imposed controls on its production as are necessary to insure the safety of its products.

Enclosed is a copy of an analytical method our Analytical Laboratory has developed. Perhaps you would like to have your analysts look it over before coming here. Our analyst will be available to discuss the method with you.

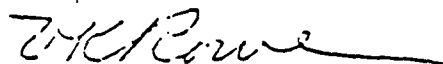
I have reserved a room for each of you at the Midland Country Club for the night of March 23, 1965. When you arrive at the airport serving Midland, Bay City and Saginaw, get the Midland limousine and it will take you directly to the Country Club.

I suggest that we all meet in the lobby at 7:30 A.M. for breakfast and then we will come to our laboratory for our discussions.

I believe we can complete our discussions by lunch time so that reservations for your return trips can be made for any time after lunch.

If any of you have any questions, please call me.

Sincerely yours,



V. K. Rowe
Biochemical Research Laboratory
1701 Building
Phone ME 6-2376
Area Code 517

VKR/jd

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THE DOW CHEMICAL COMPANY

MIDLAND, Michigan
March 29, 1965

*copy to Bill Haberstick
on 1-29-69
- ock.*

DOW 029959

✓ V. K. Rowe
Biochemical Research Laboratory
1701 Building

cc: P. H. Riley
R. M. Smiley
L. B. Grant
C. O. Hutchenreuther
F. C. Amstutz
W. P. Falsey
G. E. Lynn
W. M. Gill
M. O. Wiltse
D. E. Fletcher
W. L. Corbin
D. D. Irish
J. E. Peterson

J. C. Tucker
J. W. Harris
H. W. Feinauer
E. C. Staehling
C. E. Otis
K. Y. Hansen
R. C. Hoff
W. J. McCoy
J. D. Doodens
K. C. Barrons
H. R. Hoyle
B. B. Holder, M.D.
S. E. Sadek

REPORT ON THE CHLORACNE PROBLEM MEETING ON 3/24/65

Present: Dr. J. Wilkenfeld and
Mr. Raymond Verhoeze, Hooker Chemical Corporation

Mr. Francis Kennedy and
Dr. Ed Chandler, Diamond Alkali Company

Mr. C. L. Dunn and
Dr. John P. Frawley, Hercules Powder Company

V. K. recapped the Dow situation in terms of the problem and the initial studies by Toxicology and Environmental Research Laboratory regarding the in-plant situation. He expanded this in general terms to the study of end products, ours and other peoples. He made reference to symmetrical 1,1,1-trichloro-p-dibenzodioxin. He referred to the evidence for unknown achogens. There were some questions from the group about the unknowns. We (Dow) were not able to answer these questions except to review the evidence for their existence in the process samples and end products.

CONFIDENTIAL - SUBJECT TO DISSEMINATION
D.C., ED. 4-4-78, DOW/SPA AGREEMENT 9-79

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3/25/77

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JOHN COPE, JR.

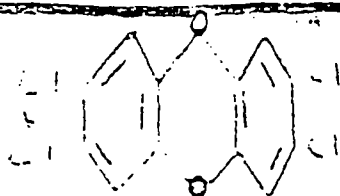
S. L. CHANDLER

CHLOROACNE - DOW MEETING

cc: F. R. Kennedy - Mgr., Newark plant
J. O. King
M. F. Wilkinson

On March 24, Mike Kennedy and I met with two people from Hooker Chemical Co., two from Hercules, and with the Dow group to discuss the toxicological impurities associated with 2,4,5 trichlorophenol and related materials.

Dr. Rose of Dow Chemical opened the meeting by stating that they had operated for 25 years without trouble, but, in the last year, they had 60 to 70 cases of chloracne. Ten of these were moderate, and five to ten were extremely severe. Their approach was a qualitative one at first. They wanted to find the causative material, learn how to identify it, and try to avoid continual trouble with the unknown. They tested various materials from tar fractions and from, as they put it, "gunk", etc. They found that there are a number of suspect materials, probably 26 or 27; but the major "bad actor" that they identified and which seemed to consistently cause the problem was 2,3,7,8-Tetrachlorodibenzo p-Dioxin (symmetrical).



→ 2,3,7,8-TETRACHLORODIBEN
p-DIOXIN
(SYMMETRICAL)

This incidentally was previously listed as a suspect material by Cy Parkins of our company. A similar material is the unsymmetrical 1,3,7,8-TCDD, also sometimes listed as 2,3,7,9-TCDD.

The Dow people used the white glove approach and found this contaminant on tool handles, benches, instruments, and other fomites. In test animals, they could consistently cause the symptoms to appear. Dr. Holder of Dow, one of their medical doctors, had excellent color slides of the various patients. The difficulty starts with multiple blackheads, resulting in closed cystic structures which make the patient look like he needs to wash his face. The disease develops slowly, not appearing until six weeks to two months after mild exposure but appearing in five to seven days with very heavy exposure.

One bench chemist has been under treatment for two years and his face is starting to show signs of clearing. Dr. Holder says that he believes this man's problem will be solved in another six months. Dr. Sadler, who does their microscopic work in connection with their animal laboratory, showed photo micrographs of the cysts as they formed in the ears of rabbits. The cysts correlated with those found on the faces of the man.

REPLY: DIOXINE, CSR

DS 000246391155

Mar 2 1983

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Basically, there is a carotenoid deposit in the hair follicles and oil ducts in the face. These eventually go from the blackhead stage to form a closed, heavy core deposit. The chemical cannot be found in the facial tissues or in the cores, but the problem still persists after exposure. The best description of the acute stage is that the facial tissues resemble the exaggerated surface texture of an orange rather glazed and scrubby with the enclosed hard core deposits.

A secondary symptom, which does not correlate directly with the amount of facial dermatitis, is a fatigue reaction where the employee is completely listless, tired out, and nearly incapacitated. A complete biopsy of liver, kidney, etc., showed no degeneration of major organs. A complete clinical examination of the patients showed no measurable affect on heart, blood pressure, respiration rate, blood sugar etc. The fatigued patients seemed to be helped by heavy doses of vitamins, perhaps related in some way to the carotene metabolism of the body (involving vitamin A, etc.).

An oral dose of 17 micrograms immediately killed the test animals. The Dow people did not lower this dosage to obtain an LD₅₀ but decided that, when they can detect this compound, it should not be in the product. They found that, after exposure to the material, washing within 15 minutes did not help a great deal, but did slow down the speed at which the symptoms appeared. Washing after one hour was of absolutely no help whatsoever in reducing total dermatitis or speed of appearance of the reaction. Moderate scrubbing with detergent does not remove this material. Extremely hard scrubbing can accomplish the task or the use of solvents, such as 1,1,1-trichloroethane.

Dow has developed a new analytical method in which they have confidence in their sensitivity to 1 ppm. They can only state in levels below this that some may be present below the 1 ppm. They stated that they have not used micro-colorimetric methods, and the electron capture tests that they ran made only a very slight improvement in sensitivity with this compound. Their analytical chemist stated that the electron cell saturates because of the presence of other materials in high concentration compared to the dioxin.

This material has some strange properties. It has a fairly high vapor pressure but nevertheless is quite persistent as a contaminant. It can be separated from benzene by boiling if it is not carried down to dryness. The Dow people are extremely careful in all of their work with this compound. They use PVC throw-away gloves, and all samples are burned in a special furnace which operates at 800°F. These samples are sealed before going to the burner. They use bioassay methods on rabbits for qualitative checking only.

The Dow people state that they intend to set a limit of zero with sensitivity of plus or minus 1 ppm on this material. They have analyzed materials from other companies, including our company, and have found amounts as high as 10 ppm in 2,4,5-T acid and 20 to 30 ppm in phenols.

They have made a single application to the ears of test rabbits and found that 20 ppm will not give folliculitis. Forty ppm does give a slight affect, and 100 ppm is severe. They have made repeat applications of from 10 to 100 ppb, and 25 of these treatments do not cause a response; however, 1000 ppb (1 ppm) gives a slight response with nine applications and a severe reaction with 11 applications.

They conclude, therefore, that 1 ppm with repeat exposure can create a real problem.

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Dow's people outlined a method for extracting and running samples of 2,4,5-T; 2,4,5-F; and phenols. It involves a chloroform extraction, followed by

March 25, 1965

a certain work, and a reduction by boiling to one-tenth the volume before putting it in the chromatograph. They have given the gas-liquid chromatography method to us, along with analytical-grade diiodo material. Mike Kennedy has these materials and intends to pursue the laboratory work necessary to ascertain where and how much, if any, of this diiodo appears in our 2,4,5-T process.

The purpose of this meeting was obviously designed to help us solve this problem before outsiders confuse the issue and cause us no end of grief. Dow is sending the test results on our material to us, incidentally; and this will further check our technique, etc.

Sincerely,


E. L. Chandler

EC:een

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DS 00024641

11558

000003

TO: File

FROM: C. L. Dunn

Detailed Notes on Dow Visit 3/24/65
(Toxic Materials in 2, 4, 5-TCP)

Personnel at Meeting

Dow:

Mr. V. K. Rowe - Asst. Director, Biochemical Research
Laboratory
Mr. Larry Silverstein - Industrial Hygienist
Mr. Jack Peterson - Industrial Hygienist (Chem. Engr.)
Dr. S. Sadek - Biochemical Lab.
Dr. Benjamin Holder - Dow Medical Dept. -
Mr. Harold Gill - Anal. Chem., Dow Operating Dept.
Mr. Harold Gordon - (lunch only)
Dr. Edward Adams (lunch only) - Biochem. Res. Lab., Dir.

Hooker Chemical Co.:

Dr. J. Wilkenfeld - Tech. Superintendent, Niagara Falls, N.Y.
Mr. Raymond Verhoofze - Tech. Mgr. Eastern Div.,
Niagara Falls, N. Y.

Diamond Alkali:

Dr. Ed. Chandler - Mgr., Tech. Service, Cleveland, Ohio
Mr. Francis (Mike) Kennedy - Plant Mgr., Newark, N. J.

Hercules Powder:

Dr. J. P. Frawley - Chief Toxicologist
Mr. C. L. Dunn - Syn. Dept.

MAR 2 1965

Wilkenfeld - 4 Id

11357

HO 1305

V. K. Rowe

Presented a brief history of their experience at Dow. Stated that they had no chloroacne problems at Dow for a period of 25 years. Recently (no details given) discovered that their plant was contaminated with chloroacnegens--tools, walls, piping, all surfaces. About 60-70 cases of chloroacne resulted. Of these, 5-10 were severe, 10 moderate, remainder mild.

Examination of fractions from 2, 4, 5-trichlorophenol (2, 4, 5-TCP) by rabbit ear bioassay identified certain portions as chloroacnegens. Analysis later confirmed the identity of some of these. Tars were analyzed by gas chromatography, and yielded at least 26 peaks; there is some evidence that these are also chloroacnegens.

The plant was examined by taking "wipe samples". A clean canvas glove was worn, a surface was wiped with a finger, and the finger cut from the glove. The finger was extracted and the extract bioassayed (rabbit ear). The plant was found to be completely blanketed with chloroacnegens.

2, 4, 5-T made from Dow 2, 4, 5-TCP was tested by benzene extraction and bioassay and chemical analysis. Their results for chloroacnegens were positive. Rowe expressed concern that carry-through of toxic materials into final formulated herbicide products may occur unless precautions are taken.

11558

Dr. Benjamin Holder

Presented a description of the chloroacne cases, including ~~photographs of the chloroacne cases, including~~ photographs. Cystic sebaceous involvement. Sooty appearance of skin on face due to blanketing of skin with myriad of blackheads. Also larger swellings due to occluded cysts. Complaints of excessive fatigue also noted in some cases. Evidence that the chloroacnegens may be systemic. "Cycling" noted throughout the 2-1/2 year period of the disease--more intensive at certain periods, less at others.

Very thorough battery of clinical chemistry tests and physical examination to see if any other impairment of body function. Even liver biopsy in a few cases. No ^effect other than skin could be found. Pimple squeezings were collected and subjected to analysis, but could find no chloroacnegens by gas chromatography.

Dow is now operating their plant, and have encountered no new

electrical insulation. Fumes or dust produced the disease, and the bilateral responses suggest that the toxic materials may be systemic.

Severe exposure gives an inflammatory response within seven days. Lesser exposure gives a response period of 2-3 weeks.

Photomicro graphs of sections of skin from rabbit ears at various stages of chlo-ro-acne were shown, as well as some liver sections.

Hyper Keratosis in cattle and swine due to feed contaminated with chloromphthalenes from lubricating oil was experienced in the U. S. about 10 years ago. The predilection site for cattle is the neck; for swine, the buttocks. Vitamin A may be involved in the sequence of events involved in the course of the disease, or may be an index or indicator.

Topical application to rabbit ears is the bioassay procedure. After topical application, washing from 15 minutes to 4 hours later does no good. Dr. Sadek noted that rabbits whose ears had been washed (thoroughly washed or scrubbed with detergent ^{and} water) had severely damaged livers ("grade 4"). This suggests washing may have caused greater absorbtion.

Plant clean-up at Dow was done by thorough scrubbing with detergent and water, and in some areas washing with solvent (Chlorothene, 1, 1, 1-trichloroethane) was performed.

The acute oral LD₅₀ to rabbits of 2, 3, 7, 8-tetrachlorodibenzo-p-dioxin was found to be only 17 micrograms per kilogram body weight. Extremely toxic.

Harold Gill - Analytical Techniques

Gas chromatography (see attached method). They have not used micro-coulometric detector. Electron capture detector does not give the expected super-sensitivity. Has disadvantage that other chlorinated materials do have strong electron-absorption, and have a swamping, or overwhelming effect on detector which is troublesome.

Detection limits as follows:

nonsaponifiable oils from 2, 4, 5-TCP - 10 p.p.m.

2, 4, 5-TCP - 1 p.p.m.

2, 4, 5-T acid - 1 p.p.m.

2, 4, 5-TP acid (Silvex) - 1 p.p.m.

Believe that bioassay is more sensitive than gas chromatography.

2, 4, 5-TCP converted to sodium phenate, and this extracted with chloroform. Twenty grams 2, 4, 5-TCP + NaOH, extracted with 20 ml CHCl₃.

2, 4, 5-T and 2, 4, 5-TP free acids-- shake 20 grams of sample with 40 ml CHCl₃ for one hour. Filter, wash CHCl₃ solution with an equal volume of 0.1 N aqueous NaOH. Evaporatively concentrate to one-tenth volume.

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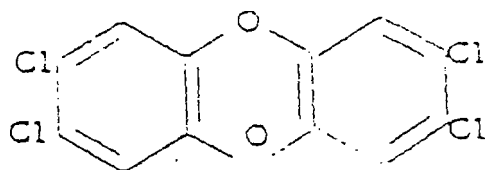
609639

Use extreme care in handling. Disposable gbyes. All refuse collected in special containers, disposal by burning in special high-efficiency incinerator (ok'd for burning radioactive trash). At 800°C. in an open tube, decomposition of the 2,3,7,8-compound was 99.6% complete. Dow lab has decontaminated glassware by putting in glass shop annealing oven overnight.

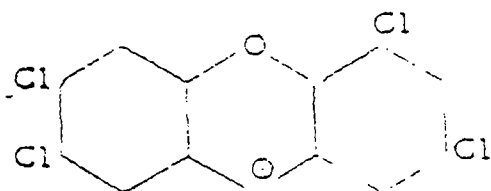
Plant waste at Dow is presently encapsulated (drums) and buried.
~~They do not know if soil bacteria decompose the chloroacnogens.~~

(X) Competitor products - Dow has examined all manufacturers' 2,4,5-T products. Some have "surprisingly high" amounts of chloroacneger. This defined as 10 p.p.m. in 2,4,5-T acid, and up to 30 p.p.m. in 2,4,5-trichlorophenate.

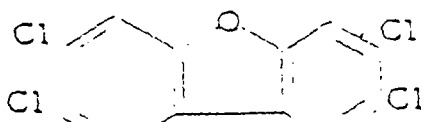
Jack Peterson - Identities and Statistics



2,3,7,8-tetrachlorodibenzo-p-dioxin



1,3,7,8-tetrachlorodibenzo-p-dioxin
 (misnamed 2,3,7,9-tetrachlorodibenzo-p-dioxin)



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Bioassay technique 2, 3, 7, 8-tetrachlorodibenzo-p-dioxin

has been applied in single and multiple dosages ranging from 2 p.p.m. to 0.1% in benzene solution. Application is 0.1 ml of solution, spread over the 1-1/2 inch upper portion of the ear (inner surface). Multiple applications are made one a day, 5 days each week.

Single Application (no washing):

20 p.p.m. - no reaction
40 p.p.m. - slight folliculitis
100 p.p.m. - severe folliculitis

Multiple Application (no washing)

Average induction period 10 days.

Up to 25 applications of 100 p.p.m. gave no response (folliculitis)

Liver Response - do not yet know what the no-effect level is for liver response.

C. L. Brown
3-29-65

11563

HO 1311

Rowe - 9

3-16-83

Visit to Dow Chemical, Midland, Michigan - Chloracne

On Wednesday, March 24, 1965, R Ver Hoeve and the writer visited the Biochemical Research Department of Dow at their request to discuss their findings on chloracne as outlined in the attached letter. Information was presented by the following people from Dow: V. J. Rowe, Assistant Director, Biochemical Research Department; Dr. Holder, physician who examined the affected people; Dr. Sadik, a member of the Biochemical Research Department staff who discussed experimented animal pathology; Harold Gill of the analytical section who developed the vapor-liquid chromatographic method; Larry Silverstein, industrial hygienist concerned with implant investigations; and Jack Peterson who is conducting the statistical evaluation.

The information as presented was that about a year ago, Dow encountered widespread plant contamination that was not caused by an explosion. Approximately 50-70 cases of chloracne occurred and it is their impression that the rash takes from 6 weeks to 7 months to appear after exposure. Severe exposure results in symptoms becoming apparent in 5-7 days.

Much of the investigatory work was carried out using the bio-assay test on rabbit ears which is Dow's standard procedure as discussed in a memorandum dated April 24, 1961 by the writer. More recently, Dow has developed a vapor-liquid chromatographic method which will detect down to 1 ppm of the primary causative agent, 1,2,3,4-tetra-chloro p-dibenzodioxane. They have also found that the 1,3,5,7 is also active biologically, but not to the extent the symmetrical compound is.

The results also indicate that the bio-assay method is more sensitive than the chromatographic, however, concentrations down to 1 ppm can be determined chromatographically. Dow has collected over 500 plant wipe samples, using clean canvas gloves for bio-assay testing and have used this method for determining corrective action. They have had safe chloracne-free operation in their plant for the last several months.

Clinical photographs shown during the discussion revealed that there was a great deal of blackhead formation in open and closed pores and Dr. Holder reported that there was also some indication of excessive fatigue and tiredness but that this does not have any correlation with the extensiveness of the rash. No pathological effects could be found on the individuals examined including one on which a liver biopsy was conducted.

The primary effects appears to be one of stimulation of production of keratin and sebaceous materials in the glands of the skin. Earlier literature references indicate that there might be some possible relationship with Vitamin A metabolism but vitamin therapy did not seem to help in the current cases though there was some slight sign it may have helped the fatigue symptoms.

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~~Work with rabbits with washing after exposure, sometimes as soon as 15 minutes after application, did not stop the development of the chloracne and single oral dose toxicity tests (not also) resulted in the death of some rabbits at a dose level of 100 mg/kg. Periodic liver cell necrosis occurred in some rabbits where the washing was done. Mice appear to be resistant to this material. It was the opinion of the speakers that there are strong indications that the action of the material is by absorption through the hair follicles with systemic distribution.~~

A & G 805820

With regard to plant cleanup procedures, it was reported that the chloracne can be removed by solvents such as benzene or chloroethane (Dow's brand name for 1,1,1 tri). It was also possible to clean contaminated surfaces using detergent and water with vigorous scrubbing.

With regard to analytical methods, it was noted that determinations can be run to 10 ppm for samples in oils such as tri and tetrachlorobenzene or directly in non-extractable fractions. In 2,4,5 T acid, the symmetrical chloracne can be detected down to 1 ppm when handled by a procedure where a 10 gram sample is extracted with 20 grams of chloroform and given a caustic wash. The chloroform extract is then concentrated 10:1 and run as outlined in the method provided. It was noted that they cannot at present test water formulations chromatographically. At present samples of TCP are handled by converting the material to the sodium salt and dissolving to a 10% solution in water followed by extraction with chloroform. The current practice is to use a 20 gram sample of the phenate and extract with 20 ml of chloroform; no caustic wash is required with the chloroform extract then being concentrated 10:1.

Lab handling procedure require the use of vinyl throw-away gloves at all times. Dow uses Quixams, made by Pioneer Rubber Company, Willard, Ohio. A separate pak is used for all wastes, including contaminated materials, gloves, and any samples. The entire fiber pak is sealed before taking to their residue burner installation where the entire drum is burned. This is not their liquid incinerator but their rotary kiln.

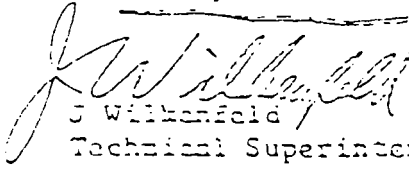
A sample of the symmetrical 2,3,7,8 tetra chloro dibenzodioxane was given us to be used as a standard for chromatography work.

Currently Dow feels that the bio-assay test is the more sensitive analytical test and are working on correlating the two. They realize bio-assay is too lengthy procedure for routine use but are continuing to use it for final control.

The current inplant working limit is "no response" with less than 1 ppm by chromatography considered safe. When they were having difficulty, chloracne caused here in the order of 20-30 ppm. Air sampling finds no chloracne causative in vapor or gas samples, indicating safe volatility levels. Dust samples were only active when collected from extremely large air samples.

Their statistical work currently indicates that a single application of 0.1 ml of a 40 ppm solution will give a slight reaction. Reactions were severe at 100 ppm. For repeated applications, initial response was rarely found in less than 7 days. Response averaged 10 days. With 25 applications at 10 ppb, 25 ppb, and 100 ppb no response was found. At 1 ppm a slight response was noted after 9 applications and severe response after 11.

Mr Rowe told us that our product was not active (see attached note) and the general statement was made that some samples of phenates tested had as high as 20-30 ppm of the symmetrical dioxane and some of the 2,4,5 T acid as high as 10 ppm.


J. Willenfeld
Technical Superintendent

fl

cc: JSC CIG RVH MLP NH HRE PDE CMO

11565



THE DOW CHEMICAL COMPANY

MIDLAND, Michigan
March 29, 1965

*copy to Bill Haberstick
on 1-29-69
- ocl.*

DOW 029959

A&G 000871

156

V. K. Rowe
Biochemical Research Laboratory
1701 Building

cc: F. H. Niley
R. M. Smiley
L. B. Grant
C. O. Hutchenreuther
F. C. Amstutz
W. P. Valsey
G. E. Lynn
W. M. Oill
M. O. Wiltse
D. E. Fletcher
W. L. Corbin
D. D. Irish
J. E. Peterson

J. C. Tucker
J. W. Harris
H. W. Feinauer
E. O. Staehling
C. E. Otis
K. Y. Hansen
R. O. Hoff
W. J. McCoy
J. D. Doedens
K. C. Barrons
H. R. Hoyle
B. B. Holder, M.D.
S. E. Sadek

REPORT ON THE CHLORACNE PROBLEM MEETING ON 3/24/65

Present: Dr. J. Wilkenfeld and
Mr. Raymond Verhoeve, Hooker Chemical Corporation

Mr. Francis Kennedy and
Dr. Ed Chandler, Diamond Alkali Company

Mr. C. L. Dunn and
Dr. John P. Frawley, Hercules Powder Company

V. K. recapped the Dow situation in terms of the problem and the initial studies by Toxicology and Environmental Research Laboratory regarding the in-plant situation. He expanded this in general terms to the study of end products, ours and other peoples. He made reference to symmetrical intrachloro-p-dibenzodioxin. He referred to the evidence for unknown mutagens. There were some questions from the group about the unknowns. We (Dow) were not able to answer these questions except to review the evidence for their existence in the process samples and end products.

CONFIDENTIAL - SUBJECT TO EXEMPTION
D.C. ED. 41 4-478, DOW, EPA AGREEMENT 9-79

UOW 1 129860

ONLY CONFIDENTIAL

I have not been neglecting your request for information on use in discussing the problem presented with Harkness and the GPO. I have been busy, however, because the analytical method has been changed and it is in the process of being cleared and reproduced. I expect then any day, but rather than wait, I thought I should advise you of the situation. I will send you copies of these methods as soon as they become available.

[illegible]

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DOW CONFIDENTIAL

M. Mulholland

- 2 -

June 24, 1965

DOW 1129861

plants handling such phenol, T acid, or T acid esters.

I might add that we are continuing our researches on this particular problem from the standpoint of studying the other impurities which may have the capacity to produce this type of reaction. Also, we are attempting to quantitate the effects of the known impurities when added to base materials. This work is progressing well, but it will be several months before we have a completed story.

I would urge again that if your big customers such as Co-Op and Naugatuck have particular questions about this problem that you invite them to come to Midland where we will be glad to discuss the matter in detail with them and show them what we have learned. We are not in any way attempting to hide our problem under a heap of ash, but we certainly do not want to have any situations arise which will cause the regulatory agencies to become restrictive. Our primary objective is to avoid this.

I trust that you will be very judicious in your use of this information. It could be quite embarrassing if it were misinterpreted or abused.

V. K. Rowe
Biochemical Research Laboratory
1701 Building
MS 6-2376

VKR/ld

cc: L. Silverstein
C. Otis
Grady Waldman
F. Amstutz
D. Goergen
H. Horie
W. Falser
V. K. Rowe (2)
T17.4-12-20
Correspondence

P.S. Under no circumstances may this letter be reproduced, shown, or sent to anyone outside of Dow.

VKR

A&G

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INTRODUCTION AND BACKGROUND

GEORGE E. LYNN

CHEMISTRY AND ANALYTICAL METHODOLOGY

ETCYL H. BLAIR

TERATOLOGY

DON D. MCCOLLISTER

801856

11571

CONFIDENTIAL
HERCULES POWER COMPANY

P-13 ID

3-8-83

John Copeland - Executive
John Dugan - President
C. L. Dorn - President
E. L. Vicker - Superintendent, etc.
Allen R. A. D. Arnold
J. G. Dandora - Legal
L. C. Moore - Industrial

NOT TO DISCLOSE INFORMATION FROM THIS DATE 3-8-83

In July 8, 1963, Mr. Jack Burman of the General Company telephoned me stating that he was calling in the request of Mr. Donald Nelson, Vice-President of Dow to inquire how serious I considered the aluminum problem in relation to the consumer use of 2,4,5-F. When I suggested that he should discuss this with Burman management rather than with me, he stated that on the advice of their toxicologists Dow had gone to great expense to alter their manufacturing practices in order to produce 2,4,5-F which was less than 1 ppm aluminum.

When several months ago Dow had made available to all other producers the same data which concerned their toxicologists to set an internal specification of 1 ppm on the acid, they had assumed that the other producers would take similar action. On the basis of their chemical analysis, they are convinced that no one else has been willing to remove the aluminum from their 2,4,5-F and consequently, they wanted to obtain whether they had been misinformed by their own toxicologists.

I advised Mr. Burman that I did not believe this was a proper question for me and that he should seek outside advice from a private consultant if he doubted the advice of his own toxicologists. I pointed out that considerable individual professional judgment would be involved in establishing a specification of this type because all of the important facts are not known.

He then stated that Dow was extremely frightened that this situation might explode. They are aware that their competitors are producing 2,4,5-F which contains "aluminum impurities" of unknown and if the Government learns of this the whole industry will suffer. They are particularly fearful of a Congressional investigation and extensive restrictive legislation on manufacture of pesticides which might result.

I advised Mr. Burman that we shared his fear but were not aware of this allegation that the competitors' products were hazardous. He asked if Burman had established an internal specification. I stated that he should discuss this with someone in our management and referred him to Mr. Copeland. I recalled his statement that we had experienced great difficulty in conducting the analysis for the aluminum by the Dow procedure, and that only within the past few weeks, following a visit of our chemists to England, were we able to obtain any useful information. I suggested that if he wanted any additional information on this problem he should call to Mr. Copeland. He asked that he be transferred to Mr. Copeland.

(After the call was transferred I learned that Mr. Copeland was out of town and Mr. Burman left word that he would call on Monday, July 15).

JPJ/aww
July 15, 1963

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HERCULES 4 (K)

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Exhibit No. DARROW - 7 ^{Id}

JUL 13 1992

Heywood Waga

SHUEA-RHT

11 March 1970

MEMORANDUM FOR: Director of Research Laboratories

SUBJECT: Report of Trip to ACSFOR, Washington, D. C., 6 March 1970

1. Purpose of Travel:

To attend a briefing by Dow Chemical Company representatives for General William A. Stone on 2,4,5 trichlorophenoxy-acetic acid (2,4,5T).

2. Discussion of Problem:

The Dow Chemical Company representatives presented the following information on 2,4,5T.

Since 1950 it has been known that 2,3,7,8 tetrachlorodibenzo-p-dioxin is an impurity associated with 2,4,5 trichlorophenol (TP). The latter material is used in the manufacture of 2,4,5T. Dioxin is a highly toxic material having oral LD50s in rats and guinea pigs of 22-45 and 6 ug/kg, respectively. It is a potent acne-producing substance. The LD50 for 2,4,5T in rats and guinea pigs is 500 and 380 mg/kg, respectively. In 1964, Dow closed their plant which manufactured 2,4,5T due to widespread acne among plant workers. Dioxin and other impurities were found in the 2,4,5T. The plant was cleaned and the manufacturing process was changed to eliminate the dioxin and other impurities. The Dow 2,4,5T now contains less than 0.5 ppm of dioxin.

Bionetics reported that daily doses of 4.6 ug/kg of 2,4,5T during the 10-15th day of gestation caused cleft palates and other abnormalities in fetal rats. The Bionetics' sample of 2,4,5T was manufactured by Diamond Alkali Co., and contained 27 ppm of dioxin.

Dow Chemical Co. recently tested "dioxin-free" 2,4,5T in rats at 1, 3, 6, 12, and 24 mg/kg and in rabbits at 1, 20, 40 mg/kg, during formative days of gestation. The purified 2,4,5T did not cause fetal anomalies. Dioxin in doses of 0.03, 0.125, 1.5, 2.0 and 3.0 ug/kg in rats during the 6-15 day of gestation did cause fetal abnormalities but not cleft palates as were noted in the Bionetics' tests. The Dow toxicologist felt that the difference seen in the two tests might be referable to semantics of reporting. However, it is also possible that impurities other than dioxin might have caused the cleft palates in the Bionetics' tests.

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SMJEA-RMT

11 March 1970

MEMORANDUM FOR: Director of Research Laboratories

It appears that 2,4,5T itself does not cause teratogenic effects in the doses studied.

The acid and butyl-esters (used in "Orange") are manufactured by Dow Chemical Co., Monsanto Chemical Co., Hercules Powder Co., Howard Taft Chemical Co., and Diamond Alkali Co. The latter discontinued producing these products in 1969. The US Army purchased 2,4,5T esters from all of the above mentioned companies. Teratogenicity of the butyl esters has not been tested.

3. List of Attendees:

Dr. George E. Lynn, Regulatory Operations; Dr. Evelyn H. Blair, Chemist; Dr. Keith Barrons, Herbicide Specialist; and Mr. Don McCollister, Toxicologist, Dow Chemical Company.

General William H. Stone, COL George W. Connell, COL John J. Osick, and MAJ Manuel L. Sanches, ACSFOR.

Dr. Benjamin L. Harris, OSD, DOR&E.

Dr. Charles Minarik, and Dr. Robert Darrow, Ft. Detrick, Md.

Dr. Wayne Vandeventer, Analytical Chemist, Kelley AFB, Texas

Dr. B. Jandorf, Dr. B. P. McHamara, and Mr. S. Sass, Psch Labs, Edgewood Arsenal, Maryland.

BERNARD P. McHAMARA, Ph.D.
Chief, Toxicology Department
Medical Research Laboratory

BERNARD J. JANDORF, Ph.D.
Chief, Chemical Research Laboratory

SAMUEL SASS
Chief, Analytical Chemistry Department
Chemical Research Laboratory

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11570

LD₅₀ BY GASTRIC INTAKE

LD₅₀ AS MILLIGRAMS PER KG BODY WEIGHT

	RAT	GUINEA PIG
"DIOXIN"*	0.022 - 0.045*	0.0006 -
2,4,5-T	500.	380.
2,4-D	375. - 666.*	1,000.
SILVEX	500.	850.
PICLORAM	8,200.	3,000.
DDT	150. - 800.*	400
PARATHION	1.7 - 30.*	9.3 - 30.*

"DIOXIN" = 2,3,7,8-TETRACHLORO-BENZO-P-DIOXIN

* VARIES ACCORDING TO VEHICLE USED AND/OR SEX.

601857

THE DOW CHEMICAL COMPANY
MIDLAND, MICHIGAN

11572

2,4,5-TRICHLOROPHENOL (2,4,5-TP).
ISOLATED 2,3,7,8-TETRACHLORODIBENZO-P-DIOXIN AND
CHLORODIBENZOFURANS FROM TARS.

- 1956 IMPURITIES FROM Dow 2,4,5-TP INACTIVE BY RABBIT EAR TEST.
- 1956 - TARS FROM Dow 2,4,5-TP PROCESS ACTIVE--WARNING GIVEN
1964 BUT NO CHLORACNE IN EMPLOYEES.
- 1964 Dow 2,4,5-TP TARS VERY ACTIVE IN RABBIT TEST. CASES OF
CHLORACNE AMONG EMPLOYEES.
PLANT CLOSED, CLEANED AND REBUILDING BEGAN.
- 1964 Dow 2,4,5-T MONITORED BY RABBIT TEST. NO DIOXIN FOUND.
- 1965 Dow DEVELOPED METHOD FOR CHLORODIOXIN SENSITIVE TO
(MARCH- 1 PPM. ESTABLISHED SPECIFICATIONS OF <1 PPM 2,3,7,8-
MAY) TETRACHLORODIBENZO-P-DIOXIN IN 2,4,5-TP AND 2,4,5-T,
PURCHASED OR MANUFACTURED.
- 1966 Dow PLANT BACK ON STREAM. NO TETRACHLORODIBENZO-P-DIOXIN
DETECTABLE IN Dow 2,4,5-TP OR 2,4,5-T.
- 1969 - IMPROVED TECHNIQUES SHOW Dow 2,4,5-T ASSAYING 0.5 PPM
1970 OR LESS 2,3,7,8-TETRACHLORODIBENZO-P-DIOXIN.

THE DOW CHEMICAL COMPANY
MIDLAND, MICHIGAN

801858

11573

27± 8 PPM 2,3,7,8 TETRACHLORODIBENZO-P-DIOXIN

ACTIVE IN RABBIT EAR TEST.

CONDUCTED TERATOLOGY TESTS WITH Dow 2,4,5-T

CONDUCTED TERATOLOGY TEST WITH 2,3,7,8-TETRACHLORO-DIBENZO-P-DIOXIN.

COOPERATED FULLY WITH FDA, NIH, USDA, OST IN
SUPPLYING:

SAMPLES
ANALYTICAL METHODS
CHEMISTRY

601859

11574

TYPICAL COMPOSITION

2,4,5-TRICHLOROPHENOXACETIC ACID

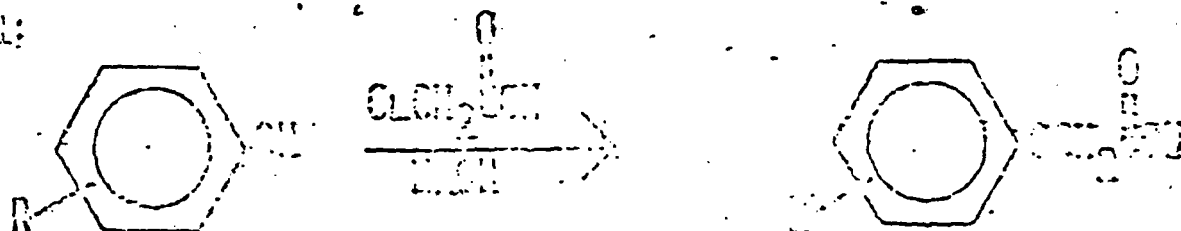
<u>COMPONENT</u>	<u>PERCENT</u>
2,4,5-TRICHLOROPHENOXACETIC ACID	95.0
BIS(2,4,5-TRICHLOROPHENOXACETIC ACID	0.5
DICHLOROMETHOXYPHENOXACETIC ACIDS	3.2
2,5-DICHLOROPHENOXACETIC ACID	0.5
2,4-DICHLOROPHENOXACETIC ACID	0.1
2,3,6-TRICHLOROPHENOXACETIC ACID	0.2
2,4,5-TRICHLOROPHENOL	0.1
2,3,7,8-TETRACHLORODIBENZO-p-DIONIN	<0.5 ppm

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1. PHENOXYACETIC ACID BY-PRODUCTS DERIVED FROM PHENOLIC IMPURITIES
IN 2,4,5-TRICHLOROPHENOL

REACTION:



R-PHENOXYACETIC ACID
BY-PRODUCTS
2,4,5-TRICHLOROPHENOL

PERCENTAGE OF
BY-PRODUCTS
2,4,5-TRICHLOROPHENOL

2,4-DICHLORO

2,5-DICHLORO

3,4-DICHLORO

2,3,4-TRICHLORO

2,3,6-TRICHLORO

4,5-DICHLORO-2-METHOXY

2,5-DICHLORO-4-METHOXY

2,4-DICHLORO-5-METHOXY

0.5

3.5

801861

ANALYSIS OF 2, 4, 5-TRICHLOROPHENOL
(GAS-LIQUID CHROMATOGRAPHY METHOD)

<u>Component</u>	<u>Sample Numbers</u>		
	<u>05029-1F</u>	<u>05160-2F</u>	<u>05040-1F</u>
Dimethyl Ethers	--	0.01	--
Sum of Monochlorophenols	2.00	2.00	2.00
2, 4, 5-Trichlorophenol	25.1	25.2	25.6
2, 3, 6-Trichlorophenol	1.21	1.08	1.70
2, 6-Dichlorophenol	--	1.02	--
3, 5-Dichlorophenol	--	1.85	0.84
2, 4, 6-Trichlorophenol	--	1.01	0.00

801862

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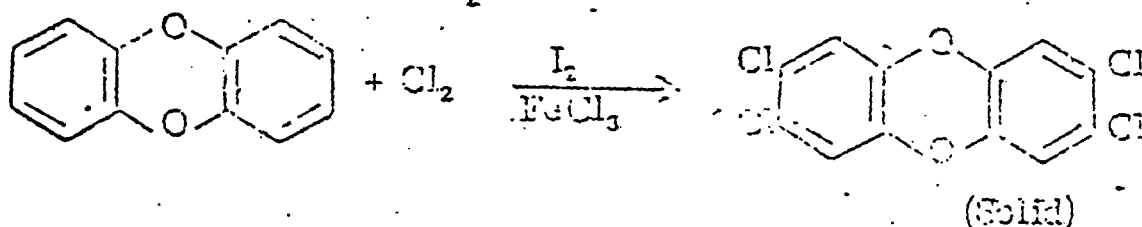
ANALYTICAL DATA FOR CHLOROFORM-INSOLUBLE
IMPURITY IN DISTILLATION RESIDUE

<u>Analysis</u>	<u>Found</u>	<u>2, 3, 7, 8-Tetrachloro-p-dioxin</u>
Carbon, %	45.2	41.7
Hydrogen, %	1.45	1.25
Chlorine, %	44.8	41.0
Mass No.	320	320
Mol. Wt.	320	320
Melting Point	200-205°C	200-205°C
Infrared Examination		

801863

11578

SYNTHESIS
OF
2,3,7,8-TETRACHLORODIBENZO-*p*-DIOXIN



CHLORINATION

PURIFICATION

	Found	Theoretical
Carbon, %	44.7	44.7
Hydrogen, %	1.31	1.25
Chlorine, %	43.7	44.0
Mass No.	320.	320.
Mol. Wt.	318.	322.
Melting Point	293-305	295; 295-300; 320-325

Infrared examination agreed with structure.

Sandermann, W., et al, Chem. Ber. 90, 690 (1957)

601864

11579

SOLUBILITY OF 2,3,7,8-TETRACHLORODIBENZO-P-DIOXIN
IN VARIOUS SOLVENTS AT 25°C

<u>SOLVENT</u>	<u>SOLUBILITY</u>	
	<u>G./100 ML.</u>	<u>WT. PERCENT</u>
O-DICHLOROBENZENE	0.18	0.14
CHLOROBENZENE	0.080	0.072
PERCHLOROETHYLENE	0.068	0.048
CHLOROFORM	0.055	0.037
BENZENE	0.047	0.057
ACETONE	0.009	0.011
DIMETHYLSULFOXIDE (a)	<0.01	<0.01
METHANOL	0.001	0.001
WATER	<0.0005	<0.0005

(a) DMSO CAUSED DETECTOR FOULING AND A BETTER VALUE COULD NOT BE OBTAINED. HOWEVER, SOLUBILITY DOES NOT EXCEED 0.01 PERCENT.

ML-ALS 57-474

DECEMBER 8, 1964

THE DOW CHEMICAL COMPANY
MIDLAND, MICHIGAN

801865

11580

		NORMAL		FETUSES/LITTER		MORTALITY		ANOMALIES	
113	0	INJ.	0	0.03	--	--	--	--	--
113	3.4	INJ.	0.2	0.03	--	--	--	--	--
21.5	3.4	ORAL	0.5	0.1	--	--	--	--	--
45.4	0.6	INJ.	0.75	0.1	--	--	--	--	--
113	1.4	INJ.	0.71	0.56	--	--	--	--	--
113	3.4	ORAL	--	0.29	Yes	--	--	--	--
3.4	3.4	ORAL	1.00	--	--	--	--	--	CK
		ORAL	1.00	0.37	0	--	--	--	CP
		ORAL	1.00	0.70	0	--	--	--	CP
				0.54	--	--	--	--	0
					Yes	--	--	--	--
					Yes	--	--	--	--
						--	--	--	CK
						--	--	--	CP
						--	--	--	CP

CK = CYSTIC KIDNEY
CP = CLEFT PALATE

11581

1874

BIOLOGICAL

672

RAT TERATOLOGY STUDY

(FROM "REPORT OF THE SECRETARY'S COMMISSION ON PESTICIDES AND THEIR RELATIONSHIP TO ENVIRONMENTAL HEALTH" USDHEW DECEMBER 1969)

ORAL DOSE LEVELS

MG 2,4,5-T* /KG BODY WT/DAY**	EQUIVALENT (APPROX) UG "DIOXIN"/KG BODY WT/DAY	EFFECTS	
		FETAL MORTALITY	ABNORMAL FETUSES
0	0		
4.6	0.14	[UP TO 60% AT HIGHEST DOSAGE	[THREE-FOLD OVER CON- TROLS, EVEN AT LOWEST DOSE
10.0	0.3		
45.4	1.4		

* DOW ASSAY = 27 ± 8 PPM 2,3,7,8 TETRACHLORODIBENZO-P-DIOXIN

** DOSED FOR 6 DAYS, 10 THROUGH 15 DAYS OF GESTATION,
VEHICLE = HONEY

801867

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THE DOW CHEMICAL COMPANY

23 FEBRUARY 1970

801868

11583

ORAL DOSE LEVEL

MG 2,4,5-T* /KG BODY WT/DAY**	EQUIVALENT UG "DIOXIN"/ KG BODY WT/DAY	NO. OF LITTERS	AVG. NO. OF LIVE PUPS PER LITTER	TOTAL DEAD PUPS	AVG. NO. RESORPTIONS PER LITTER	VISCERAL AND SKELETAL ABNORMALITIES ***
0	0	48	12	0	0.67	] NO SIGNIFICANT DIFFERENCES OBSERVED BETWEEN CONTROL GROUP AND HIGHEST DOSAGE GROUP
1	0.0005	24	11	0	1.04	
3	0.0015	23	12	0	0.74	
6	0.003	23	12	0	1.17	
12	0.006	24	12	0	0.71	
24	0.012	25	12	0	0.64	

* Dow 2,4,5-T CONTAINED 0.5 PPM "DIOXIN" (2,3,7,8-TETRACHLORODIBENZO-P-DIOXIN)

** Dosed for 10 days, 6 through 15 days of gestation, vehicle 0.25% HYDROXYPROPYL-
METHYLCELLULOSE

*** FETUSES EXAMINED PER GROUP: VISCERAL = 200, SKELETAL = 100

EXPERIMENTAL DESIGN WORKED OUT WITH NIH-NCI AND NIEHS OF USDHEW.

RESULTS OBSERVED BY DR. H. L. RICHARDSON, FDA OF USDHEW

PROOF READ
10 DECEMBER 1970
REPLIES TO 2,4,5-T

THE DOW CHEMICAL COMPANY
12 JANUARY 1970

MG 2,4,5-T* /KG BODY WT/DAY**	DOSE LEVEL EQUIVALENT UG "DIOXIN"/ KG BODY WT/DAY	NUMBER PREGNANT/ NO. BRED	TOTAL LIVE KITS	TOTAL RECEPT
1	0.0005	2/4	9	1
20	0.01	1/4	5	0
40	0.02	4/4	11	0

* HOW 2,4,5-T, CONTAINED 0.5 PPM 2,3,7,8-TETRACHLORODIBENZO-P-D.
("DIOXIN")

** Dosed 13 days, 6 THROUGH 18 OF GESTATION
TO TERATOLOGICAL CHANGES OR LESIONS OBSERVED THAT COULD BE ASSOCIATED
WITH THE 2,4,5-T.

(29)

PROGRESS REPORT
RAT TERATOLOGY STUDY

2,3,7,8-TETRACHLORODIBENZO-P-DIOXIN

801870

11585

THE DOW CHEMICAL COMPANY
5 MARCH 1970

DOSE LEVEL IN "DIOXIN"/KG BODY WT/DAY*	NO. OF LITTERS	AVG. NO. OF LIVE PUPS PER LITTER	TOTAL DEAD PUPS	AVG. NO. RESORPTIONS PER LITTER	GROSS ABNORMALITIES			
					INT HEM 1	SUB-Q EDEMA 2	TAIL AND TAIL LIMS	
0	21	10	0	3	0	0	0	0
0.03	10	12	0	3	0	0	0	0
0.125	9	12	3	2	17	0	1,	0
0.5	11	8	9	4	31	0	0	0
2.0	10	0.3	0	12	1	2	0	1,
8.0	8	NFE	NFE	14	NFE	NFE	NFE	NFE.

DOSED FOR 10 DAYS, 6 THROUGH 15 DAYS OF GESTATION; VEHICLE ACETONE/CORN OIL SOLUTION
NFE = NO EVIDENCE OF FETAL TISSUE PRESENT,
1 = INTESTINAL HEMORRHAGE, 2 = SUBCUTANEOUS EDEMA, 3 = RUDIMENTARY TAIL, 4 = ROTATION OF
LIMBS, SHORTENING OF DIGITS, TAIL CURVED

RESULTS OBSERVED BY DR. H. L. RICHARDSON, FDA AND DR. T. KING, NIH.

SOLUBILITY OF ORANGE = 20 PPM AT 30°C

THIS EQUIVALENT TO $\left\{ \begin{array}{l} 10 \text{ PPM PHYL ESTER 2,4,5-T} \\ 8 \text{ PPM 2,4,5-T ACID} \end{array} \right.$

45 KG WOMAN DRINKING 2 LITERS (2 KG) WATER PER DAY,

8 PPM 2,4,5-T IN 2 KG = 16 MG/DAY

THIS IS EQUIVALENT TO INGESTING 0.4 MG/KG BODY WT/DAY:

INGESTION RATE OF 2,4,5-T (MG/KG/DAY) INGESTION RATE OF "DIOXIN" (µG/KG/DAY) WHEN PPM "DIOXIN" IN 2,4,5-T IS:

	0.5	1	5	30
0.4	0.0002	0.0004	0.002	0.012
FOLD SAFETY FACTOR OVER 0.03 µG/KG/DAY *	150 **	75	15	2

* TENTATIVE DOSE LEVEL SHOWING NO-EFFECT ON FETUSES

$$** \frac{0.03}{0.0002} = 150$$

("DIOXIN" = 2,3,7,8-TETRACHLORODIBENZO-P-DIOXIN)

THE DOW CHEMICAL COMPANY
MIDLAND, MICHIGAN

801871

11586



THE DOW CHEMICAL COMPANY

EARSTOW BUILDING
2020 DOW CENTER
MIDLAND, MICHIGAN 48640

June 15, 1970

DOW 424633

The Honorable Melvin R. Laird
Secretary of Defense
The Pentagon
Washington, D. C.

Sir:

Subject: Defoliants for the Department of Defense

Several weeks ago the Department of Defense announced the temporary suspension of the use of Agent Orange (a mixture of the n-butyl esters of 2,4-dichlorophenoxyacetic acid and 2,4,5-trichlorophenoxyacetic acid) as a defoliant in Southeast Asia. It has now come to our attention that the use of Agent Orange may be reinstituted.

There is abundant evidence that 2,3,7,8-tetrachlorodibenzo-p-dioxin occurring as an impurity in 2,4,5-T is highly toxic. 2,4,5-T can be produced that contains only minute quantities of this impurity (less than one part per million), and such a product is available to the government from various sources. We at Dow are convinced that 2,4,5-T containing less than one part per million of 2,3,7,8-tetrachlorodibenzo-p-dioxin can be used safely. Certainly such a product is safer in use than one containing larger quantities.

The Dow Chemical Company again recommends strongly that the government set appropriate specifications and controls to insure that no 2,4,5-T be used if it contains more than one part per million 2,3,7,8-tetrachlorodibenzo-p-dioxin. More specifically, we would make this recommendation with respect to the use of 2,4,5-T as a component of Agent Orange if it is to be used as a defoliant in Vietnam. Such specification should apply to stocks on hand as well as new procurement.

The Honorable Melvin R. Laird

Page 2

Because of our strong feelings in this matter, we are sending copies of this letter to those listed below.

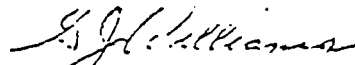
Dr. Lee A. DuBridge
Science Adviser to the President

The Honorable Clifford M. Hardin
Secretary of Agriculture

The Honorable Elliot Richardson
Secretary of Health, Education, and Welfare

The Honorable Walter J. Hickel
Secretary of the Interior.

Yours very truly,



G. J. Williams
Vice President

GJW:lm

DOW 424631

11588

MEMORANDUM FOR THE DIRECTOR

December 11, 1951

Dr. J. H. Soderstrom
Dr. C. E. Soderstrom
Dr. L. E. Soderstrom - Dr. Soderstrom

Dr. J. H. Soderstrom
MEMORANDUM FOR THE DIRECTOR

CONFIDENTIAL

As you know we have recently discussed with Dr. Soderstrom of the Kettering Laboratory at the University of Cincinnati the possibility of continuing test work on the 2,4,5-T chloracene problem. You also know that the 2,4,5-T problem has not been solved and chloracene remains as the outstanding problem of the filter plant in dealing with hourly personnel. Although the present plant is considerably larger than previous operations, we know of three new chloracene cases during the past year. Since a large percentage of the men who have worked in the new department had chloracene from previous exposure, it is not possible to say that they would not have contracted chloracene in the new department.

I am convinced that the only solution to the problem is to isolate the chloracene causing material and remove it from the process. Our experience and that of Dow and Diamond Alkali indicates that distillation of the trihalogenated can provide this solution to the problem.

The Kettering Laboratory has successfully developed a test using human subjects and I have asked them to estimate the cost of establishing definitely whether or not the distillation step will effectively control the problem. A copy of Dr. Soderstrom's answer and cost estimate is attached.

It is my recommendation that we proceed with this work as rapidly as possible.

ZS/r

R. Z. Soderstrom

Attachment

16349
68085

SCHEDULE #5

MONSIEUR CORPORATION
SCHEDULE #5

ROLL #0

11589

I talked with W. H. Howe, of Dow, this morning. He stated the following:

1. Dow has 20 cases of chloracne. He did not tell me whether or not their plant was down.
2. They analyzed the trichlorophenoxyacetic acid we sent them and found 3 - 10 ppm of 3,4,7,8-trichloro-dibenzodioxane. This, he states, he is sure is the chloracne agent, although there may be other impurities. At any rate, he is so concerned that they are having a management meeting to decide whether to use these five carloads of material we sent them.
3. He had definitely caused chloracne on rabbit ears with this material. When I tried to say that some of our people have not been able to cause it with other material, he just scoffed and said there was no doubt in his mind that he can tell chloracne by this rabbit ear test and that he has run about 500 tests on rabbit ears.
4. Dow has been receiving complaints from their customers (whether formulators or ultimate users, I don't know). He was not too clear on whose material it was and how much chloracne developed.
5. He had heard that "the PHS is looking into this problem and has contacted some of Dow's customers concerning the occurrence of chloracne."
6. Dow will have a management meeting today to decide whether or not they will accept this 2,4,5-T we sent them. He asked if we had any specifications or the presence of any particular contaminants that I told we did not.
7. He wanted some sort of crash meeting with all the producers to try to reach some specification level in order to eliminate this particular contaminant before the PHS got into the act.

005172

68640

SCHEDULE #4

0 2 2 3

11590

ROLL #7

02/10/83
SCHEDULE #4
CONTRACTOR'S COPY

0224

SCHEDULE #4

MONSANTO CORPORATION
SCHEDULE #4
15.D 3/21/83 ROLL #7

February 24, 1988

2-2-88

then, met with Rumer, Hoffman, Boyton, Arvin and others. All of the above was named over again. The only thing the Agricultural Division people could add was that they had no history of chloracne from any of their customers. They are going to call AnChem, who has bought about 1.2 million pounds of 2,4-D, to find out if they had any trouble. Rumer is to check Thompson Company to see if the PHS has been after her. They also stated that if such a meeting occurs Dr. Jacobs, who is a combination quality control/process man, would be their representative, along with someone from the Medical Department.

RK

R. Kelly, M. D.

RK/ln

005073

12391

MEMORANDUM

Department of Agricultural Research - St. Louis

cc. W. P. DUNLAP
J. A. STEPHENS
D. B. SHARP

DATE September 14, 1963

SUBJECT

REFERENCE

TO Mr. E. F. Taka - Nitro

file with
243-T in

Confidential

The results of our analysis of four autoclave batches are summarized in the attached graphs (Figures 1-4). I believe the code is self-explanatory with the possible exception of DDMEIO. This refers to the total of the dimethoxydichlorobenzenes and the methoxydichlorophenols. The tetrachlorodibenzodioxan (TDD) concentration is read on the right abscissa. The TDD concentrations are based on the total of the ether products (TCP, TCA, DDMEIO) and the TCB. We have previously shown that the concentrations of TDD in the TCP is approximately equal to the concentration of TDD in the T-400 produced from that TCP. With this background, certain conclusions can be drawn by a comparison of Figures 1-4 and a knowledge of the past history of TDD production (Figure 5). Some of these conclusions are:

1. During April, 1963, production of TDD rose to an all-time high and has remained much higher than the previous norm-current ~50 ppm., normal ~10 ppm.
2. The formation of TDD takes place almost entirely during the hold period.
3. At the end of the hold period the TCA content accounts for 2.0-2.5% of the yield. About 1/2 of this is removed by azeotropic distillation in the methanol still and recycled with the methanol.
4. The TCB is essentially gone at about one hour into the hold period.
5. Extending the hold period results in increased TDD formation (Batch 701).

The cause of the recent increase in TDD formation is not obvious from the data. However, since TDD formation has been relatively low in the past we feel that a detailed laboratory study of the autoclave reaction has a reasonably good chance for success. Such a study is now in the planning stage.

W. R. Udell

/w/
Attachments

001564

16/23

PROGRESS REPORT

NITRO PLANT TECHNICAL SERVICES

NO. 2382

DATE

February 21, 1969

SENIOR PLANT	SENIOR	SENIOR	SENIOR
B. G. McGuire	L. A. Curtright	W. R. Udell	J. A. Stephens
W. R. Kellogg	L. F. Dodson		D. E. Cayard
H. A. Dodd	V. L. Rhodes		C. F. Luicks
J. D. Garrison	P. J. Helmer		J. O. Bright
W. E. Lynch	O. E. Dollin		R. E. Howard
	P. B. Balderson		

REPORTED BY

J. C. Strum (P. J. Helmer)

TITLE

REDUCTION OF TDD IN NaTCP - BUILDING 92

PROBLEM

Reduce formation of TDD in 2,4,5-T plant NaTCP autoclaves, and increase conversion of TCB to NaTCP.

SUMMARY

A brief plant trial run has been completed in an attempt to support the results of an Agricultural Research NaTCP autoclave study. The Research study indicated a reduction in formation of TDD (a chlorinated biphenyl) from 40 ppm (1968 experience) to 5 - 7 ppm, with a concurrent reduction in TCA (reaction intermediate) content from 1% to trace.

The trial run showed a reduction in TDD content from 10.5 ppm to 3.05 ppm. The lower than expected TDD content is believed due to improved raw material charge control because of the new autoclave pressure charging system. TCA was reduced from 0.63% to 0.19%, according to analysis of three representative batches.

A 30-day plant trial run will begin on February 24 to complete the demonstration.

J. C. Strum

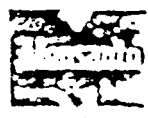
JCS/sal

001462

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ROLL #4
P. J. HELMER CORPORATION
SCHEDULE #4

11593

Mr. Webb
June 13, 1961

Mr. H. E. Webb
NITRO

Thank you for your encouraging note of June 13. I don't want to be cynical, but are there any employees in the Department who don't have chloracne already?

R. ~~Donat~~ Kelly, M. D.

RK/Ln

U06000

0237

SCHEDULE #4

CONVICTION
SCHEDULE #4
D 3/21/83
ROLL #7

11594

EXHIBIT 2

As long as this plant has been in operation, there has been a chronic problem in the employees hired of this condition and referred to as chilblains. At one time, some 60 of these 72 workers in the plant were so affected with the chilblains. They have been well cared for under the services of Dr. Jacob Blumberg, a Dermatologist, who visits the plant weekly and who has been quite concerned with this chronic problem.

Up to this date, Dr. Blumberg had been under the assumption that most of these workers were suffering from merely an environmental condition of the skin. However, after years of observation, he began to suspect that other internal organs might be affected by the hypoparathyroidism which originally caused the same dried condition. It is my impression and the impression of the management that these hypoparathyroids are those of a calcified ather and are a result of the position of calcium spots on the 2,4,5 Tetrachloroacetylene he used in the making of the 2,4,5 T.

Dr. Blumberg has become much more interested and excited about

DS0000195271

END

Doc 11595

ENCLOSURE - CONTINUED

EXHIBIT

P-2

1-21-83 M.H.

March 27, 1963

Mr. Frank W. Jarvis - Cleveland

Richard W. McElroy, M.D.

RE: CHLORINE - CONTAMINATION

Re the request of Mr. Gold and C. Richard Brown, I was in Newark, New Jersey yesterday and visited the Diamond's Newark Plant.

Much of which this letter contains will be, of course, repetitions to you, but I feel I should cover the entire problem as I understand it. Please let me say on the onset that Mr. Gold was most gracious and did his utmost to furnish me with data covering a period of some seven years during which the management of this plant has been very conversant with the problem at hand.

Essentially this plant produces 7,4-Dichlorophenoxyacetic acid and 7,4,5-Trichlorophenoxyacetic acid. The main building which comprises the laboratory and offices, as well as the women's shower rooms, is quite up-to-date, and the sanitary facilities leave nothing to be desired. As you face the river on the left, there is a new building where the initial reactions take place, and after a visitation personally, by me, of this building, I find that I could offer nothing in the way of constructive advice in the improvement of this particular factory. The building on the right, however, is of an ancient vintage, and it is in this building the 7,4,5,7 acid process actually takes place, and in this building the workers are easily contaminated by vapors in the air and by other chemical products and by-products of the process; most especially in the regions of the 1500 gallon reactor tank, the 1500 gallon filter holding tank and the rotary string filters as well as the 7400 acidification and the centrifuge feed tank.

Mr. Frank M. Jarvis

- 2 -

March 27, 1963

this problem since an article appeared in the January issue of the Journal of the American Medical Association concerning a disease known as Porphyria Cutanea Tarda. This article, contrary to most of the medical thinking in the past, shows that instead of this being a disease which is "congenital", it may be acquired by the ingestion of certain chlorobenzene products and this specific article reported 143 cases of this disease which occurred in Turkey when the population were given wheat to plant that had been treated with a fungicide, notably Hexachlorobenzene. Instead of planting the wheat, most families ate it, and thus occurred this outbreak which is estimated to have exceeded 1,000 cases, although only 143 personally observed cases were seen by these authors.

This disease is a disease of the blood forming elements of the body in which the hemoglobin of the red blood cells is broken down and essentially the spleen, liver and kidneys are affected to a greater or lesser extent, depending upon the ingestion of such a chlorinated benzene. Its outward manifestations are those which are prevalent in the plant in Newert and resembled the chloracne which we have known occurred there for a period of time. It is also well known that there is an individual susceptibility to the development of this disease and men are affected about 70% more than women.

One of the significant and easy tests to diagnose this disease other than the skin changes, is the finding of the chemicals called porphyrins in the urine and this is easily accomplished by looking at a fresh specimen of urine under an ultraviolet lamp. This has been carried out by Dr. Eisberg, and he found that of the four men who have suffered the longest from the chloracne, two of them had a positive porphyrin reaction in their urine. Also, there was evidence of bile in the urine which is not a normal finding, in all four individuals and two of them had traces of albumin.

It is my impression that two or more of these individuals which Dr. Eisberg pointed out to us are probably suffering from this disease, Porphyria Cutanea Tarda. It is somewhat doubtful in my mind that all cases of chloracne are in reality this disease, but probably will be merely the usual chloracne that is seen in individuals working with chlorinated benzene products. My statement here is based upon a supposition, but represents fully a 16 hour perusal of the medical literature dealing with these two diseases and what has been known about them in the past.

Management of the plant has in the past appealed to the Department of Health of the State of New Jersey for some aid in handling this problem and it is Mr. Gaidi's opinion, as well as mine, that they were of no benefit at all in solving our problem. Dr. Eisberg has, on several occasions, written to Dr. Donald J. Birmingham of Cincinnati, Ohio, who is Chief of the Dermatology Section of the Division of Industrial Hygiene of the U. S. Public Health Service and a personal friend of Dr. Eisberg. Dr. Birmingham expressed both an interest

DSG 0019526

11596

Mr. Frank A. Jarvis

- 3 -

March 27, 1963

in the condition that exists at the plant and a willingness to make a personal inspection of our plant, and today I have been notified that such an inspection will be carried out by him next week, subject of course, to your approval. I would heartily concur with Dr. Kleiberg and offer the opinion that Diamond Alkali Company can only profit by his visit and would so recommend that he be allowed to make it.

I believe that he probably will wish to undertake more extensive hospital testing of individuals than I personally believe is necessary, and my recommendation in this regard, at the present, would be to hospitalize only the two worst cases and have a thorough medical examination, especially regarding the blood forming elements, the kidneys and the livers of these individuals. I do not feel that I would recommend that more than this be done at the present time.

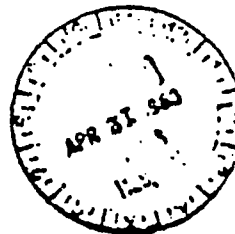
I have been informed that the company's future plans include a rehabilitation of the older building with raising of the roof, revision of the fume and admission of equipment along with adequate ventilation, and I cannot emphasize too strongly to you that until this program is carried out, the problem of the dermatitis and/or porphyria in the plant will continue. I, of course, am not conversant either with the finances available nor the feasibility of carrying forth this program; however, I do believe that this is the only real solution to the problem which exists in the New Jersey plant.

In summary then, Diamond Alkali has a plant in Newark hiring 72 workers, most of whom have been afflicted with a skin disease and which may prove to be even more dangerous to health than this in some. Present management has been aware of this problem for sometime and the medical treatment has certainly been of high standards and quality. Until a renovation of the old portion of this plant is carried out, I am certain this problem will continue to exist.

Richard W. McBarney, M.D.

McBarney

cc: Mr. C. Richard Brown
Mr. Raymond A. A. Ocidi



0300019529

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Guidi - J Id

10-24-85

HSO

F

July 9, 1962

Mr. R. A. Guidi - Newark Plant

Dr. Z. L. Chandler

The question of chloro-acne has not been resolved in the consideration of two eligible customers. Bill Champion of Riverdale Chemical says that he gets better formulations using other suppliers' herbicides, and he insists that he has a chloro-acne problem when he uses Diam. 3 esters.

As you will recall, the Parker City Tree personnel were rather severely affected by this dermatological problem, and we have definitely lost them as a customer.

Jim King would like a reply from you, giving your personal convictions as to the possible recurrence of this problem in the future.

Z. L. CHANDLER

ELC:j1
cc: H. S. Weiner

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O
P
Y

10-117-22

11798

Diamond Alkali Company

INTER OFFICE CORRESPONDENCE
LC74-44

18 March 1964

TO: New York

FROM: Alex Creamer, Jr. COLOMBIA

SUBJECT

"DOROCNE" problem to the users of 2,4-D and 2,4,5-T products in Colombia.

During my recent visit to Colombia, Quimor Ltda (DACO agents) put me abreast of the reported serious problems resulting to workers who have used Diamond Alkali products which contain 2,4-D and 2,4,5-T acids.

At the time of my visit which was during the last of Feb., there had already been correspondence between Diamond and Quimor discussing problems which arose in the Bucaramanga area. At that time the last bit of correspondence had come from Diamond on the 27th of November 1963. Since that date Quimor reported that there had been even more people and animals affected who had been in contact with the product, and in other areas also.

BUCARAMANGA—Approximately 20 people have been affected—Most have been hospitalized for months with very little signs of curing themselves. In some cases the victims have become increasingly worse. Horses used in application of the products were also badly affected, loss of hair, skin lesions, and in one case death. Cattle have also been affected who grazed the treated areas.

area

Several claims have come in from the Bucaramanga requesting consideration for the hospital, doctor bills, plus subsistence for the loss of work time by the workers.

CALI—late in 1963 a couple of victims were reported in the Cali area, however very little commotion was made about the fact.

MEDILLIN—Recently cases are reported in the Medellin area of Dorocne with hospitalization. At this point the government is stepping in by having the Public Health Society investigate the matter. As reported that the Society will eventually take samples of the product with analysis following.

Quimor's business has been jeopardized by the adverse publicity. Farmers in Colombia are frightened of the product and are turning to the competitors. Quimor feels that the product was the fault after investigating all facts of the case. They feel that the product might have come from a bad batch or two. Quimor still has stock of the same shipment and do not want to sell the anymore of the material.
by Diamond.

The subject material was shipped to Quimor Ltda in Colombia upon receiving the material Quimor painted the Diamond drums and placed their own "KILEX" label.

Alex Creamer, Jr.

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3/25/57

JOHN CORTE, JR.

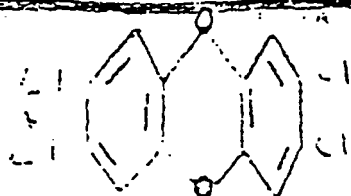
S. L. CHANDLER

CHLOROACNE - DOW MEETING

cc: F. R. Kennedy - Mgr., Newark plant
J. O. King
M. F. Wilkinson

On March 24, Mike Kennedy and I met with two people from Hooker Chemical Co., two from Hercules, and with the Dow group to discuss the toxicological impurities associated with 2,4,5 trichlorophenol and related materials.

Dr. Rose of Dow Chemical opened the meeting by stating that they had operated for 25 years without trouble; but, in the last year, they had 60 to 70 cases of chloracne. Ten of these were moderate, and five to ten were extremely severe. Their approach was a qualitative one at first. They wanted to find the causative material, learn how to identify it, and try to avoid continual trouble with the unknown. They tested various materials from tar fractions and from, as they put it, "runk", etc. They found that there are a number of suspect materials, probably 26 or 27; but the major "bad actor" that they identified and which seemed to consistently cause the problem was 2,3,7,8-Tetrachlorodibenzo p-Dioxin (symmetrical).



→ 2,3,7,8 - TETRACHLORODIBENZO
p - DIOXIN
(SYMMETRICAL)

This incidentally was previously listed as a suspect material by Cy Parkins of our company. A similar material is the unsymmetrical 1,3,7,8-TCDD, also sometimes listed as 2,3,7,9-TCDD.

The Dow people used the white glove approach and found this contaminant on tool handles, benches, instruments, and other fomites. In test animals, they could consistently cause the symptoms to appear. Dr. Holder of Dow, one of their medical doctors, had excellent color slides of the various patients. The difficulty starts with multiple blackheads, resulting in closed cystic structures which make the patient look like he needs to wash his face. The disease develops slowly, not appearing until six weeks to two months after mild exposure but appearing in five to seven days with very heavy exposure.

One bench chemist has been under treatment for two years and his face is starting to show signs of clearing. Dr. Holder says that he believes this man's problems will be solved in another six months. Dr. Sadek, who does their microscopic work in connection with their animal laboratory, showed photo micrographs of the cysts as they formed in the ears of rabbits. The cysts correlated with those found on the faces of the man.

WILLIAM D. MOORE, CSR

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A&G 706001

Basically, there is a carotenoid deposit in the hair follicles and oil duct in the face. These eventually go from the blackhead stage to form a closed, hard core deposit. The chemical cannot be found in the facial tissues or in the core but the problem still persists after exposure. The best description of the acute stage is that the facial tissues resemble the exaggerated surface texture of an orange rather glazed and mottled with the enclosed hard core deposits.

A secondary symptom, which does not correlate directly with the amount of facial dermatitis, is a fatigue reaction where the employee is completely listless, tired out, and nearly incapacitated. A complete biopsy of liver, kidney, etc., showed no degeneration of major organs. A complete clinical examination of the patients showed no measurable affect on heart, blood pressure, respiration rate, blood sugar, etc. The fatigued patients seemed to be helped by heavy doses of vitamins, perhaps related in some way to the carotene metabolism of the body (involving vitamin A).

An oral dose of 17 micrograms immediately killed the test animals. The Dow people did not lower this dosage to obtain an LD₅₀ but decided that, when they can detect this compound, it should not be in the product. They found that, after exposure to the material, washing within 15 minutes did not help a great deal, but did slow down the speed at which the symptoms appeared. Washing after one hour or absolutely no help whatsoever in reducing total dermatitis or speed of appearance of the reaction. Moderate scrubbing with detergent does not remove this material. Extremely hard scrubbing can accomplish the task or the use of solvents, such as 1,1,1-trichloroethane.

Dow has developed a new analytical method in which they have confidence in their sensitivity to 1 ppm. They can only state in levels below this that some may be present below the 1 ppm. They stated that they have not used micro-columnar methods, and the electron capture tests that they ran made only a very slight improvement in sensitivity with this compound. Their analytical chemist stated the electron cell saturates because of the presence of other materials in high concentration compared to the dioxin.

This material has some strange properties. It has a fairly high vapor pressure but nevertheless is quite persistent as a contaminant. It can be separated from benzene by boiling if it is not carried down to dryness. The Dow people are extremely careful in all of their work with this compound. They use PVC throw-away gloves, and all samples are burned in a special furnace which operates at 3000°F. These samples are sealed before going to the burner. They use bioassay methods on rabbits for qualitative checking only.

The Dow people state that they intend to set a limit of zero with sensitivity of plus or minus 1 ppm on this material. They have analyzed materials from other companies, including our company, and have found amounts as high as 10 ppm in 2,4,5-T acid and 20 to 30 ppm in phenates.

They have made a single application to the ears of test rabbits and found that 20 ppm will not give folliculitis. Forty ppm does give a slight affect, and 100 ppm is severe. They have made repeat applications of from 10 to 100 ppb, and 25 of these treatments do not cause a response; however, 1000 ppb (1 ppm) gives a slight response with nine applications and a severe reaction with 11 applications.

They conclude, therefore, that 1 ppm with repeat exposure can create a real problem.

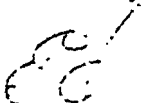
Dow's people outlined a method for extracting and running samples of 2,4,5-T; 2,4,5-T; and phenols. It involves a chloroform extraction, followed by

March 25, 19

a certain wash, and a reduction by boiling to one-tenth the volume before putting it in the chromatograph. They have given the gas-liquid chromatography method to us, along with analytical-grade diene material. Mike Kennedy has these materials and intends to pursue the laboratory work necessary to ascertain where and how much, if any, of this diene appears in our 2,4,5-T process.

The purpose of this meeting was obviously designed to help us solve this problem before outsiders confuse the issue and cause us no end of grief. Dow is sending the test results on our material to us, incidentally; and this will further check our technique, etc.

Sincerely,


E. L. ChandlerC
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P
Y

EJC:esm

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HERCULES INCORPORATED

Production Department

cc:

In turn:
H. F. Pierce
E. W. Lemons
K. T. Givens

J. P. Frawley - Medical

In turn:
J. C. Copeland, Jr.
G. E. Lowe

Wilmington, Delaware
April 15, 1970

TO: C. L. Duns
FROM: R. B. Scott

2,4,5-T ANALYSES

Bob Fisher of the Jacksonville Lab informed me today the analyses for dioxin content of 2,4,5-T acid are proceeding very satisfactorily. The samples analyzed this week show:

January 1966	< 0.2 ppm (threshold of detection)
February 1966	"
March 1966	"
Dow sample of T-Acid from 1966	2.33 ppm

Fisher believes he can average 3 to 4 retained samples a day, now that the method and instruments are functioning properly.

RBS/mh

R.B. Scott

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DOW CHEMICAL U.S.A.

September 15, 1977

MIDLAND, MICHIGAN 48640

ALL DOW U.S.A. SUPERVISORS

RECORDS RETENTION

Recent events have dramatized the need for reemphasis of guidelines for the creation and retention of records.

Briefly stated, those records which are useful to our business, factually reported, and which accurately portray a situation should be created. Conversely then, records which contain more feelings or opinions than fact, which contain phrases, paragraphs or subjects of dubious value or are readily capable of misinterpretation should be avoided. Today's memo may be tomorrow's headline only because we have not anticipated the consequences when we generated the paperwork. Too frequently, words are taken out of context by people who want to embarrass us, especially in a time frame of 10 years or more after the writing. Reasonableness and discretion should accompany our words.

The maintenance of records is also a costly proposition and today, more than ever, we cannot afford the luxury of retaining useless or obsolete data in our files. We face tremendous costs in filing and handling papers. Not long ago, one document retrieval exercise, required by a court order to disclose documents to a plaintiff, turned up more than 50,000 documents in various company and personal files. The cost of complying with that order was in excess of \$10 per document.

We have a records retention program, with a policy manual containing schedules for retention and destruction. We need to apply them more strictly to our activities.

- Dow business matters belong in Dow's official files -- not in personal files.

Your effective leadership in this area is needed.

WHEN IN DOUBT, THROW IT AWAY!!!

Paul F. Greffice
President
Dow Chemical U.S.A.

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NOV 14 1979

AT COVINGTON
DAVIS T. MCGARVEY
CLERK, U.S. DISTRICT COURT

IN RE BEVERLY HILLS FIRE LITIGATION

Civil No. 77-79

ORDER

This action arises out of a fire which occurred at the Beverly Hills Supper Club in Southgate, Kentucky on Saturday, May 28, 1977.

Numerous defendants have filed motions for summary judgment. In general these motions resist imposition of industry-wide liability on targeted groups of defendants. For the reasons stated below, we hold that under certain limited factual situations liability against an entire industry may be imposed in this litigation.

I Background Facts and Contentions

This is a plaintiffs' class action lawsuit. The class of plaintiffs consists of those who were injured in the fire and representatives of those who had died.

Plaintiffs named more than 1000 defendants in their complaint. These defendants have been divided into various groups in order to facilitate and expedite trial of this lawsuit. Motions for summary judgment are presently under consideration from the group of producers of electric wire insulation (Wire Insulation Group)¹ and from the manufacturers of aluminum wire and devices and their trade

1

The following defendants are included in this Group: American Insulated Wire Corporation, Anaconda Company, Cadillac Cable, Cerro-Marmon (Marmon Group, Inc.), Coleman Cable and Wire Company, Conoco Chemicals, Continental Oil Company, Diamond Shamrock, Ettco Wire and Cable Corporation, Firestone Plastics Company (Firestone Tire & Rubber), General Cable Corporation, General Electric Company, The B. F. Goodrich Company, I.T.T. Suprenant Division, Monsanto Company, Phelps Dodge Communication Co., Plymouth Wire and Cable Co., Reynolds Aluminum, Soltex Polymer Corporation, Southwire Company, Tenneco Chemicals, Triangle PWC, Inc. and U.S. Steel Corporation, Electrical Cable Division.

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association (Wire and Device Group)². A brief review of the salient facts is necessary to understand the bases for these motions.

The Beverly Hills Supper Club was a large facility occupying over an acre in area. The Club contained a number of rooms for dining, banquets, dinner dances and small parties. The Club also contained a large showroom, The Cabaret Room, which featured well-known entertainers.

At the time of the fire there were approximately 2,400 to 2,800 people in the Club, with approximately 1,200 to 1,300 people in the Cabaret Room.

The cause and location of the Beverly Hills Supper Club fire are still in dispute, although several reports have indicated that the fire was probably electrical in nature³. When the fire was discovered, evacuation proceedings were initiated. However, many of the patrons, especially those in the Cabaret Room, were unable to escape in time. The blaze consumed almost the entire interior and structure of the Supper Club⁴.

2

The Aluminum Associates, Inc., American Electrical Industries, Inc., American Insulated Wire Corporation, The Anaconda Company, Bryant Electric Company, Cadillac Cable Corporation, Capital Wire & Cable Corporation, Cerro-Marmon Corporation (Marmon Group, Inc.), Colonial Wire & Cable Company, Columbia Cable and Electric Corporation, Eagle Manufacturing Company, Inc., Essex Group, Ettco Wire and Cable Corporation, General Cable Corporation, General Electric Company, Hatfield Wire, Kaiser Aluminum & Chemical Company, Leviten Manufacturing Company, Inc., John I. Pauling, Inc., Puss & Seymour, Inc., Reynolds Metal Company, Sierra Electric, Slater Electric, Inc., Southwire Company, Square D. Company, Bell Electric Company, Rodale Manufacturing Company, Inc. and Triangle PWC, Inc.

3

See Report of the Special Prosecutor, The Beverly Hills Supper Club Fire, February, 1979; Reconstitution of a Tragedy, The Beverly Hills Supper Club Fire, National Fire Protection Association and National Bureau of Standards; U.S. Consumer Product Safety Commission Staff Report on the Beverly Hills Supper Club Fire of May 28, 1977; and Investigative Report to the Governor (Kentucky State Police) Beverly Hills Supper Club Fire.

4

The foregoing recitation is intended for background only. Nothing stated therein has been relied upon by the Court in disposing of the pending motions

plaintiffs contend that as a result of the fire and post-fire disturbances, the identity of some of the manufacturers whose products may have caused or contributed to the fire is indeterminable. To overcome this problem in identification, plaintiffs advance a theory of industry-wide liability. This theory seeks to impose joint liability against an entire industry when the particular manufacturer of the injury-causing product cannot be identified.

Plaintiffs' claims against the Wire and Device Group and the Wire Insulation Group sound in negligence, breach of warranty, strict liability and so-called enterprise liability. As to the Wire Insulation Group, plaintiffs aver that these defendants manufacture polyvinyl chloride (PVC) wire insulation; that PVC insulation decomposes and is combustible, generating toxic fumes; and that PVC insulation caused the deaths and injuries suffered in the Beverly Hills Supper Club fire.

As to the Wire and Device Group, plaintiffs contend that they produced "old technology" aluminum wiring which creates a fire hazard when connected to copper wiring and devices. Plaintiffs claim that a large portion of the electrical wiring in the Supper Club consisted of "old technology" aluminum wiring.

Defendants in both groups have filed motions for summary judgment in opposition to plaintiffs' contentions. Defendants contest plaintiffs' claim of industry-wide liability. Defendants also contend that electrical code violations found in the Supper Club and attributable to the owners of the Supper Club cut off defendants from any liability they may have toward plaintiffs. The determination of the pending motions will be deemed to cover all defendants in a group whether a motion by a specific defendant has been filed or not.

II. Summary Judgment Standard

Motions for summary judgment are governed by Rule 56 of the Federal Rules of Civil Procedure. Rule 56(c) provides that "[t]he judgment sought shall be rendered forthwith if the pleadings, depositions, answers to interrogatories, and admissions on file, together with affidavits, if any, show that there is no genuine issue as to any material fact and that the moving party is entitled to a judgment as a matter of law."

A District Court must be circumspect in deciding a motion for summary judgment because it operates to deny a litigant his day in court. Tee-Pak, Inc. v. St. Regis Paper Co., 491 F.2d 1193, 1196 (6th Cir. 1974). A trial judge must be especially cautious of disposing of complex litigation on a motion for summary judgment. S. J. Groves & Sons v. Ohio Turnpike Comm., 315 F.2d 235, 237, cert. denied 375 U.S. 824 (1963). See Management Investors, et al. v. UMW, No. 78-1428 (6th Cir. October 25, 1979). And in considering a motion for summary judgment the movant's papers are to be closely scrutinized, those of the opponent are to be viewed indulgently. Smith, et al. v. Hudson, 600 F.2d 60, 63 (6th Cir. 1979).

A difficult question concerns the quality and sufficiency of proof necessary to establish the presence or absence of a genuine issue of material fact. In this regard, the United States Court of Appeals for the Sixth Circuit has directed that the burden of showing conclusively the nonexistence of a genuine issue as to a material fact rests always with the movant. Id. at 63, 64. But pursuant to Rule 56(c), the nonmovant may not simply rest on the allegations in his pleadings in opposing a motion for summary judgment. Summary judgment therefore is only proper where the facts alleged in the complaint are directly contravened in the affidavits supporting the defendants' motion for summary judgment, and

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where the plaintiffs' version of the facts is not presented in any deposition, affidavit, or other document on file, except the pleadings. Id. at 65.

III. Applicable Principles of Law

This diversity action was brought in the United States District Court for the Eastern District of Kentucky. There is no dispute but that the law of the State of Kentucky must apply on all substantive issues. Erie R. Co. v. Tompkins, 304 U.S. 64 (1938).

The central question raised by defendants' motions concerns the application to defendants of a theory of industry-wide liability. There has been no decision by the Supreme Court of Kentucky on this issue. Thus, it is our obligation "to make a considered 'educated guess'" as to what conclusion would most likely be reached on the issue by the Kentucky Supreme Court. In making this determination we must consider the present state of the Kentucky law as well as that of other jurisdictions. Wells, d/b/a Recmart v. 10-X Mfg. Co., ___ F.2d ___, Nos. 77-11-4011, (6th Cir. October 30, 1979).

Since plaintiffs are raising what may be novel theories of liability and in many instances questions of first impression, it would seem advisable to outline the present state of Kentucky law and the burden imposed upon plaintiffs thereunder.

Regardless of how plaintiffs' claims are denominated, plaintiffs must establish under Kentucky products liability law the presence of three factors -- causation, defect and injury. Sturm, Roger & Co., Inc. v. Blovd, ___ S.W.2d ___, No. 78-SC-451-DG (Ky. July 3, 1979); See also W. Prosser, Law of Torts § 103 (4th Ed. 1971). The causation factor may be further divided. Plaintiffs must show (1) that a defect in defendants' product was the "cause in fact" of their injuries; and (2) that a defect in defendants' product was the "proximate cause" of their injuries. Johnson v. Vaughn, 370 S.W.2d 591 (Ky. 1963); Piffe v. Black, 548 S.W.2d 175 (Ky. 1977); Texaco v. Standard, 536 S.W.2d 136 (Ky. 1976). See, Green, The Causal Relations Issue In Negligence Law, 60 Mich. L. Rev. 543, 548-569 (1962); 2 Harper & James, The Law of Torts, §§ 20.1-6 at 1108-1161 (1956).

A. Cause In Fact

The first step in establishing a defendant's liability is to identify him and connect his conduct with the victim's injury. In a products liability action this problem has two components.

First, plaintiffs have the burden of proving the identity of the product causing the harm⁵. As part of this component, a "plaintiff must trace his injury to a quality or condition of the product which was unreasonably dangerous either for a use to which the product would ordinarily be put, or some special use" which was brought to the attention of the manufacturer. James, General Products -- Should Manufacturers Be Liable Without Negligence? 24 Tenn. L. Rev. 923, 927 (1957). Secondly, plaintiffs have the burden of linking the product to a particular defendant⁶.

A related question is how much causal relation must be found between a defendant's conduct and the plaintiffs' harm in order to resolve the issue in the plaintiff's favor. It is here that the "substantial factor test" has been invoked. See, Texaco v. Standard, 536 S.W.2d 136 (Ky. 1976)⁷.

5

See, e.g. Rollins v. Avery, 295 S.W.2d 214 (Ky. 1956) (directed verdict affirmed for defendant where plaintiff unable to identify gas floor furnace manufactured by defendant as a cause of explosion and fire); Holbrook v. Rose, 458 S.W.2d 155 (Ky. 1956) (directed verdict affirmed for defendant where plaintiff unable to identify worm medicine manufactured by defendant as cause of child's death); American Insurance Company v. Horton, 401 S.W.2d 758 (Ky. 1966) (affirmed summary judgment for defendant where plaintiffs unable to identify defendant's ethylene gas as cause of explosion in banana ripening room).

6

See, e.g. Wetzel v. Eaton Corp., 62 F.R.D. 22 (D.C. Minn. 1973) (summary judgment granted for defendant where plaintiff unable to identify which of two suppliers supplied the defective tractor part which caused plaintiff's injury); Nehi Bottling Co. v. Thomas, 33 S.W.2d 701 (Ky. 1930) (directed verdict for defendant appropriate where plaintiff unable to identify any connection between the poisoned Nehi-grape which caused plaintiff's injury and defendant).

7

The "substantial factor test" originated in an article by Jeremiah Smith, Legal Cause in Actions of Tort, 25 Harv. L. Rev. 103, 223, 229 (1971) and passed through case law into the Restatement of Torts § 431.

In determining whether conduct is a substantial factor, the Kentucky courts have adopted a so-called "rule of probabilities". Holbrook v. Rose, 458 S.W.2d 155, 158 (Ky. 1970); Rutherford v. Modern Bakery, 310 S.W.2d 274 (Ky. 1958); Texaco v. Standard, 536 S.W.2d 136 (Ky. 1976). Thus a verdict for defendant is to be directed when plaintiffs have failed to provide sufficient evidence on causation "to tilt the balance of 'possibility' to 'probability.'" Holbrook, supra at 158.

Defendants' conduct need not be the only cause of the harm to satisfy the cause in fact requirement. Put otherwise, a defendant's conduct may be culpable where it contributed to the victim's injury even though there are other factors that would have caused the same or similar injury to the victim. Bradford v. Sagraves, 556 S.W.2d 166, 168 (Ky. 1977); Propane Transport Co. v. Edelen, 400 S.W.2d 697 (Ky. 1966); See Peaslee, Multiple Causation and Damages, 47 Harv. L. Rev. 1127 (1934). Plaintiffs' burden of proof requires only that the jury find from a preponderance of the evidence that defendants' conduct contributed to the victim's injury. Bradford v. Sagraves, supra. See Green, The Causal Relation Issue in Negligence Law, 60 Mich. L. Rev. 543, 557 (1962).

Cases in which the defendant who manufactured the defective product cannot be identified create unique cause-in-fact problems. Three theories have been advanced to overcome these problems. They are: (1) the concert of action theory⁸, (2) the alternative liability theory, and (3) the enterprise liability theory. These theories seek to impose joint and several liability over defendants whose particular products cannot be directly linked to the injury. Application of these theories requires consideration of the above-mentioned principles of causation.

8

Also referred to as the concerted action theory, Sindell v. Abbott Laboratories, 149 Cal. Rptr. 138 (1978) and discussed under the caption "Joint Control of Risk" in Hall v. DuPont, 345 F.Supp. 371-376 (E.D. N.Y. 1972).

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1. The Concert of Action Theory

Concert of action between two or more actors resulting in injury to plaintiff is a fact situation under which a joint tort has historically been imposed. 1 Harper & James, The Law of Torts § 10.1 at 697-98 (1956); Hall v. DuPont de Nemours & Co., Inc., 345 F.Supp. 353, 371 (E.D. N.Y. 1972). See also Prosser, Joint Torts and Several Liability, 25 Calif. L. Rev. 413, 429 et seq. (1937). This doctrine imposes joint liability against "[a]ll those who, in pursuance of a common plan or design to commit a tortious act, actively take part in it." W. Prosser, supra, §47, at 292.

The doctrine of concert of action is well-established in Kentucky law. See Bonte v. Postel, 58 S.W. 536 (Ky. 1900); Stephens v. Schadler, 207 S.W. 704, 705 (Ky. 1919); Murphy v. Taxicabs of Louisville, Inc., 330 S.W.2d 395 (Ky. 1959); Davenport's Admix. v. Crummies Creek Coal Co., 184 S.W.2d 887 (Ky. 1945); McIntosh v. Taulber, 279 S.W.2d 8 (Ky. 1955). See also Brewster v. Miller's Sons Co., 41 S.W. 301 (Ky. 1899); Baker v. Metropolitan L. Ins. Co., 64 S.W. 913 (Ky. 1901); Hurdley v. Louisville & N.R. Co., 48 S.W. 429 (Ky. 1898). The Second Restatement of Torts also has recognized this theory, providing in § 876 in part as follows:

For harm resulting to a third person from the tortious conduct of another, a person is liable if he . . . (b) knows that the other's conduct constitutes a breach of duty and gives substantial assistance or encouragement to the other so to conduct himself, or (c) gives substantial assistance to the other in accomplishing a tortious result and his own conduct, separately considered, constitutes a breach of duty to the third person.

There are three elements which must be satisfied by plaintiffs in order to prove a case of joint liability for concerted action in a products liability case. Plaintiffs must establish a causal relation between plaintiffs harm and the targeted defendants. As a second step plaintiffs must prove that defendants in the group participated by cooperative

or concerted activities to cause this harm. Thirdly, plaintiffs must show that the defendants in the group have by their actions or omissions contravened a legal standard of care. See Hall v. E. I. Du Pont de Nemours & Co., Inc., 345 F.Supp. 353, 371 (E.D.N.Y. 1972).

a. Causal Relation

The general rules of causation have been previously outlined. Application of these rules under the concert of action theory in a products liability case requires plaintiffs (1) to identify the product causing plaintiffs' harm; and (2) to prove that the acts of each defendant in marketing and promoting a defective product are a substantial factor in plaintiffs' injuries. These requirements will be more fully explained.

The concert of action theory imposes joint liability on groups whose actions violate a legal standard, even though only one member of the group may be directly linked to the physical cause of the injury. The typical cases in this area involve drag racing and assault. See Bierczyaski v. Rogers, 239 A.2d 218 (Del. Sup. Ct. 1968); Lemons v. Kelly, 239 Ore. 354, 397 P.2d 784 (1964); Hanrahan v. Cochran, 12 App. Div. 91, 42 W.Y.S. 1031 (4th Dep't 1896); Thompson v. Johnson, 180 F.2d 431 (5th Cir. 1950); Sir John Rayden's Case, 77 Engl. Reg. 1150 (1613); Acovino v. Kunze, 181 Cal. App.2d 591, 5 Cal. Rptr. 534 (Dist. Ct. App. 1960); Anderson v. Espisoto, 90 N.J. Super. 170, 216 A.2d 607 (Supr. Ct. 1966). In those cases the actual injury-producing party is known. The effect of the concert of action theory is to place joint liability on those who acted in concert with the injury-producing party, although they are not direct, causative agents.

The concert of action theory was applied to a products liability action in the blasting cap⁹ and DES cases¹⁰. These cases differ from the traditional cases in that the injury-producing party is unknown. Thus, the blasting cap and DES cases were directly confronted with the issue of causation.

As to the causation requirement, the court in the DES case stated that "where concerted action is pled it is irrelevant whether the actual manufacturer of the product is identified." Sindell v. Abbott Industries, 149 Cal. Rptr. 138, 145 (1978). And in the blasting cap cases, the court noted that "the issue of who 'caused' the injury is distinctly secondary to the fact that the group engaged in joint hazardous conduct." Hall v. E. I. DuPont de Nemours & Co., 345 F.Supp. 353, 372 (E.D. N.Y. 1972). Thus the fact that the injury-producing party was unknown did not affect application of the theory of concert of action. But in both cases the court assumed that plaintiffs were capable of proving the identity of the product which caused the injury. Put otherwise, the effect of applying the concert of action theory is only to satisfy plaintiffs' burden of linking the product to the defendants; it does not satisfy plaintiffs' burden of identifying the injury-causing product.

Under the concert of action theory the agreement among the defendants to commit a culpable act is the tortious event. To establish causation plaintiffs must prove that this event was the cause in fact of plaintiffs' injuries. In order to prove cause in fact under Kentucky law, plaintiffs are required to prove that each defendant is a substantial

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Hall v. DuPont, 345 F.Supp. 353 (E.D. N.Y. 1972).

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Sindell v. Abbott Laboratories, 149 Cal. Rptr. 138 (1978).

factor in the tortious event. Sindell v. Abbott Industries, 149 Cal. Rptr. 138, 145 (1978); Sheiner, DES and A Proposed Theory of Enterprise Liability, 46 Fordham L. Rev. 963, 983 (1978). This proof links the harm done to a particular defendant. Thus, the fact that a specific injury-causing party is unknown does not prevent plaintiffs' recovery.

To establish that defendants are a substantial factor in plaintiffs' injuries, it is necessary for plaintiffs to show that all defendants in the group manufactured and promoted generically similar defective products. Sindell v. Abbott Industries, 149 Cal. Rptr. 138, 145 (1978); Hall v. E. I. DuPont de Nemours & Co., 345 F.Supp. 353, 374 (E.D. NY. 1972). By placing a defective product into the stream of commerce and promoting it, the manufacturer increases the public usage of the product. This, in turn, compounds the chance of injury caused by the product. Thus, each defendant who produced and promoted the defective product in concert with others shares in the responsibility for plaintiffs' injuries

b. Cooperative or
Concerted Activities

In addition to satisfying the causation requirement, plaintiffs also must establish that the targeted defendants acted by cooperative or concerted activities before the theory of concert of action will be imposed. Sulkeld v. Davis, 247 S.W.2d 517, 520 (Ky. 1952); McIntosh v. Taulber, 229 S.W.2d 8, 9 (Ky. 1955). See also La Forte, Recent Developments in Joint & Several Liability, 24 Syracuse L. Rev. 1319, 1320 (1973).

Generally, all that is required to invoke the theory is that there be some tacit understanding among the defendants. W. Prosser, Law of Torts § 46 at 292. Historically, mere knowledge of what the other party did along with parallel behavior was not sufficient to show concert of action. See Prosser, supra at 414. See also, Sheiner, DES and A Proposed Theory of Enterprise Liability, 46 Fordham L. Rev. 963, 983 (1978).

In the blasting cap cases the court pointed out three ways in which cooperative or concerted activities may be shown: (1) explicit agreement among the defendants; (2) parallel behavior sufficient to support an inference of tacit agreement or cooperation; and (3) adherence to an industry-wide standard or custom. Hall v. E. I. DuPont de Nemours, 345 F.Supp. 353, 374 (E.D. N.Y. 1972)¹².

While the first alternatives fall within the classic requirements for concert of action, the third alternative of independent adherence is unusual. The alternative of independent adherence has been defined as parallel behavior which does not support an inference of tacit agreement. See Hall v. E. I. DuPont de Nemours, 345 F.Supp. 353, 374 (1972). See also 61 Geo. L. J. 1327, 1351. Thus, this alternative does not meet the historical requirements for concert of action.

Although the independent adherence alternative was discussed by the court in the blasting cap case, it was not a necessary part of that court's decision. There, plaintiffs had chosen to proceed under the first of the above three alternatives, arguing that defendants had entered into an explicit agreement. Hall, supra at 374.

No Kentucky case has held that either parallel activity or mere independent adherence to an industry-wide safety standard is sufficient to make out a case of concert of action. Nor are we inclined at this time to extend this theory of liability to include this alternative. Under Kentucky law plaintiffs must show an express or tacit agreement among the defendants. In the products liability arena

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The court also noted that it was not necessary that the defendants be engaged in a special business relationship such as a joint venture before joint tort liability could be imposed. Hall, supra at 373.

the express or tacit agreement among the defendants must be to market and promote a defective product. Sindell v. Abbott Industries, 149 Cal. Rptr. 138, 145 (1978); Hall v. E. I. DuPont de Nemours & Co., 345 F.Supp. 353, 372 (E.D. N.Y. 1972).

c. Breach of Legal Standard

The third element of the concert of action theory requires proof that defendants in the group have by their action or omission contravened a standard of care as to these plaintiffs. In products liability cases Kentucky has adopted Section 402A of the Restatement of Torts, Second as the legal standard to be applied¹³. Dealers Transport Co. v. Battery Distributing Co., 402 S.W.2d 441 (Ky. 1966).

Section 402A imposes liability on the seller of a product "in a defective condition unreasonably dangerous" to a person who should be expected to use or be exposed to it. Bohnert Equip. Co., Inc. v. Kendall, 569 S.W.2d 161, 164 (Ky. 1978). In a design defect case this same standard of conduct is applied regardless if the cause of action sounds in negligence or strict liability. Jones v. Hutchinson Mfg., Inc., 502 S.W.2d 66, 69-70 (Ky. 1973). The difference is that under strict liability principles a product is "unreasonably dangerous" if it does not meet the reasonable expectations of the ordinary consumer as to its safety. Ulrich v. Kasco Abrasives Co., 532 S.W.2d 197 (Ky. 1976).

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Section 402 A reads in full as follows:

§ 402 A. Special Liability of Seller of Product for Physical Harm to User or Consumer

(1) One who sells any product in a defective condition unreasonably dangerous to the user or consumer or to his property is subject to liability for physical harm thereby caused to the ultimate user or consumer, or to his property, if

(a) the seller is engaged in the business of selling such a product, and

(b) it is expected to and does reach the user or consumer without substantial change in the condition in which it is sold.

(2) The rule stated in Subsection (1) applies although

(a) the seller has exercised all possible care in the preparation and sale of his product, and

(b) the user or consumer has not bought the product from or entered into any contractual relation with the seller.

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In contrast, under negligence principles plaintiffs must identify and prove a particular failure on the part of a manufacturer to exercise reasonable care in the design of the product. Id.

Defendants correctly assert that the manufacturer of a product is not an insurer that the design of the product is incapable of causing injury. Jones v. Hutchinson Mfg., 502 S.W.2d 66, 70 (Ky. 1973). Nor is a manufacturer required to design "the best possible product, or one as good as others make, or a better product than the one he has, so long as it is reasonably safe." Id. at 69. See also Sturm, Ruger & Co., Inc. v. Bloyd, ___ S.W.2d ___, No. CA-76-271 (Ky. July 3, 1979). But a manufacturer may be liable, even though in conformity with prevailing industry standards, where the safety practices of the entire industry are below the standard of reasonable care. See Jones v. Hutchinson Mfg. Co. Inc., 502 S.W.2d 66, 70 (Ky. 1973). See also, Marsh Wood Products Co. v. Babcock and Wilcox Co., 240 N.W. 392, 396 (1932); The T. J. Hooper Co., 60 F.2d 737, 740 (2d Cir. 1932); Katz, The Function of Tort Liability in Technology Assessment, 38 U. Cinn. L. Rev. 587, 631-36 (1969). Thus "the fact that others make use of the same design is evidence for the defendant, although it is not always conclusive." Prosser, Law of Torts, § 696 (4th Edition 1971). See also K.R.S. 411.310.

Under the concert of action theory it is essential that plaintiffs prove that each defendant charged with responsibility is proceeding tortiously. A defendant who innocently, and carefully, does an act which furthers the tortious purpose is not acting in concert with him and cannot be held liable. Prosser, Law of Torts, § 46 (4th ed. 1971). Plaintiffs must prove that a generically similar defective product was manufactured by all defendants in the targeted group.

* * *

To recapitulate, in order for plaintiffs to prevail under a concert of action theory they must first demonstrate an absolute inability to identify the particular defendant whose product caused plaintiffs' injury. Second, plaintiffs must establish a causal relation between the defendants and the injury-causing product by (1) identifying the injury-causing product; (2) proving that each defendant marketed and promoted a generically similar product; and (3) establishing that the act of each defendant was a substantial factor in the action of defendants to market and promote this product. Third, plaintiffs must prove that defendants acted by express or tacit agreement to market and promote the defective product. Finally, plaintiffs must establish that each defendant in the targeted group contravened a legal standard of care.

2. The Alternative Liability Theory

The alternative liability theory is advanced as a second theory under which joint and several liability has been imposed over defendants whose particular products cannot be directly linked to the injury. The theory of alternative liability applies "where negligence on the part of both defendants is clear, and it is only the issue of causation which is in doubt, so that the choice must be made between letting the loss due to failure of proof fall upon the innocent plaintiff or the culpable defendants." Prosser, Law of Torts, § 41, 243 (4th Edition 1971). Where the alternative liability theory is applicable, the burden of proving causation shifts to the independently acting defendants.

The alternative liability theory has been rejected by at least one Kentucky court in Cox v. Cooper, 510 S.W.2d 520 534 (Ky. 1974). The Cox court required plaintiffs to prove that each defendant in particular is culpable, and refused to shift the burden of causation to defendants. The Court

provided the following example of Kentucky law on this issue:

Though it may be uncontroverted that either A or B or both were negligent and that such negligence caused C's injuries, a verdict against either one must be predicated on the jury's belief from the evidence that he in particular was negligent. The certain knowledge that one or both were guilty cannot sustain the burden against either individual. That burden begins with the plaintiff and remains with the plaintiff. If he does not succeed in convincing the jury that A was guilty, he is not entitled to a verdict. The practical result of the type of instruction under discussion is to shift the burden to the defendants, and that is wrong. The onus cannot be thrust upon the jury to decide something the plaintiff has failed to prove to its satisfaction.

510 S.W.2d at 534.

See also Bradford v. Sagraves, 556 S.W.2d 166, 169 (Ky. 1977).

Since Kentucky does not recognize the alternative liability theory, this claim is subject to dismissal for failure to state a claim upon which relief can be granted.

3. The Enterprise Liability Theory

Plaintiffs also have advanced the theory of enterprise liability as a means of bridging the gap of causation between the injury-causing product and the particular defendants. Concededly, this theory of liability has not been adopted by the Kentucky courts. In fact, Hall v. DuPont, 345 F.Supp. 353 (E.D. N.Y. 1972) is the only case in which this theory has received judicial recognition¹⁴. But see Sheiner, DES and a Proposed Theory of Enterprise Liability, 46 Fordham L. Rev. 963 (1978).

Enterprise liability blends the theories of concert of action and alternative liability, although it relies primarily on the latter. Id. at 974. Thus it is doubtful that Kentucky -- which does not recognize alternative liability or the shifting of the burden of proof to defendants -- would adopt the theory of enterprise liability.

Since enterprise liability is not recognized under Kentucky law, this theory also is dismissed for failure to state a claim upon which relief can be granted.

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This matter was before the court on defendants' motion to dismiss for failure to state a claim. For purposes of this action the Court assumed a "national body of tort law". Hall v. DuPont, 345 F.Supp. 360 (E.D. N.Y. 1972). Assumptively, the acceptance of this theory by any jurisdiction would depend on the law of that jurisdiction.

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B. Proximate Cause

In addition to proving cause in fact, plaintiffs must prove proximate cause as an indispensable prerequisite to recovery in any tort action. Johnson v. Vaughn, 370 S.W.2d 591 (Ky. 1963); Bradford v. Sagraves, 556 S.W.2d 166 (Ky. 1977). The ambit of proximate cause concerns questions of intervening events, remoteness or general policy considerations which prevent a finding of liability.

Under Kentucky law a tortious act is a proximate cause of an injury if the injury is a natural and probable consequence of the act. See Stacy v. Williams, 69 S.W.2d 697 (Ky. 1934); Ohio Casualty Ins. Co. v. Comm. Dept. of Highway, 479 S.W.2d 603 (Ky. 1972); Morris v. Combs' Adm'r, 200 S.W.2d 281 (Ky. 1947); Home Ins. Co. v. Hamilton, 253 F.Supp. 752 (E.D. Ky. 1966). Put differently, "the proximate cause is a cause which would probably, according to the experience of mankind, lead to the event which happened" Sturm, Ruger & Co., Inc. v. Bloyd, ___ S.W.2d ___, No. 78-SC-451-DG, Slip Opinion at 8, (Ky. July 3, 1979), quoting Miller v. Watts, 436 S.W.2d 515 (Ky. 1969).

Only under certain circumstances will an intervening act by a third person - even if negligent - insulate the original actor from liability. Bryant v. Hercules, Inc., 325 F.Supp. 241, 247-48 (W.D. Ky. 1970); Hines v. Westerfield, 254 S.W.2d 728 (Ky. 1953); Hall v. Midwest Bottled Gas Distributors, Inc., 532 S.W.2d 449, 453 (Ky. 1975). When these circumstances occur the intervening force is deemed a superseding cause of the injury.

The test essentially is one of foreseeability. Thus, an intervening force becomes a superseding cause -- and relieves the original actor from liability -- only if the intervening force is so "unexpected or extraordinary" that it could not have been anticipated by the first actor in

the exercise of reasonable care. Watson v. Kentucky and Indiana Bridge and R. Co., 126 S.W. 146, 151 (Ky. 1910); House v. Kellerman, 519 S.W.2d 380, 382 (Ky. 1974). See also Restatement of Torts Second, § 447 (1965). And when strict liability principles are applied, the range of intervening acts which will shield the defendants from liability will be even narrower than under negligence principles. See Second Restatement of Torts § 402A, comment n (1965); 2 Frumer & Friedman, Products Liability, Section 16A.

Under Kentucky law "[t]he question of whether an undisputed act or circumstance was or was not a superseding cause is a legal issue for the court to resolve, and not a factual question for the jury." House v. Kellerman, 519 S.W.2d 380, 382 (Ky. 1974); see also Hall v. Midwest Bottled Gas Distributors, Inc., 532 S.W.2d 449, 452 (Ky. 1975). According to the holding in House v. Kellerman, the court is left with these alternatives in deciding questions of proximate cause. If the court finds an intervening force to be a superseding cause, it must direct a verdict for defendants. If instead the court finds that a certain act would be a supervening cause, but there is a dispute whether the act occurred, the court should submit the question to the jury with the instruction that "unless it believes from the evidence that it did not happen it shall find for the defendant" The final alternative occurs if the court finds an undisputed act not to be a superseding cause as a matter of law. In this event, the case should be submitted to the jury, leaving it to counsel to argue "whether the event . . . played such a major role as to exclude defendant's negligence from being a 'substantial factor' in causing the accident." 519 S.W.2d at 383.

IV. Application of Law to Present Case

Several motions have been filed by members of the Wire

Insulation Group and Wire Device Group.¹⁵ Each motion will be considered separately in view of the above-mentioned principles.

A. Wire Insulation Group

A decision on the motion of the Wire Insulation Group for summary judgment as to plaintiffs' claim under the concerted action theory is stayed pending additional briefs by the parties. This disposition will be more fully explained.

1. Concert of Action Theory

Plaintiffs have satisfied the initial hurdle of concert of action by alleging and presenting evidence in support of the proposition that they are absolutely unable, due to the fungible nature of PVC insulation, to identify the particular injury-causing defendant. See, e.g., Diamond Shamrock's Answer to Plaintiffs' Interrogatory No. 2; Hatfield Wire's Answer to Plaintiffs' Interrogatory No. 17; Essex Group's Answer to Plaintiffs' Interrogatories Nos. 14 and 15. In addition plaintiffs have presented sufficient evidence of causal relation and cooperative or concerted activity. However, the Court is uncertain as to whether plaintiffs have presented sufficient evidence to overcome summary judgment on the issue of whether these defendants breached a legal standard of care owed to plaintiffs.

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Those motions are: Motion by Certain Members of the Aluminum Wire/Device Group for Summary Judgment on All Issues or in the Alternative Partial Summary Judgment as to Enterprise Liability; Motion for Summary Judgment on Behalf of Wire Insulation Only Defendants; Motion by Sol-tex Polymer Corporation for Summary Judgment on all Issues; Motion for Summary Judgment on Behalf of United States Steel Corporation, Motion of Kaiser Aluminum & Chemical for Summary Judgment; Motion for Partial Summary Judgment on Behalf of General Cable Corporation; Separate Motion from [sic] Summary Judgment on Behalf of Defendant American Electrical Industries, Inc., Motion of The Aluminum Association Incorporated for Summary Judgment, Motion for Summary Judgment Dismissing ITT Suprenant Division, Defendant Plymouth Wire and Cable Company's Motion for Summary Judgment.

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a. Causal Relation

In opposition to defendants' motion for summary judgment, plaintiffs have submitted the affidavit of a physician who examined some of the victims of the fire¹⁶. This affidavit indicates that a corrosive substance was found on the lungs of two victims which was of the same type as caused by the emission of corrosive gases from the thermal degradation of PVC insulation. The fact that PVC electrical insulation was located in the Beverly Hills Supper Club is not disputed. Several patrons of the club have indicated that they detected an odor which could have been emitted from PVC insulation. See Deposition of Timothy Napier; Deposition of Maurice Ittel. Thus, for purposes of a summary judgment motion this evidence is sufficient to create a material issue of fact on the question of causation under the concert of action theory.

b. Cooperative or Concerted Activity

Plaintiffs allege that the Wire Insulation defendants acted in concert by promoting and perpetuating the acceptance of PVC insulation with the National Electrical Code, including placement upon Panel No. 8 of the NFPA Code Committee. Plaintiffs' Memorandum Contra Electrical Wire Insulation Defendants' Motion for Summary Judgment at 19, n. 12. Again, plaintiffs have presented sufficient support to satisfy a motion for summary judgment. This support is culled from the affidavit of an engineer who discussed the hazards of PVC insulation at a meeting of wire insulation manufacturers in 1972. Deposition of Roger Keith, Chief Engineer, Insulated Products, Kaiser Aluminum at ____; See also Letter from Joseph S. McDermott to John A. Blair dated November 7, 1975. There is a factual dispute as to whether defendants were jointly aware of the allegedly defective

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Plaintiffs Supplemental Affidavit of Victor H. Esch.

nature of the product, but jointly continued to promote and sell the product as one which was without defect.

c. Breach of Legal Standard

On the question of whether defendants in this group violated a legal standard of care, plaintiffs claim that PVC insulation is unreasonably dangerous and that defendants failed to provide adequate warning of this defect in design. Plaintiffs' contentions on this issue are supported by the affidavit of a fire protection engineer, an article on the toxicity of polyvinyl chloride in fires and an affidavit of a physician familiar with the properties of PVC insulation. See Plaintiffs' Affidavit of Robert E. Taylor, (Plaintiffs' Appendix A to Plaintiffs' Memorandum Contra to Summary Judgment); Esch, "Polyvinyl Chloride Toxicity in Fires", Journal of the American Medical Association (1976) (Plaintiffs' Appendix B to Plaintiffs' Memorandum Contra to Summary Judgment); and Plaintiffs' Supplemental Affidavit of Victor H. Esch; Deposition of Richard Best; Deposition of David Dennis at 428-429.

Whether under the circumstances of the Beverly Hills Supper Club fire the use of PVC insulation was an unforeseeable use, as a matter of law, is an issue which troubles the Court. This issue has not been fully addressed by the parties. Therefore, a decision on the motion for summary judgment of the Wire Insulation Group is stayed pending additional briefs on this issue.

2. Superseding Cause

A genuine issue of material fact does remain on the question of superseding cause. In particular, there is a factual dispute as to whether the acts of others were so unexpected or extraordinary as to cut off defendants' liability as a matter of law. Therefore, this issue is more appropriate for disposition on a motion for a directed verdict.

According to the preceding discussion a decision on summary judgment as to the Wire Insulation Group is STAYED until the parties have the opportunity to address the one

outstanding issue which is of concern to the Court. A briefing schedule on this issue will be set by the Court in the near future.

B. Wire and Device Group

The Wire and Device Group has not demonstrated conclusively the absence of any genuine issue of material fact concerning plaintiffs' theory of concert of action and on the issue of superseding cause.

1. Concert of Action

a. Causal Relation

Plaintiffs have supplied the affidavit of Jesse Aronstein on the question of causation. Plaintiffs' Supplemental Affidavit of Jesse Aronstein Contra Defendants' Motion for Summary Judgment. In addition, plaintiffs have submitted excerpts from the deposition of Jesse Aronstein. Aronstein's affidavit indicates he conducted tests on cable samples which came from the remains of the Beverly Hills Supper Club to determine "the effect that gasses and deposits from burning cable insulation in a conduit have on electrical disconnect panels attached to that conduit." Aronstein Affidavit at 1. Aronstein concluded from these tests that he had "demonstrated one possible mechanism by which the spread of the fire at Beverly Hills could have occurred." This may be insufficient evidence to avoid a motion for a directed verdict, but it is sufficient for purposes of summary judgment on the issue of causation under the concert of action theory.

b. Cooperative or Concerted Activity
and
Burden of Legal Standard

As to the requirement that defendants in this group have acted in concert and violated a legal standard of care,

plaintiffs append the following: "Hazards Posed by Old Technology Aluminum Wiring Systems", Hearing before Subcommittee on Oversight and Investigations, Committee on Interstate and Foreign Commerce (1978). Specifically, plaintiffs refer to a letter by Battelle Columbus Laboratories dated August 30, 1972 (Hearing at 5455); the testimony of Rainbow (H. 221247); Rainbow, "Some Thoughts on Electrical Connections" (H. 221247); the testimony of Gilvert (H. 264265, 284); and a letter by DuPont dated May 8, 1970 (H. 22627, 303309). These documents create a genuine issue of material fact as to whether aluminum wire and devices are defective and whether these defendants acted in concert in promoting and selling a defective product without adequate warnings.

2. Superseding Cause

Finally, on the issue of superseding cause, a genuine issue of material fact remains in dispute which is not appropriate for disposition at this time but which will be considered upon defendants' motion for a directed verdict. Accordingly, the motion by the Wire and Device Group for summary judgment is DENIED.

C. Soltex Polymer

The motion of Soltex Polymer (Soltex) is unique in the motions filed by members of the Wire Insulation Group. More specifically, Soltex contends it does not manufacture the product claimed by plaintiffs in their complaints to have been manufactured by it. In support of this contention, Soltex submits the affidavit of Dr. Elliott A. Vogelfarger, Manager of Research and Development of the Soltex Polymer Corporation (Soltex' Exhibit F).

According to the complaint, plaintiffs allege that Soltex is a manufacturer or distributor of electrical wiring insulation. This is the only claim plaintiffs have against

this defendant. The affidavit of Dr. Elliott A. Vogelfarger states that: "Soltex Polymer has never engineered, designed, manufactured, sold, distributed or supplied any electrical power wire insulation." In addition, Dr. Vogelfarger's affidavit provides that Soltex has never manufactured or distributed any components used in the manufacture of insulation or jacketing material for electrical power wire.

Plaintiffs have been unable to present any support in controversion of the Vogelfarger affidavits. Soltex has established conclusively that no genuine issue of material fact is present and that defendant Soltex is entitled to a judgment as a matter of law.

Accordingly, the motion of Soltex Polymer for summary judgment is hereby GRANTED.

D. United States Steel Corporation

United States Steel Corporation (U.S. Steel) has also filed a motion for summary judgment as well as a Reminder and Rejoinder and a Supplement to Rejoinder. Unlike Soltex, U.S. Steel does not contest the fact that it manufactures aluminum wire or wire insulation. Instead, U.S. Steel claims that it did not manufacture a product located in the Beverly Hills premises on the day of the fire. In support of this contention U.S. Steel submits the affidavit of Joseph M. Cooper, Sales Manager. This affidavit indicates that U.S. Steel is primarily engaged in supplying materials for industrial uses. In addition, U.S. Steel has submitted other affidavits of other employees, all indicating that U.S. Steel did not supply the Beverly Hills Supper Club.¹⁷

Under the concert of action theory it is not a necessary element of plaintiffs' proof that they identify a defendant as manufacturing the particular product which caused plaintiffs harm. It is sufficient under this theory if plaintiffs show

¹⁷ See Affidavits of George E. Hanson, Jr. and Donald J. [illegible]

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(1) that defendant manufactured a generically similar product to the one identified as causing plaintiffs' harm and that defendant's actions in placing in the marketplace and promoting the product were a substantial factor in plaintiffs' injuries; (2) that defendant acted in concert with other members of the targeted industry in promoting and selling the product; and (3) that defendant violated a legal standard of care towards these plaintiffs. Thus, issues of fact are contested and summary judgment is not the proper avenue for disposition of this matter.

Accordingly, the motion of United States Steel Corporation for summary judgment is DENIED.

E. Kaiser Aluminum & Chemical Company

Kaiser Aluminum & Chemical Company initially raises questions of service or process, subject matter jurisdiction and statute of limitations. As to service of process, Kaiser contends that service in the Coburn case, No. 77-79, was improper but concedes the propriety of service in Kiser, No. 78-29. Kaiser admits that it has received notification of this lawsuit along with a copy of the complaint.

Since the Kiser and Coburn actions have been consolidated, Kaiser's claim on the issue of service of process is meritless. See Pretrial Order No. 115. Kaiser is properly a party to this action and has received timely and adequate notice of the pendency of this lawsuit. Thus, Kaiser's motion to dismiss for improper service or process is DENIED.

Questions of subject matter jurisdiction have previously been considered by this court. See Pretrial Order No. 119. At that time this court determined that subject matter jurisdiction was present. Kaiser's motion to dismiss for lack of subject matter jurisdiction is therefore DENIED.

Statute of limitations issues also have previously been considered and disposition rendered. See Pretrial Order No. 182. Since Kaiser adopts the memoranda of those defendants

whose motions have already been disposed of on the statute of limitations issue, no additional consideration is necessary. This claim too is DENIED.

Finally, Kaiser contends that its product was not identified as being in the Supper Club. In this respect Kaiser's motion is similar to the motion of U.S. Steel and it is DENIED.

F. General Cable Corporation

General Cable Corporation (General Cable) moves for summary judgment on the ground that its product was not identified as a product in the Supper Club. In this way General Cable's motion is similar to the motion of U.S. Steel and portions of the motion filed by Kaiser. These defendants have collectively been referred to as "Product Out" defendants.

General Cable is a member of the Wire and Device Group. Several defendants in this group have been identified by plaintiffs as having a product located in the Supper Club. General Cable was not among these defendants.

Although certain defendants were identified as having products in the Supper Club, no defendant has been identified as the manufacturer of the product which caused plaintiffs' injury. This case is not similar to Hall v. DuPont, 345 F.Supp. 353 (E.D. N.Y. 1972), where the particular manufacturer of the injury-causing product was identified. On the contrary, this case is more closely analogous to Chance v. DuPont, 345 F.Supp. 353 (E.D. N.Y. 1972) where the particular manufacturer of the injury-causing product was not identified and industry-wide liability was found to be applicable.

Therefore, there is no sound basis for distinguishing the "Product Out" defendants from other members of the Wire and Device Group. Accordingly, General Cable's motion for summary judgment, in line with the motions of U.S. Steel and Kaiser, must be DENIED.

G. American Electrical Industries, Inc.

American Electrical Industries, Inc. (AEI) moves for summary judgment as a member of the Wire and Device Group. AEI contends that summary judgment is appropriate because (1) it did not have a product in the Supper Club; and (2) it has not manufactured "old technology" aluminum wire or wiring systems.

AEI's first contention is denied for the above-mentioned reasons. As to its second contention, AEI has not established by affidavit or otherwise that it does not manufacture "old technology" aluminum wire or wiring systems. A dispute of material fact is present and summary judgment cannot be granted. Accordingly, the motion of AEI for summary judgment is hereby DENIED.

H. Aluminum Association, Incorporated

The Aluminum Association, Incorporated (AA) is a trade association of aluminum wire and device manufacturers including six defendants named in this action¹⁸. AA does not manufacture or distribute aluminum products. AA contends (1) that this court lacks personal jurisdiction over the AA, and (2) that plaintiffs' liability theories are not applicable to the AA.

The AA originally filed its motion to dismiss for lack of personal jurisdiction on June 21, 1978. In response plaintiffs requested additional time and discovery to establish that the AA had the requisite contacts with the State of Kentucky for personal jurisdiction. To date plaintiffs have failed to supply any evidence to suggest that the AA has any contact with Kentucky.

The AA is a nonprofit corporation, incorporated in the State of Delaware with its only office in Washington, D.C.

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The Association members are American Electrical Industries, Inc., The Anaconda Company, Reynolds Metals Company, Southwire Company, Kaiser Aluminum & Chemical Corporation and General Cable Corporation.

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As such, the in personam inquiry is whether the AA has had a substantial enough contact with the State of Kentucky to permit this Court to acquire jurisdiction over it pursuant to Kentucky's long-arm rule.

In a diversity action, the jurisdiction of a federal district court is determined by the law of the state in which federal district court is held. Southern Machine Co. v. Mohasco Industries, Inc., 401 F.2d 374, 376 n.2 (6th Cir. 1968). A federal district court may exercise jurisdiction over a non-resident of the forum state if the forum state has a procedure which would permit the exercise of such jurisdiction. Fed. R. Civ. P. 4(e); Fed. R. Civ. P. 4(d)(7).

Kentucky has such a procedure. The pertinent portions of the statute are:

A court may exercise personal jurisdiction over a person who acts directly or by an agent, as to a claim arising from the person's

1. Transacting any business in this Commonwealth;
2. Contracting to supply services or goods in this Commonwealth;
3. Causing tortious injury in this Commonwealth by an act or omission outside this Commonwealth, if he regularly does or solicits business, or engages in any other persistent course of conduct, or derives substantial revenue from goods used or consumed or services rendered in this Commonwealth, provided that the tortious injury occurring in this Commonwealth arises out of the doing or soliciting of business or a persistent course of conduct or derivation of substantial revenue within the Commonwealth;
5. Causing injury in this Commonwealth to any person by breach of warranty expressly or impliedly made in the sale of goods outside this Commonwealth when the seller knew such person would use, consume, or be affected by, the goods in this Commonwealth, if he also regularly does or solicits business, or engages in any other persistent course of conduct, or derives substantial services rendered in this Commonwealth;

* * *

(b) When jurisdiction over a person is based solely upon this section, only a claim arising from acts enumerated in this section may be asserted against him. Ky. Rev. Stat. § 454.210(2)(a).

When jurisdiction is asserted under this statute, two conditions must be satisfied before jurisdiction, in fact, will attach. First, the Court must find that defendant committed a physical act which falls within one of the fact situations of the statute. If it does, the Court must find, in addition, that an exercise of jurisdiction based upon the defendant's act would comport with Fourteenth Amendment due process.

In support of its motion to dismiss for lack of personal jurisdiction, the AA has submitted the affidavit of Robert A. Reinfried, Treasurer of the Aluminum Association, Incorporated. This affidavit provides in part:

[t]hat the Association does not transact business or contract to supply services or goods in the Commonwealth of Kentucky. The Association does not regularly do or solicit business in Kentucky and does not engage in any persistent course of conduct or derive substantial revenue from goods used or consumed or services rendered in Kentucky. The Association has no office, agents or employees in Kentucky.

Again, this affidavit is not controverted by the plaintiffs.

Plaintiffs have failed to provide any factual basis for asserting in personam jurisdiction over this defendant. Based on the Reinfried affidavit, the AA has no contacts with the State of Kentucky. The exercise of personal jurisdiction over the AA does not satisfy the statutory requirements under the Kentucky long-arm statute or the due process requirement under the Fourteenth Amendment.

Accordingly, the Aluminum Association's motion to dismiss for lack of personal jurisdiction is GRANTED. Since this Court lacks in personam jurisdiction over the Aluminum Association it is unnecessary to examine the other grounds for summary judgment asserted by the Aluminum Association.

I. ITT Surprenant Division

The motion of ITT Surprenant Division (ITT) is similar to the motion of Soltex Polymer. ITT claims that it does not manufacture the product which plaintiffs claim it manufactures.

According to the complaint, ITT is sued as a manufacturer of PVC insulation. ITT has attached the affidavit of

W. William Bennett, Jr. which indicates that ITT manufactures neither aluminum wire nor PVC insulation. ITT does manufacture copper wire and cable and extrudes PVC insulation onto its copper wire. ITT's product was not located in the Supper Club.

Plaintiffs have advanced no theory by which a purchaser of PVC insulation can be brought into this action, and we are reluctant to advance a theory of concert of action beyond the limits already established. Thus, plaintiffs have failed to state a claim for relief against this defendant. Accordingly, plaintiffs' claims against ITT are hereby DISMISSED.

V. Conclusion

The foregoing should not be deemed as an expression by the Court of liability of any of the defendants herein. Plaintiffs' ability to prevail on the merits or to survive motions for directed verdicts at the conclusion of their case must await the trial of this matter on its merits.

The Court holds only that in accordance with the appropriate standards in this circuit defendants, except as hereinabove noted, are not entitled to summary judgment.

This matter will proceed to trial on the merits in accordance with previous Orders of this Court.

IT IS SO ORDERED.


Carl B. Rubin, Chief Judge
United States District Court

11634

DAY 7 AGENT ORANGE TESTIMONY
KER V DOW

11030
11031

UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF NEW YORK

-----X

In re:

"AGENT ORANGE"

Product Liability Litigation

-----X

MDL No. 381 (JBW)

(All Cases)

U.S. DISTRICT COURT
EASTERN DISTRICT OF NEW YORK
9
✓ 14

MEMORANDUM OF LAW OF DEFENDANT THE DOW
CHEMICAL COMPANY IN SUPPORT OF ITS MOTION
TO DISMISS IN LIGHT OF PLAINTIFFS' INABILITY
TO ESTABLISH THAT ANY PARTICULAR PLAINTIFF
WAS EXPOSED TO ANY AGENT ORANGE MANUFACTURED
BY DOW

1736

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We submit this memorandum of law on behalf of defendant The Dow Chemical Company ("Dow") in support of Dow's motion to dismiss under Rule 12 of the Federal Rules of Civil Procedure all claims asserted against Dow in the In re "Agent Orange" Product Liability Litigation, MDL No. 381 (hereinafter "Agent Orange Litigation"), on the ground that plaintiffs are unable to identify any Agent Orange* manufactured by Dow as the cause of their alleged injuries.**

INTRODUCTION

One of the most basic tenets of products liability law is that "the imposition of liability depends upon the plaintiff proving that the defendant manufacturer made the product that caused the plaintiff's injury." Starling v. Seaboard Coast Line R. Co., 533 F. Supp. 183, 187 (S.D. Ga. 1982).

In Pretrial Order No. 66, this Court recognized the difficulties that each individual plaintiff would encounter in attempting to prove that a particular defendant made the particular batch of Agent Orange to which that plaintiff was exposed. Thus, the Court requested argument

on how plaintiffs propose to show that a particular defendant is responsible for any injury to any particular plaintiff.

* As used herein, the term "Agent Orange" refers to all herbicides in issue in these proceedings.

** The Court has the right under Rule 12(b), Fed. R. Civ. P., to consider Dow's motion to dismiss as a motion for summary judgment under Rule 56.

In that same Order, the Court also expressed its doubt regarding the applicability of any alternate theories of liability in the absence of defendant identification:

The case authority I have seen [applying the alternate liability theories] seems distinguishable from the instant case.
(Citations omitted.)

In response to Pretrial Order No. 66, Dow submitted a memorandum asserting that, in light of the unique circumstances surrounding the use of Agent Orange in Vietnam, no individual plaintiff would be able to satisfy his burden of defendant identification and that, upon plaintiffs' failure to demonstrate an ability to satisfy this burden, plaintiffs' claims must be dismissed.* We further urged this Court to refrain from relieving plaintiffs of their burden of defendant identification by applying any of the alternate theories of liability to this case.

In their response to Pretrial Order No. 66, plaintiffs conceded that they would be unable to meet their well-settled burden of proof of defendant identification: "[T]o require each plaintiff to identify the specific defendant or defendants whose

* See Memorandum of Law of The Dow Chemical Company in Opposition to the Utilization of Alternate Theories of Liability in this Litigation and in Support of the Dismissal of Plaintiffs' Claims, dated November 30, 1983 (hereinafter "Dow's Alt. Liability Memo at ____").

Agent Orange caused his injuries, would present impossible burdens of proof."*

Plaintiffs, in light of their admitted lack of proof, have advanced a number of theories of liability which would relieve them of their burden of defendant identification. See Plaintiffs' Alt. Liability Memo at pp. 96-112; "Sixth Amended Verified Complaint," filed in Ryan v. Dow, Civ. Action No. 79-C-747 (E.D.N.Y.), a copy which is annexed as Exhibit "1".

At a pretrial conference on December 5, 1983, these theories were discussed. After hearing oral argument from plaintiffs' counsel, the Court inquired whether Dow was moving to dismiss this case in light of plaintiffs' inability to meet their burden of defendant identification. Counsel for Dow acknowledged that it was indeed seeking such relief, and the Court requested submission of a formal motion. Tr. at 40-42.

Pursuant to the Court's direction, this memorandum and the accompanying exhibits are submitted in support of Dow's motion to dismiss all claims against it in these proceedings on the grounds that plaintiffs are unable to meet their burden of defendant identification and that there is no legal or factual basis for the alternate theories of liability asserted by plaintiffs.

* See Plaintiffs' Memorandum on the Applicability of the Legal Theories of Failure to Warn, Concerted Action, Enterprise Liability and Alternative Liability, dated December 1, 1983 at p. 82 (hereinafter "Plaintiffs' Alt. Liability Memo at ____").

SUMMARY OF ARGUMENT

Under well-settled principles of product liability law, an essential element of a plaintiff's claim is that the manufacturer's product was the proximate cause of the harm complained of. Absent proof establishing this causal relationship, plaintiffs' claims must be dismissed.

Plaintiffs in the Agent Orange Litigation have conceded their inability to satisfy this element of their case. Responsibility for plaintiffs' lack of proof and, indeed, their inability to sue the only clearly identifiable potential tortfeasor in the case, the United States, lies with the United States.* Under these circumstances, relieving plaintiffs of their burden of defendant identification is unjustified.

In a few rare instances, courts have fashioned remedies which relieve plaintiffs of their burden of identifying the particular defendant which was responsible for producing the product that actually caused plaintiff's harm. Essentially four theories of so-called alternate liability have been articulated: (1) alternative liability, (2) market share liability, (3) concert of action and (4) enterprise liability. It is unclear whether plaintiffs intend to rely upon the market share theory.

* The Government has informed the parties that it cannot identify the manufacturer of particular batches of Agent Orange to which plaintiffs may have been exposed. Letter of Arvin Moskin, Esq. to All Counsel, dated January 9, 1984. As explained at p. 17, infra, the Government's current inability to do so is a direct consequence of its method of conducting the defoliation program.

See p. 16, infra. Nonetheless, we include it in our discussion for the sake of completeness and in light of the Court's reference to it, albeit in terms of dubious applicability, in Pretrial Order No. 66.

Dow's opposition to the imposition of any of these theories is twofold. First, there are significant policy considerations which counsel against relieving plaintiffs of their burden of defendant identification as a matter of law. Indeed, the creation of these remedies and their application in product liability cases is discouraged and viewed as a "radical departure" from long-standing and well-established product liability principles. Mizell v. Eli Lilly & Co., 526 F. Supp. 589, 596 (D.S.C. 1981).

Second, aside from these policy considerations, the facts of this case, as developed after almost two years of discovery, simply do not provide the factual predicate for the imposition of any of the alternate theories of liability.

Alternative Liability

Alternative liability, which imposes joint and several liability on all defendants, has been uniformly rejected in every product liability case in which it has been raised. Alternative liability is only applicable when the cause of the harm complained of is undisputed, when all of the possible tortfeasors are before the court and when the defendants are in a superior position to offer evidence of defendant identification or are

responsible for plaintiff's inability to identify the specific tortfeasor.

The Agent Orange Litigation does not satisfy any of these factors. The cause of the harm complained of by plaintiffs is clearly disputed. Indeed, plaintiffs' claim that the trace amounts of 2,3,7,8 tetrachlorodibenzo-p-dioxin ("TCDD" or "dioxin") in the herbicide Agent Orange caused the incredibly diverse range of maladies they allege is contrary to the overwhelming weight of medical and scientific evidence. Additionally, in light of the staggering number of potential alternate causes for plaintiffs' alleged injuries, it is evident that all of the possible tortfeasors -- most notably the United States -- are not before the Court.* Furthermore, it was the military's method of procuring and using Agent Orange which renders plaintiffs unable to satisfy their burden of defendant identification. Other than supplying the herbicide under government contract, Dow played no part in this military operation and is in no better position than plaintiffs to identify the specific manufacturer of a batch of Agent Orange to which a particular plaintiff was exposed.

Market Share Liability

Under market share liability, articulated by a sharply-divided California Supreme Court in Sindell v. Abbott Laborator-

* While this Court has indicated that the United States may be a defendant in the upcoming trial with respect to the claims of non-veterans, the government's exposure is nonetheless severely limited in view of the central role it plays in the underlying facts of this case.

ies, 26 Cal. 3d 588, 607 P.2d 924, cert. denied, 449 U.S. 912 (1980), a defendant is subject to liability for a percentage of plaintiff's alleged damages equal to that defendant's share of the total market of the product within a given area and time frame. The defendant can escape liability by establishing that it could not have made the product which caused plaintiff's damage. Market share liability constitutes an unprecedented and questionable departure from well-settled product liability principles. Moreover, the social and economic ramifications of this theory require that the legislature rather than the judiciary address the issue in the first instance.

The creation of market share liability in Sindell was predicated on the fact that all defendants manufactured an identical product with the capacity to cause the alleged harm that was undisputed. Thus, the risk created by each defendant's product was identical. Consequently, a defendant's share of the relevant market bore a direct correlation to the likelihood that its product caused a particular plaintiff's harm. Utilizing this formula, the court concluded that liability without product identification could be apportioned fairly.

The Agent Orange Litigation presents a far different situation. Each defendant's Agent Orange had widely disparate amounts of TCDD -- the allegedly toxic causative agent -- resulting in a non-fungible product whose propensity for causing harm, as alleged by plaintiffs, is directly dependent on the con-

centration of the TCDD in each manufacturer's Agent Orange. The greater the concentration of TCDD in Agent Orange, the greater the likelihood of the alleged risk; the smaller the concentration, the lesser the likelihood of the alleged risk. Therefore, in contrast to the equal risk imposed by each manufacturer's DES product in Sindell, each defendant's Agent Orange posed a different alleged risk to the ultimate user. Thus, imposing liability based upon market share would bear no correlation at all to the likelihood that a particular defendant's Agent Orange caused a particular plaintiff's harm.

Moreover, market share liability, as espoused in Sindell, has no application where, as here, the capacity of the product to cause harm is seriously disputed and the number of other possible causative factors renders one defendant's share of the market of one product meaningless.

Concert Of Action

The concert of action theory is analogous to a theory of criminal conspiracy. Under this theory, joint and several liability will be imposed on defendants who have either expressly or tacitly agreed to commit a tortious act which is the proximate cause of plaintiffs' injuries.

Courts have generally rejected the concert of action theory in product liability cases, citing serious conceptual problems. These courts have concluded that employing this theory to normal business practices within an industry would take the

theory far beyond its intended scope, unfairly rendering the manufacturer of a safe product liable for the allegedly defective product of other industry members.

Furthermore, more than two years of discovery has demonstrated that there is simply no factual basis for plaintiffs' concert of action allegations. Briefly stated, plaintiffs contend that defendants conspired to hide from the government the fact that TCDD was a potential by-product in the manufacture of trichlorophenol ("TCP"), a precursor to 2,4,5-T, that some manufacturers had experienced occupational health problems as a result of this and that trace amounts of the TCDD by-product could be present in Agent Orange.

However, plaintiffs have offered no direct or even circumstantial evidence of an agreement between Dow and any other Agent Orange manufacturer to hide this information. Moreover, the actions of Dow and its competitors do not even remotely suggest a tacit agreement to conspire to conceal information.

Indeed, far from creating an issue of fact sufficient for consideration by a jury, the evidence clearly establishes that plaintiffs' allegation of a conspiracy to conceal information is sheer fantasy. The record before this Court demonstrates that when Dow experienced an occupational health problem in 1964 among its trichlorophenol workers, it endeavored to identify the source of the problem. Upon learning that the chloracne experienced by its plant employees was attributable to high con-

centrations (up to 10,000 parts per million ["ppm"]) of TCDD in the waste stream of the TCP process, Dow immediately notified its TCP customers and the Michigan Department of Health and instituted quality control procedures to eliminate dioxin from its trichlorophenol and 2,4,5-T products. Thereafter, Dow shared its information with occupational health specialists throughout the world, as well as representatives of the United States Army and Public Health Service. In addition, in March, 1965, Dow technical personnel met with their counterparts at other companies manufacturing TCP to advise them of what Dow had learned.

Significantly, neither Dow nor any of the other three TCP manufacturers in attendance at the meeting were selling Agent Orange to the government at that time, and, in fact, Dow did not commence selling Agent Orange to the United States until the following year. Furthermore, in 1967 Dow again notified the Army and the Department of Defense of the above occupational health problems when the military decided to manufacture Agent Orange at a facility in Weldon Springs, Missouri. In addition, the Department of Commerce, which was supervising the sale of Agent Orange to the military, was advised by Dow of the occupational health problems attributable to the potential TCDD by-products in the manufacture of 2,4,5-T.

The widely disparate amounts of TCDD in each defendant's Agent Orange aptly illustrates that Dow and other manufacturers, far from acting in concert, acted independently and differently regarding the potential TCDD contaminant in Agent Orange. While

Dow imposed a standard of no dioxin -- at the lowest level at which dioxin could then be reliably detected -- others did not, presumably relying on the long history of widespread and safe domestic use of 2,4,5-T.

Plaintiffs' allegations of a sinister and conspiratorial failure to warn are of no legal significance if this failure to warn was not the proximate cause of their injuries. Here, the element of proximate cause is missing because the information purportedly withheld by the defendants was known to the government. As this Court concluded in Pretrial Order No. 51, there is uncontradicted evidence that the government and the military were well aware of the presence of trace amounts of dioxin in Agent Orange and of industrial health hazards associated with the manufacture of 2,4,5-T. Evidence uncovered subsequent to Pretrial Order No. 51 further documents that the military possessed both the scientific and technical expertise in these areas, belying plaintiffs' assertion that this information was exclusively known by defendants.

Moreover, unbeknownst to defendants at the time, the only study -- albeit of questionable validity -- even suggesting a possible health hazard to humans from the use of 2,4,5-T was the government-sponsored Bionetics Report. It was the political controversy surrounding the release of this confidential government report, along with other well-documented political pressures, which lead to the suspension of the herbicide program.

Finally, the relevant information on chloracne and dioxin was common knowledge among interested persons in government, industry, and academia, and was in fact published in the open scientific literature on many occasions during the 1950s and 1960s.

Enterprise Liability

The facts of this case also fail to satisfy the factual predicate for enterprise liability. Enterprise liability, as conceived by this Court in Hall v. E. I. Du Pont De Nemours & Co., 345 F. Supp. 353 (E.D.N.Y. 1972), is premised on a factual setting where all defendants share jointly the control of the risk associated with a given product. In this case, there is clearly no joint control of the risk. Each defendant manufactured Agent Orange in accordance with its own process and, thus, exercised individual control over any risk attributable to the presence of trace amounts of TCDD in their Agent Orange. Furthermore, in Hall, there was evidence of an industry-wide safety standard adopted by the defendants. Here, contrary to Hall, there is no evidence of a uniform safety standard adopted regarding Agent Orange or TCDD, nor even an explicit or tacit agreement among defendants as to the need for a safety standard.

* * *

In sum, sound policy reasons and the unique facts of this case counsel against departure from the well-settled requirement of defendant identification by resorting to one of

the alternate theories of liability discussed herein.

Accordingly, the Court should grant Dow's motion under Rule 12 of the Federal Rules of Civil Procedure to dismiss all claims against Dow in these proceedings.

POINT I

PLAINTIFFS HAVE ACKNOWLEDGED THAT THEY ARE UNABLE TO SATISFY THEIR BURDEN OF IDENTIFYING THE MANUFACTURER OF THE PARTICULAR BATCH OF AGENT ORANGE TO WHICH EACH PLAINTIFF WAS EXPOSED.

In their response to Pretrial Order No. 66, plaintiffs have admitted that at trial they will be unable to present proof that one particular defendant's Agent Orange was the proximate cause of the injuries complained of by a specific plaintiff. Plaintiffs' Alt. Liability Memo at p. 82; Proceedings before Judge Weinstein on December 5, 1983, Tr. at 66.

Under traditional products liability law, plaintiff bears the burden of establishing this causal connection and, in the absence of such proof, plaintiff's claims must be dismissed. See, e.g., Morton v. Abbott Laboratories, 538 F. Supp. 593, 595 (M.D. Fla. 1982); Starling v. Seaboard Coast Line R. Co., *supra*, 533 F. Supp. at 197; Prelick v. Johns-Manville Corp., 531 F. Supp. 96, 98 (W.D. Pa. 1982); Tidler v. Eli Lilly & Co., 95 F.R.D. 332 (D.D.C. 1982); Mizell v. Eli Lilly & Co., *supra*, 526 F. Supp. at 595; Ryan v. Eli Lilly & Co., 514 F. Supp. 1004, 1018 (D.S.C. 1981); Payton v. Abbott Labs, 512 F. Supp. 1031 (D. Mass 1981). See also Dow's Alt. Liability Memo at pp. 4-5.

Plaintiffs' inability to meet their burden of identifying a particular manufacturer is the direct result of the military's methods of procuring and using Agent Orange. Under the

terms of the government contracts and specifications issued by the military for the sale of Agent Orange, the herbicide was to be delivered to the military in fifty-five gallon drums. These contracts and military specifications required that the drums be identified only by contract number rather than by the manufacturer's name. See, e.g., Award/Contract for Herbicide Orange, dated May 20, 1968, at p. 4, Exhibit "2". Furthermore, the handling and shipping of the drums and the eventual disposition of their contents were all within the complete discretion and control of the military. Dow simply played no part in this and the resultant inability of plaintiffs to meet their burden of proof.

Plaintiffs' inability to pursue its claims against the government, which decided to use Agent Orange as part of its integrated weapons system in Vietnam, is the result of the Supreme Court's interpretation of Congressional intent in Feres v. United States, 340 U.S. 135 (1950). The Supreme Court held in Feres that Congress did not intend to waive the United States' sovereign immunity from suit for injuries arising incident to military service. As this Court noted at the pre-trial conference on December 5, 1983:

[T]he only reason here that you [the plaintiffs] have that problem is because the Government is immune. Normally, if they [the defendants] sold everything to another party who sprayed it, you'd sue the other party, but here you have a special problem. That doesn't seem to make

your argument any more powerful. The unfairness comes not from the unfairness of the law but because of the unfairness of the Government.

Tr. at p. 9 (emphasis added).

In short, any unfairness plaintiffs complain of is directly attributable to the actions of the military during a time of war and the government's immunity from suits arising out of military service. We respectfully submit that these factors do not justify departing from sound principles of product liability law which, in this instance, require dismissal of plaintiffs' claims.*

* Indeed, the Agent Orange Litigation presents a compelling example of a situation where departing from traditional tort principles of liability would have serious ramifications. See discussion at pp. 48-49, infra.

POINT II

NONE OF THE THEORIES OF ALTERNATE
LIABILITY ADDRESSED BY THE COURT
OR THE PARTIES ARE APPLICABLE IN
THIS CASE.

In certain product liability cases, where plaintiffs are unable to identify the manufacturer of the injury-causing product, courts have created theories of recovery which relieve plaintiffs of the burden of identifying a particular defendant and have shifted the burden of proof to defendants. There are four of these so-called "alternate" theories of recovery: alternative liability, market share liability, concert of action and enterprise liability.

It appears from plaintiffs' submission in response to Pretrial Order No. 66 that they presently rely on three of these theories -- alternative liability, concert of action, and enterprise liability -- but it is somewhat unclear whether they intend to rely upon the fourth theory, market share liability. See Plaintiffs' Alt. Liability Memo at p. 83 n.10. Plaintiffs' recently filed class action complaint in Ryan v. Dow, Civ. Action No. 79-C-747 (E.D.N.Y.), contains vague and conclusory allegations which suggest that they may rely on all four theories. See "Sixth Amended Verified Complaint," at ¶¶ 40-41, 45, 47-52, 64, Exhibit "1". In any event, we address the market share theory herein, since the Court has specifically referred to it in Pretrial Order No. 66, though questioning its application to this litigation.

Significantly, the four theories of alternate liability cited above have been applied in an extremely limited number of circumstances. The vast majority of courts that have been asked to consider the application of one or more of these theories have rejected them, viewing them as "radical departure[s]" from traditional concepts of product liability principles, Morton v. Abbott Laboratories, supra, 535 F. Supp. at 599; Mizell v. Eli Lilly & Co., supra, 526 F. Supp. at 596, and as "repugnant to the most basic tenets of tort law." Ryan v. Eli Lilly & Co., supra, 514 F. Supp. at 1017.*

In Pretrial Order No. 66, and again at the conference on December 5, 1983, this Court expressed serious doubt regarding the application to this litigation of any of the alternate theories of liability. We agree with the Court. As set forth in more detail below, as a matter of policy and in light of the unique facts of this case, none of the four theories of alternate liability are applicable to the Agent Orange Litigation.

A. Alternative Liability

The theory of alternative liability is appropriate where it is unquestioned that one of two or more defendants, all of whom acted tortiously, caused plaintiff's injuries, but the

* It must also be recognized that serious due process questions are raised by imposing liability on a manufacturer absent a showing that it was that manufacturer's product which caused the harm complained of. See Dow's Memo on Alt. Liability at p. 7 n*.

plaintiff is unable to identify which defendant caused his injuries. In that instance, joint and several liability will be imposed on all of the defendants, although only one of them in fact caused plaintiff's injuries. The policy underlying this theory is that it would be unjust to deny recovery to the innocent plaintiff merely due to his inability to identify the proper defendant. See Restatement (2d) of Torts, §443B(3) (1965).

The seminal case establishing the principle of alternative liability is Summers v. Tice, 33 Cal. 2d 80, 199 P.2d 1 (1948). There, plaintiff was injured when his two hunting companions each simultaneously fired a shot in his direction, one of the shots striking him in the eye. Plaintiff was unable to prove which of the defendants fired the shot that struck him. The court emphasized that there was no question as to causation. There could be no doubt that one of the defendants fired the errant bullet, and the only failure of proof was as to which one it was. Accordingly, the court held both defendants jointly liable.

Efforts to apply the theory of alternative liability embodied in the Restatement and Summers to product liability cases have been uniformly rejected. Sindell v. Abbott Labs, supra; Starling v. Seaboard Coast Line, supra; Ryan v. Eli Lilly & Co., supra; Morton v. Abbott Labs, supra.* Indeed, the

* In Abel v. Eli Lilly & Co., 94 Mich. App. 59, 289 N.W.2d 20 (1979), a DES case, a Michigan appellate court held that plaintiff's broad allegations fell within the theory of alternative liability. A close reading of the decision, however, indicates that the court was proceeding under a market share theory of liability, discussed at pp. 41-54, infra.

California Supreme Court, the very court which recognized the theory of alternative liability in Summers, concluded that it was inapplicable in complex products liability litigation. Sindell v. Abbott Labs, supra, 607 P.2d at 931.

In their analysis of whether alternative liability is appropriate in a products liability case, the courts have focused on a number of factors, which can be summarized as follows: (1) whether the cause of the harm complained of is undisputed; (2) whether all of the possible tortfeasors are before the court; (3) whether the defendants are in a superior position to offer evidence of identification, or the defendants are responsible for plaintiff's inability to identify the manufacturer. See, e.g., Ryan v. Eli Lilly & Co., supra, 514 F. Supp. at 1016-17.

Applying these factors to the facts of this case, it is apparent that this theory of liability is inappropriate in the Agent Orange Litigation.

1. Causation

The issue of causation in this case is far from settled and is quite distinguishable from Summers. In Summers, there was no question as to the cause of plaintiff's injuries. One of the bullets, fired by one of the two defendants, and nothing else, produced plaintiff's injuries.

By contrast, the cause of the myriad of injuries claimed by the plaintiff-veterans in the Agent Orange Litigation is one

of the central issues in dispute.* Indeed, the overwhelming weight of medical and scientific opinion to date, in regard to dioxin and Agent Orange, supports defendants' position that their herbicides caused no harm.** Thus, the circumstances surrounding the causation issue in Agent Orange preclude adoption of the alternative liability theory.

Despite the seriousness of the claims leveled against defendants by plaintiffs and the volume and intensity of the media coverage of the Agent Orange and dioxin issues, an objective analysis of the present state of the medical and scientific evidence reveals surprisingly little, if any, support for plaintiffs' claims.***

* The list of illnesses and physical disorders claimed by the 15,000 named plaintiffs in this litigation, allegedly attributable to the plaintiff-veterans' exposure to trace amounts of TCDD in Agent Orange, is staggering. Plaintiffs' recent interrogatories to defendants list approximately eighty different types of disorders purportedly caused by the herbicides used by the military in Southeast Asia, ranging from headaches and intolerance to cold to cancers of every major type and description and of every major organ of the body. See Plaintiffs' Interrogatories to Defendants, dated December 22, 1983, at p. 14.

** For an excellent overview of the present state of medical and scientific evidence and the on-going studies on the toxicity of the TCDD in 2,4,5-T, we respectfully refer the Court to a recent article by Colonel Alvin Young, who is a world-renowned expert on Agent Orange and who is presently assigned to the White House as an advisor to the President on Agent Orange matters. See Young, A., et al., Chlorinated Dioxins as Herbicide Contaminants, 17 Environ. Sci. Technol. 530A-540A (1983), annexed as Exhibit "3".

*** It is this lack of evidence which has led the Veterans Administration to disallow claims for compensation based upon

(Footnote Continued)

Perhaps the most complete and compelling examination of this issue and the unsubstantiated nature of plaintiffs' claims is the recent decision by Justice Nunn of the Supreme Court of Nova Scotia in Palmer v. Stora Kopparbergs Bergslags Aktiebolag, S.SN. No. 02555 (September 15, 1983). (A copy of the decision is annexed as Exhibit "5".) In Palmer, plaintiffs sought to enjoin defendants from spraying 2,4,5-T and 2,4-D, citing the serious risk to health posed by exposure to these herbicides and the TCDD contaminant.* In his 182-page decision denying plaintiffs' request for an injunction, the court confronted head-on the issue of the toxicity of TCDD and, in turn, of 2,4,5-T, which this

(Footnote Continued)

exposure to Agent Orange, except for two cases of chloracne, an acneform dermatitis. See discussion at p. 31, n.*, infra. However, even the validity of these chloracne claims is dubious. While theoretically, there could be a causal link between chloracne and Agent Orange containing significantly higher amounts of TCDD than in the Agent Orange supplied by Dow, Betty Fischmann, Chairperson of the Veterans Administration Chloracne Task Force, recently testified before a U.S. Senate Committee that the Task Force's special review of 3200 Vietnam veterans who filed claims with the VA for compensation for Agent Orange injuries failed to produce a single diagnosis of chloracne, past or present.

Ms. Fischmann also testified that another pilot study of 906 veterans in the Agent Orange Registry led to the diagnosis of the two cases of chloracne noted above. However, although VA compensation was allowed in these two cases, Ms. Fischmann made clear that even these two instances of chloracne have not been conclusively attributed to Agent Orange.

A copy of Fischmann's statement is annexed as Exhibit "4".

* The court was satisfied that the alleged serious risk to human health, if proven, would constitute irreparable harm and that damages would not be an adequate remedy. Slip op. at 163, Exhibit "5".

Court has also been asked to consider. The issue, as framed by Justice Nunn, was:

Have the plaintiffs offered sufficient proof that there is a serious risk of health and that such serious risk of health will occur if the spraying of the substances here is permitted to take place?

Slip op. at 163, Exhibit "5".

In deciding this issue, Justice Nunn noted that he was mindful its magnitude, the world-wide implications of his ruling and the assistance which his findings may provide in understanding this complex issue:

Because of the nature of the issues in dispute, the witnesses produced and the testimony given, the enormous publicity attached to the trial and the public interest involved, the evidence went far beyond the particular substances involved and related to all the phenoxy herbicides and their derivatives. The whole trial had the aura of a scientific inquiry, as to whether the world should be exposed to dioxins. Scientists from all over North America, as well as from Sweden were called and testified. Scientific reports and studies from scientists the world over were filed as part of the evidence.

* * *

While this dispute is between the parties to the action and will depend upon the facts and their relevance as I find them, this case is unique by its nature and the world-wide interest in its result. Apparently, it is the first time that the leading scientists of opposing views regarding dioxin have met in Court where the chemicals involved are at the very center of the dispute.

As a result, this is one of those very rare cases where, I believe, the Court owes a duty which goes beyond the parties, to make clear its findings so as to give some assistance, one way or another, which will help the understanding of those so vitally interested in this substance.

Slip op. at 164-66 (emphasis added).

After hearing extensive testimony from the leading experts on both sides of the dioxin/2,4,5-T issue and after reviewing the voluminous scientific material introduced into evidence, the court concluded:

To my mind, after hearing all the evidence and reading all the exhibits, there is no doubt that the weight of current responsible scientific opinion does not support the allegations of the plaintiffs.

Slip op. at 179 (emphasis added).*

The holding in Palmer is consistent with the conclusion reached by every major organization which has looked into the issue, to wit, that the accumulated medical and scientific evidence simply does not support the claims of injuries attributable to Agent Orange containing trace amounts of TCDD.**

* The court also noted the lack of objectivity evidenced by plaintiffs' experts. Slip op. at 179.

** Plaintiffs' claims are coming under increased scrutiny and criticism. For example, plaintiffs apparently allege a causal link between exposure to Agent Orange and soft tissue sarcoma, based upon research conducted by Swedish scientists. See

(Footnote Continued)

One example of this is a 1981 report entitled "The Health Effects of 'Agent Orange' and Polychlorinated Dioxin Contaminants," authored by the American Medical Association's Select Panel on Toxic Substances. While the report states that dioxin is toxic at certain dose levels, as demonstrated in testing of certain animal species, it concludes that in spite of claims of numerous adverse health effects on humans attributed to dioxin, there is conclusive evidence of a cause and effect relation only with respect to chloracne.* (A copy of this report is annexed as Exhibit "6".) A subsequent report by the Library of Congress published in June, 1983, surveying the entire body of scientific opinion and its conclusions on the toxicity of TCDD,

(Footnote Continued)

Hardell, L., Case-Control Study: Soft-Tissue Sarcomas and Exposure to Phenoxyacetic Acids or Chlorophenols, 39 Brit. J. Cancer 711-17 (1979). Hardell's work purportedly showed an increased risk of developing this form of cancer among persons reporting exposure to phenoxy herbicides. However, more recent case-control studies do not support the hypothesis that exposure to phenoxy herbicides cause soft tissue sarcoma. See, e.g., Smith, A., et al., The New Zealand Soft Tissue Sarcoma Case - Control Study: Interviews and Findings Concerning Phenoxyocetic Acid Exposure, 6 Community Hlth Studies 114-19 (1982); Riihimoki, V., et al., Mortality and Cancer Morbidity Among Chlorinated Phenoxyacid Applicators in Finland, 8 Scand. J. Work Environ. Health 37-42 (1982); Thiess, A., Mortality Study of Persons Exposed to Dioxins in a Trichlorophenol-process Accident on November 17, 1953, 3 Am. J. Ind. Med. 178-89 (1982). Significantly, Hardell's work was introduced into evidence in Palmer and one of his associates testified. The court rejected the Hardell hypothesis in light of the overwhelming weight of scientific evidence that is contrary to Hardell's position. Slip op. at 174-75. Exhibit "5".

* Chloracne is a skin reaction to exposure to a wide range of chlorinated hydrocarbons characterized by acneform dermatitis.

is in full accord with the 1981 AMA Report.*

More recently, an epidemiological birth defect study involving Australian Vietnam veterans concluded that "[t]here is no evidence that Army service in Vietnam has increased the risk of the birth of a child with an anomaly."**

Furthermore, the Air Force recently released its baseline mortality study of Air Force personnel exposed to Agent Orange. That study demonstrated that the mortality experience of the Ranch Hand group*** -- whose exposure to Agent Orange far surpassed any other group of Vietnam veterans -- is identical to that of the comparison group.**** The Ranch Hand unit was

* See Dioxin: Environmental Impacts and Potential Human Health Effects, June 6, 1983, published by the Congressional Research Service of the Library of Congress. The AMA and Congressional reports are also consistent with two prior government-sponsored reports addressing the effects of herbicides in Vietnam. See The Effects of Herbicides in South Vietnam, published by the National Academy of Sciences in 1974; and Young, A., et al., The Toxicological, Environmental Fate, and Human Risk of Herbicide Orange and Its Associated Dioxin, published by the United States Air Force Occupational and Environmental Health Laboratory in 1978. (For the Court's convenience, a courtesy copy of the lengthy Air Force report will be provided under separate cover with the chambers' copy of this memorandum.)

** Report to the Minister for Veteran's Affairs, Case-Control Study of Congenital Anomalies and Vietnam Service (Birth Defects Study), January, 1983, annexed as Exhibit "7".

*** "Ranch Hand" was the code name given the defoliation operation in Vietnam and the designation of the Air Force unit responsible for carrying out the aerial spraying operations.

**** Surgeon General, USAF, An Epidemiologic Investigation of Health Effects in Air Force Personnel Following Exposure to Agent Orange, Baseline Mortality Study Results, 30 June 1983, annexed as Exhibit "8". This was a mortality study concerning 1,247 Ranch Handers and 6,171 comparison subjects.

selected as the subject for this epidemiological study because of its repeated and sustained exposure to the herbicides used in Vietnam.

The Ranch Hand mortality findings are consistent with the preliminary data collected through the Agent Orange Registry. The Agent Orange Registry was established by the Veteran's Administration in 1978 to provide any Vietnam veteran concerned about the possible health effects of Agent Orange with a complete medical examination. As of September, 1983, over 110,000 veterans had been examined at VA facilities. Based on the data collected from this self-selected group, the Veteran's Administration has concluded:

[T]he majority of the above symptoms [reported by the veterans examined] bear no correlation to the known toxicology of Herbicide Orange; in addition, no increased incidences of malignancy have been observed in this population which, by virtue of its self-selected nature, may have been expected to exhibit artificially higher than baseline rates in the general population.

Supporting the above data is the observation by the Armed Forces Institute of Pathology that there is no unusual clustering or incidences of tumor types among the over twelve-hundred pathological specimens from Vietnam veterans examined to date.

Conclusions: Thus, the Agent Orange Registry data do not support the thesis that there is any unusual long-term morbidity or mortality associated with Vietnam service or Agent Orange exposure.

Young, A., and Flicker. M.R., Evaluation of Veterans for Agent Orange Exposure, Extended Preprint Abstract, Presented before the Division of Environmental Chemistry, American Chemical Association, September 1983, at p. 2, Exhibit "9" (emphasis supplied).

The two most prevalent types of symptoms reported by this group of veterans are dermatological and psychological in nature. Id. at p. 2. Significantly, the report notes that "of several thousand veterans complaining of dermatologic problems, only one may possibly turn out to have chloracne." Id. (Emphasis in original.) The reported psychological problems have been diagnosed as delayed stress response syndrome.

Studies of human populations exposed to phenoxy herbicides and TCDD as a result of industrial accidents also continue to support defendants' position. Long term studies of Monsanto workers -- who sustained acute TCDD intoxication as a result of an explosion at Monsanto's plant in Nitro, West Virginia in 1949 and of Dow workers involved in a chloracne experience in 1964 -- have established that there is no apparent effect on mortality and no increase in cancer mortality.*

* Zack, J.A. and Suskind, R., The Mortality Experience of Workers Exposed to Tetrachlorodibenzo-p-dioxin in a Trichlorophenol Process Accident, 22 J. Occup. Med., 11-14 (1980), annexed as Exhibit "10"; Cook, R.R., Mortality Experience of Employees Exposed to 2,3,7,8-Tetrachlorodibenzo-p-dioxin, 22 J. Occup. Med. 530-32 (1980), annexed as Exhibit "11".

Similar conclusions have been reached with respect to the most extensive human exposure to TCDD known to date, an explosion at a hexachlorophene plant owned by Givaudan ICMESA in Seveso, Italy in 1976. A reactor producing trichlorophenol, which is also a precursor chemical in the manufacture of hexachlorophene, exploded causing release of the TCDD by-product into the local environment. An indication of the severity of the contamination is that the amount of TCDD released into this small community was equal to the entire amount of TCDD released in the entire continental United States annually.*

As a consequence of the explosion, a number of chickens, birds and rabbits in the area died and over 100 children contracted chloracne. Significantly, however, the results of considerable medical testing of the human inhabitants of the Seveso area who were exposed do not support plaintiffs' claims that the veterans' exposure to Agent Orange containing trace amounts of TCDD produced any of the serious and life-threatening illnesses and disorders alleged.**

While the foregoing is certainly not an all inclusive list of the evidence supporting defendants' position, it nonetheless aptly demonstrates that the fear and uncertainty surrounding the Agent Orange and dioxin issues is more the product of the

* Wagner, S., Clinical Toxicology of Agricultural Chemicals, at pp. 181-87 (1981), annexed as Exhibit "12".

** Id.

media's search for headlines than the product of the present state of medical and scientific knowledge.

Indeed, the media's reporting of this entire issue recently led the American Medical Association ("AMA") to issue a resolution condemning the media for conducting a "witch hunt" which has resulted in public hysteria over the dioxin issue. The resolution concludes that "the lives and well-being" of people living in areas where dioxin has been found "have been unnecessarily and ignorantly damaged by this hysterical mal-reporting." (Emphasis added.) A copy of a New York Times article discussing the AMA resolution is annexed as Exhibit "13".

* * *

Before a drastic remedy such as alternative liability or, as discussed in the following section, market share liability, can be applied, the cause of plaintiff's injuries must be undisputed. Plaintiffs in the Agent Orange Litigation simply cannot satisfy this requirement.

2. All Potential Tortfeasors Are Not Before The Court.

The second factor to consider in determining whether imposition of alternative liability is appropriate is whether all potential tortfeasors are before the Court. In this case, where the cause of the illnesses and disorders claimed by plaintiffs is contested, it is inconceivable that all or even substantially all of the possible tortfeasors are before the Court. Indeed, as this Court observed at the conference on December 5, 1983, the

only clearly identifiable potential tortfeasor in the Agent Orange controversy, the United States, is immune from suit by the plaintiff-veterans. Tr. at p. 9.

As noted earlier, the approximately 15,000 plaintiffs presently in the case allege an incredibly diverse range of maladies purportedly attributable to Agent Orange. Significantly, none of these injuries or physical disorders are unique to exposure to Agent Orange.* Furthermore, the vast array of alternate causative factors in this case forecloses any argument that all of the potential tortfeasors are before the Court.

One of plaintiffs' advocates, Dr. Samuel Epstein, has characterized the Vietnamese environment as a "toxicological cocktail":

* Most experts believe that chloracne is the "hallmark" of exposure to TCDD. See Chlorinated Dioxins as Herbicide Contaminants, supra, at p. 532A, Exhibit "4".

However, chloracne symptoms are not unique to TCDD exposure. Chloracne may arise from exposure to a wide variety of chlorinated compounds, particularly chloronaphthalenes, chlorodiphenyls and chlorodiphenyloxides. As Dr. Donald Birmingham, a retired United States Public Health Service officer, noted in a 1966 article on occupational dermatoses:

[Chloracne] has occurred in machinists working with insoluble oils containing chloracnogens, chemical workers making herbicides, in cable splicers, in metal platers, in paint makers, and in wood preservers, among others.

Birmingham, D., Preventable Occupational Dermatitis, 12 Arch. Envir. Hlth. at 641 (May 1966), annexed as Exhibit "14".

What you had in Vietnam was a toxicological cocktail. It's impossible on theoretical grounds to make predictions on exactly what the eventual effects of all the chemicals could be. From an epidemiologist's point of view, it would be a nightmare.

Peracchio, A., Toxic-Chemical Mix Being Eyed as Cause of Vietnam Vets' Ills, Newsday, June 8, 1980, at p. 5 (hereinafter "Newsday Article"), annexed as Exhibit "15".

Thus, for example, a committee made up of members of Australia's Senate concluded in a report on pesticides and their health effects on Australian Vietnam veterans that the potential for exposure to insecticides -- many of which have reported toxic reactions -- was far more probable than herbicide exposure:

The Committee is of the opinion that the potential for direct exposure to herbicides sprayed by Australian and U.S. forces was low. Direct exposure to insecticides sprayed by both Australian and U.S. forces, was highly probable. The Committee believes that while possible, indirect exposure to herbicides and TCDD through drinking-water and foodstuffs, was unlikely.

The Committee is of the opinion that possible exposure to pesticides is only one aspect of the health problems suffered by Vietnam veterans today.

Senate Standing Committee on Science and the Environment, Pesticides and the Health of Australian Veterans First Report, at p. 65 (November 1982) (hereinafter "Australian Senate Report") (Chapter three of the report, which provides an excellent discussion of the veterans' potential exposure to pesticides, is annexed as Exhibit "16").

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Moreover, the military's aerial spraying of military facilities in Vietnam with insecticides such as DDT, dieldrin and malathion was conducted by Ranch Hand personnel flying C-123 fixed wing aircraft, the same aircraft used in the herbicide defoliation program. Australian Senate Report at pp. 18-21, annexed as Exhibit "17". Thus, even veterans who believe that they were directly exposed to Agent Orange may in fact have been exposed to insecticides.

We list and describe briefly below only some of the man-made and natural substances which each plaintiff-veteran was potentially exposed to during his tour of duty in Vietnam. The list illustrates the broad variety of possible causative agents of plaintiffs' alleged injuries.

Munitions

Billions of tons of TNT and related explosives were used in Vietnam; animal studies indicate that at least one of these, tetryl, is a direct acting mutagen; an Army study of a TNT isomer, 2,4-DNT, concluded that, in sufficient doses over a sufficient period, it is carcinogenic, with the liver as the target organ; contact dermatitis, anorexia, severe liver injury and other "significant adverse physiological effects" claimed by veterans, have been attributed to occupational exposure to TNT.*

* See Whong, W., Mutagenic Activity of Tetryl, a Nitroaromatic Explosive in Three Microbial Test System, 5 Tox. Letters 11-17 (1980), annexed as Exhibit "18"; Midwest Research Institute, Mammalian Toxicity of Munition Compounds, Progress Report 11 at

(Footnote Continued)

Antimalarial Drugs

Dapsone - an antimalarial drug dispensed daily to United States forces in Vietnam beginning in 1966; discontinued after 25 soldiers sustained a bone marrow disorder from which nine eventually died; a National Cancer Institute study found Dapsone to be a carcinogen in laboratory animals. Symptoms such as peripheral neuropathy, skin rashes, blurred vision, loss of appetite and insomnia, similar to those claimed by many veterans, have been attributed to Dapsone.*

Chloroquine - another antimalarial drug used in Vietnam; another suspected carcinogen; after prolonged use may cause weight loss, skin eruptions and ear damage.**

Chlorinated Insecticides

Chlordane - an insecticide used in Vietnam; "unequivocally carcinogenic" according to Dr. Epstein; there are reports

(Footnote Continued)

pp. 15-17 (January, 1980), annexed as Exhibit "19"; U.S. Army Environ. Hyg. Agency, Occupational Health Special Study Newport Army Ammunition Plant, p. 1 and appendix (April 1974), annexed as Exhibit "20".

* See Newsday article; Ognibene, A., Agranulocytosis, 72 Ann. Int. Med. 521-524 (1970), annexed as Exhibit "21". McAleenan, J., Army Drug Branded a Carcinogen, Detroit News, December 28, 1980, annexed as Exhibit "22". See also Martindale, The Extra Pharmacopoeia, at p. 1489 (18 ed. 1982) (hereinafter "Martindale"); Australian Senate Report at p. 73.

** Australian Senate Report at p. 73. Goodman & Gilman's, The Pharmacological Basis of Therapeutics, at p. 1045-46 (6th ed. 1980); see also Martindale at 395-96.

of neuroblastoma and acute leukemia associated with chlordane.*

DDT (dicophane) - used extensively in Vietnam; concerns over the long-term effects of DDT led to a report in 1963 by the President's Science Advisory Committee, entitled "Use of Pesticides"; extremely persistent in soil, use is now generally discouraged.

Dieldrin - insecticide used in Vietnam; considered more toxic than DDT and is readily absorbed through the skin; reports of adverse skin reactions among workers and liver tumors in experimental mice.**

Organophosphorous Insecticides

Malathion - insecticide used in Vietnam; toxic effects include contact dermatosis, muscular twitching, anorexia, depression, neuropathy; evidence that chromosome abnormalities temporarily increased in organophosphorous poisoning victims; poisoning in more than 2,500 field workers led to five deaths attributed to impurity in malathion.***

Illicit Drugs****

Heroin - as many as 15% to 25% (estimated) of American

* See, e.g., P.F. Infante, et al., 4 Scand. J. Work Environ. Hlth. 137 (1978).

** See Martindale at p. 386.

*** See, Martindale at p. 832; P.F. Infante, et al., 4 Scand. J. Work Environ. Hlth. 137 (1978).

**** The number of Vietnam-era veterans hospitalized for alcoholism and drug dependency is considered significant. Walker, I., The Psychological Problems of Vietnam Veterans, 246 JAMA 781 (Aug. 1981), annexed as Exhibit "23".

combat forces experimented or regularly used heroin while in Vietnam; pulmonary immunological muscle, kidney and liver disorders attributed to heroin use.*

LSD - also used by U.S. servicemen in Vietnam; personality disorders, psychosis and chromosomal aberrations reported.**

Microorganisms/Diseases Endemic to Southeast Asia

Aflatoxin - a mold toxin found on native feeds, e.g., rice, in Vietnam; in addition to being naturally occurring, one of the most carcinogenic agents known to man.***

Hepatitis - a hepatitis virus of epidemic proportions was reported by medical officials in Vietnam; this form of hepatitis virus has been linked in studies with liver cancer.****

Animal Parasites - amoebic parasites known to cause liver abscesses found in ice sold to troops in Vietnam; other animal parasites causing skin diseases and liver damage were reported by the Army's medical unit.*****

* Martindale at p. 1008; Consumers Union Report, Licit and Illicit Drugs, at p. 188 (1972), annexed as Exhibit "24".

** Stanton, M., Drug Use in Vietnam, 26 Arch. Gen. Psych. 279 (1972); Martindale at 924.

*** Newsday Article; Casarett & Doll's, Toxicology, at pp. 104-05 (2d ed. 1980).

**** Newsday Article.

***** Id. See also Internal Medicine in Vietnam: Volume I Skin Diseases in Vietnam, 1965-72, at 130-136 (1977), annexed as Exhibit "25".

Melioidosis - an infectious and sometimes fatal disease with reported symptoms similar to those complained of by certain plaintiffs; reported latency period of up to 20 years in some instances. There are also reports of a sexual transmission of melioidosis from a veteran to his wife and of a fatal infection in a newborn baby.*

Other Microorganisms - other known microorganism diseases such as tropical sprue produced a wide range of illnesses and disorders among servicemen in Vietnam; for example, intestinal abnormalities were found in 22 of 37 servicemen studied after serving in Vietnam from 6 weeks to 11 months.**

Malaria - U.S. Army reported that malaria was the most important disease in Vietnam, accounting for the greatest number of man-days lost; malaria's effects are both acute and chronic.***

* Internal Medicine in Vietnam: Volume II, General Medicine and Infective Diseases, at pp. 197-214, annexed as Exhibit "26"; Brundage, W., Four Fatal Cases of Melioidosis in U.S. Soldiers in Vietnam, Amer. J. Tropical Med. & Hyg. 183-190 (1968) annexed as Exhibit "27"; Beck, J., Agent Orange Isn't Only Peril Vietnam Veterans May Meet, Columbus Dispatch at p. 10, February 15, 1982, annexed as Exhibit "28".

** See U.S. Army Medical Research Team (WRAIR) Vietnam, Annual Progress Report (1 September 1967-30 June 1968). See generally Internal Medicine in Vietnam, Vol. 2, supra.

*** U.S. Army, Malaria, Medical Bulletin (Jan-Feb. 1970), annexed as Exhibit "29".

Psychological Overlay

It has been estimated that 500,000 to 700,000 Vietnam veterans are in need of emotional help at this time, and some researchers estimate that 1.5 million of the 2.4 million veterans who served in Vietnam may eventually need psychiatric help. Incidences of post-traumatic stress disorder among Vietnam veterans are well-documented.*

Furthermore, a recent study of veterans randomly selected from the Agent Orange Registry concluded that there is a strong likelihood that at least some of the reported problems are psychosomatic and a reaction to the stressful degree of uncertainty arising from allegations -- albeit unsubstantiated -- pertaining to exposure to Agent Orange.**

* * *

Significantly, this is not an inclusive list of every possible Vietnam-related cause for the injuries claimed by plaintiffs nor will every plaintiff-veteran have been exposed to all of the man-made and natural perils which American servicemen were subjected to while serving in Vietnam. The list does, however,

* The Psychological Problems of Vietnam Veterans, supra at p. 781, Exhibit "23". See also Exhibit "9" (claims of psychological problems attributable to Agent Orange may in fact be attributable to delayed stress syndrome, see p. 27, supra).

** Korgeski, G., et al., Correlates of Self-Reported and Objectively Determined Exposure to Agent Orange, 140 Amer. J. of Psych. 11 (November 1983), annexed as Exhibit "30".

serve as an indication of the complexity of the alternate causation issue.

In addition to Vietnam-related alternate causes, each veteran's pre- and post-Vietnam history must be examined.* Moreover, where a birth defect is claimed, the plaintiff's spouse's history and the couple's genealogy are also matters of concern.

Accordingly, in view of the numerous potential causative agents responsible for the injuries alleged by plaintiffs, it is apparent that all of the parties potentially responsible for plaintiffs' alleged injuries are not in the case.

3. Defendants Are Not Responsible For Plaintiffs' Inability To Meet Their Burden Of Defendant Identification Nor Are They In A Superior Position To Offer Evidence Of Defendant Identification.

The facts of this case also do not meet the third criterion for application of alternative liability. Defendants are in no better position than plaintiffs to identify which defendant's Agent Orange individual plaintiffs were exposed to. Moreover, defendants bear no responsibility for plaintiffs'

* The past twenty years has seen explosive growth in the number of substances which Americans are exposed to daily which have identified as toxic to human health. For example, cigarette smoking -- aside from its well publicized link with cancer and health problems in the progeny of smoking mothers -- has also been reported as a potential cause for the production of abnormal sperm. Another study consistent with the foregoing, found an increased rate of perinatal deaths and birth defects among the progeny of men who smoke tobacco. Science News at 247, April 18, 1981, annexed as Exhibit "31".

inability to identify individual manufacturers. As explained in Point I, supra, the military had exclusive control over the entire herbicide operation, including the composition of the product, the markings on the drums and the deployment of the herbicide in Vietnam. Therefore, plaintiffs' inability to meet their burden of defendant identification is the direct result of the military's method of procurement and use of the herbicide. Consequently, there is no justification for shifting the burden of proof to the defendants.

* * *

In sum, the Agent Orange Litigation stands in stark contrast to the simplicity of the underlying facts in Summers v. Tice, supra. In Summers, one of two defendants involved in one isolated incident was undeniably responsible for plaintiff's injuries, the cause of which was undisputed. In Agent Orange, however, the cause of plaintiffs' alleged injuries is a principal issue in dispute. Moreover, unlike Summers, not all potential tortfeasors are parties to this case. Finally, defendants are not responsible for plaintiffs' inability to identify the defendant who caused the alleged harm, nor are defendants in a better position than plaintiffs to identify the allegedly responsible tortfeasor.

Accordingly, while the theory of alternative liability may be attractive in a simple case like Summers, it bears little relevance to a case of the size and complexity of the Agent Orange Litigation.

B. Market Share Liability

The most novel approach employed by a court to relax plaintiff's burden of identifying the specific defendant which caused his injury is that announced by a sharply divided Supreme Court of California in Sindell v. Abbott Laboratories, supra. The Court in Sindell, a DES case, developed what it characterized as "market share" liability, which is in essence a refinement of the theory of alternative liability.

Market share liability, as conceived by the court in Sindell, is based upon two basic points. The first is that all DES, no matter who the manufacturer was, had the same chemical formula, and that all DES was therefore fungible. The second is that the capacity of this product to cause the harm complained of was undisputed.

Relying on the generic nature of the products and its capacity to cause harm, the court held that, although plaintiff was unable to identify which defendant's drug had been ingested by her mother, liability would nonetheless be imposed upon each defendant proportionate with its share of the market of DES during the relevant time and in the relevant geographic area.*

In developing what has been characterized as a theory of "rough justice," Ryan v. Eli Lilly & Co., supra, 514 F. Supp. at 1018, the majority in Sindell emphasized that its proposal was

* To avoid liability, each defendant had the burden of proving, if it could, that its product did not constitute part of the relevant "market."

reasonable and a fair means of apportioning liability and compensating plaintiff for injuries attributable to a generic product manufactured and sold by all defendants. Its rationale was that because all defendants produced the identical drug, each defendant's product posed the same risk to the ultimate user. Therefore, a defendant's share of the market would with a degree of mathematical precision bear a direct correlation to the likelihood that its product caused a particular plaintiff's harm.

[W]e hold it to be reasonable in the present context to measure the likelihood that any of the defendants supplied the product which allegedly injured plaintiff by the percentage which the DES sold by each of them for the purpose of preventing miscarriage bears to the entire production of the drug sold by all for that purpose.

* * *

Under this approach, each manufacturer's liability would approximate its responsibility for the injuries caused by its own products. . . .

607 P.2d at 937.

As discussed further below, applying the Sindell formula, which equates a manufacturer's market share to the risk posed by that manufacturer's product, is simply impossible in this case.

The concept of market share liability has been rejected as a matter of policy in DES cases decided after Sindell. Ryan v. Eli Lilly Co., supra; Morton v. Abbott Laboratories, supra; Mizell v. Eli Lilly Co., supra; Tiddler v. Eli Lilly & Co.,

supra; Payton v. Abbott Laboratories, 386 Mass. 540, 437 N.E.2d 171 (1982).* It has similarly been rejected by the majority of courts that have considered it in asbestos cases on both policy and factual grounds. Thompson v. Johns-Manville Sales Corp., 714 F.2d 581 (5th Cir. 1983); Hannon v. Waterman S.S. Corp., 567 F. Supp. 90 (E.D. La. 1983); Starling v. Seaboard Coast Line Co., supra; In re Related Asbestos Cases, supra; Prelick v. Johns-Manville Corp., supra; Diamond v. Johns-Manville Sales Corp., Civil Action No. 79-2206, slip opinion (D. Md. December 11, 1981); Garcia v. Johns-Manville Sales Corp., slip opinion, 1981 Asb. Lit. Rep. 3931 (M.D. Fla. August 28, 1981); Aguilar v. Johns-Manville Sales Corp., slip opinion, 1981 Asb. Lit. Rep. 3882, 3908 (Cal. Super. Ct. September 8, 1981); Gorniak v. Combustion Engineering, slip opinion, 1981 Asb. Lit. Rep. 4141 (N.D. Ohio July 6, 1981).**

* A federal district court in South Dakota recently upheld application of the Sindell theory in a DES case under South Dakota law. McElhaney v. Eli Lilly & Co., 564 F. Supp. 265 (D.S.D. 1983). In its decision, the court justified shifting to defendants the burden of showing the source of the DES to which plaintiff was exposed because the defendants maintained extensive and detailed marketing records. The same does not hold true in the Agent Orange case. There are no records, in defendants' possession or otherwise, which could connect a defendant's Agent Orange with each exposure claimed by a plaintiff.

** In two asbestos cases, district courts in Texas permitted plaintiffs to amend their complaints to allege market share liability. Hardy v. Johns-Manville Sales Corp., 509 F. Supp. 1353 (E.D. Tex. 1981), rev'd on other grounds, 681 F.2d 334 (5th Cir. 1982); Herbeck v. Johns-Manville Sales Corp., slip opinion

(Footnote continued)

Drawing from the holdings of the above line of authority, Dow's objection to adopting the theory of market share liability in this instance is threefold. First, as a matter of public policy, the market share concept is too great a departure from well-settled principles of tort law. Second, the social and economic ramifications of the market share issue dictate that it is an issue for the legislative branch to address in the first instance.* Third, assuming the validity of the theory, we agree with this Court's assessment in Pretrial Order No. 66 that the facts of this case do not warrant its application, particularly in view of the serious questions regarding the validity of plaintiffs' causation claims, the presence of a significant number of possible alternate causative factors and, of primary importance, that each defendant's Agent Orange was a non-fungible product which did not pose the identical risk, if any, to the ultimate user.

With respect to the first basis for Dow's opposition to the market share theory, as noted earlier, product liability law

(Footnote continued)

1981 Asb. Lit. Rep. 4699 (W.D. Tex. 1981). Significantly, these courts did little else but comport with liberal rules governing amendment of pleadings. They provide little, if any, discussion of the public policy considerations at issue nor the distinguishable characteristics of the product involved in Sindell, DES, and asbestos.

* These first two issues discussed below also are addressed in Dow's Alt. Liability Memo at pp. 23-26.

rests on the fundamental premise that an essential element of causation is establishing a causal connection between a defendant's product and plaintiff's injuries. W. Prosser, Handbook of the Law of Torts, § 103 (4th ed. 1971). Market share shifts this burden away from plaintiff, requiring a defendant to show that its product was not the cause of the plaintiff's injury. As such, the market share theory constitutes "a radical departure" from the body of product liability law developed by the fifty states. Thus, in the words of one court:

Application of this burden shifting theory would violate established public policy and fundamental principles of tort law and procedure in this state in a variety of ways.

* * *

By removing the traditional requirement that the plaintiff identify the responsible manufacturer, the doctrine destroys the nexus between production of a defective product and the plaintiff's injury.

As a result, liability is placed on defendants bearing no responsibility for the defective product.

Mizell v. Eli Lilly & Co., supra, 526 F. Supp. at 596 (footnote omitted).

This view was shared by the dissent in Sindell which noted that the majority's novel concept represents a rejection of "over one hundred years of tort law which required that before tort liability was imposed a 'matching' of defendant's conduct

and plaintiff's injury was absolutely essential." 607 P.2d at 939.*

The district court's decision in Starling presents a penetrating analysis of the legal ramifications of the theory announced in Sindell. At the outset, the district court noted that market share runs contrary to long-established principles of product liability law, specifically, Georgia's product liability law, because it, in effect, makes a manufacturer an insurer of his product.

However, as the Starling court concluded, market share liability goes far beyond even that, making a manufacturer an insurer of his competitor's product.**

[This approach is] a quantum leap
"toward render[ing] every manufacturer an insurer not only of the safety of its own products, but of all generically similar products made by others."

Id. at 190, quoting Ryan v. Eli Lilly & Co., supra.

Accordingly, market share liability constitutes too radical a break from well-established rules of tort liability,

* Subsequent decisions which have rejected the market share concept have agreed with the dissent in Sindell that the court's unprecedented "legislation" was violative of public policy. Ryan v. Eli Lilly & Co., supra; Morton v. Abbott Labs, supra; Mizell v. Eli Lilly & Co., supra; Starling v. Seaboard Coast Line, supra; Tiddler v. Eli Lilly & Co., supra.

** Indeed, as one commentator has noted, "elimination of the burden of proof as to identification would impose a liability which would exceed absolute liability." Coggins, Industry-Wide Liability, 13 Suffolk L. Rev. 980, 998 (1979).

such that, as a purely legal matter, its application in this litigation is completely unwarranted.

The decision in Starling also provides a useful discussion of the second basis underlying Dow's opposition to market share liability. In its refusal to adopt "market share", the court in Starling noted the possible "Pandora's box of undesirable economic and social effects" attributable to expanding a manufacturer's liability by judicial fiat. 533 F. Supp. at 190.

In light of the impact of decisions that would so dramatically alter the relationship between manufacturers and consumers, the district court in Starling advocated judicial restraint and legislative action.

The flexibility to fashion remedies for asbestos victims that take into account economic and social ramifications is found in the legislature.

533 F. Supp. at 190. This view was shared by the dissent in Sindell.

Given the grave and sweeping economic, social and medical effects of "market share" liability, the policy decision to introduce and define it should rest, not with us, but with the legislature....

607 P.2d. at 943.

The Agent Orange Litigation presents a compelling example of a situation where departing from traditional tort principles of liability would have serious ramifications. The

defendants in this case provided, under government contract and pursuant to military specifications, a munition to the military for use in the defense of American servicemen in a time of war. Unquestionably the Agent Orange deployed by the military in the war effort saved countless numbers of soldiers' lives. Thus, this is not a routine product liability case where a manufacturer introduces a product into the stream of commerce and a party subsequently attributes an injury to use of the product. Indeed, a number of courts, including this Court, have held that under the circumstances of this case, defense contractors should not be held liable for injuries attributed to a munition. Agent Orange Litigation, 534 F. Supp. 1046 (1982); see also McKay v. Rockwell International Corp., 704 F.2d 444 (9th Cir. 1983).

In a similar vein, the Massachusetts Supreme Court refused to adopt market share liability in light of the public policy favoring development of new drugs and the potentially devastating effect market share would have on this policy.

Public policy favors the development and marketing of new and more efficacious drugs. The Restatement (Second) of Torts recognizes this policy by rejecting strict liability in favor of negligence for drug related injuries. Restatement (Second) of Torts §402A, Comment K (1965). Under the plaintiffs' market share theory, each potential drug marketing defendant would risk being held liable, not only for injuries that resulted from its own negligence but also for injuries resulting from the negli-

gence of other marketers and even for injuries caused by drugs marketed non-negligently by others. Imposition of such broad liability could have a deleterious effect on the development and marketing of new drugs.

Payton v. Abbott Labs, supra, 437 N.E.2d at 179 (emphasis added).

The impact of market share liability on defense contractors and the ability of the military to secure the best available technology during times of crisis is certainly no less compelling than the need for advancements in the pharmaceutical field.

The important policy considerations implicated in this litigation, not the least of which is the relationship between a government during a time of war and its contractors, require that any decision to depart from well-settled principles of manufacturer liability must come from the legislature. Furthermore, as the court in Starling noted, the legislative branch is best suited to deal with the claims of veterans and their families who allege injuries from Agent Orange, which requires balancing the needs of these individuals with other socially or economically desirable goals.*

* One factor which the legislature may consider and which would, in our view, counsel against expanding a defense contractor's liability, should causation be established in any instance, is the statutory benefit to which a veteran is entitled for service-related injuries. See, e.g., 38 U.S.C. §§ 310-15 (setting forth compensation to veterans and dependents for wartime disabilities); 38 U.S.C. §§ 321-22 (setting forth compensation to dependent survivors of veterans for wartime fatalities); 10 U.S.C. §§ 1071 et seq. (providing for medical care for members of the uniformed services and their dependents).

Aside from these purely policy reasons for urging rejection of the market share concept, Dow's third objection is that the facts of the Agent Orange case simply do not lend themselves to the application of market share liability. In particular, the lack of fungibility of Agent Orange as well as the acknowledged questions relating to the element of causation make the application of market share liability completely unwarranted.

In Sindell, the product at issue was DES, a drug manufactured under the identical chemical formulation by all manufacturers. Thus, although manufactured under different brand names, all DES was fungible. Every manufacturer's DES, therefore, also had exactly the same toxicity and propensity for causing harm in humans. Consequently, the goal of market share liability, establishing a correlation between sales of the product and the likelihood that a particular defendant's product caused a particular plaintiff's harm.

As noted in a number of asbestos cases, this concept has no application where each manufacturer's product is unique, and its propensity to cause injury differs. In these cases, it is the presence of asbestos fibers within a defendant's product which is alleged to be the cause of plaintiff's injuries. As one district court noted in rejecting market share liability:

Asbestos fibers are of several varieties, each used in varying quantities by defendants in their products and each differing in its harmful effects.

In re: Asbestos Cases, supra, 543 F. Supp. at 1156. See also Starling v. Seaboard, supra; Hannon v. Waterman Steamship, supra.

Thus, while all DES is fungible, asbestos products with their varying amounts of asbestos fibers are not. Because it is the fibers which cause the harm complained of, the aggregate peril caused by a particular manufacturer's product bears no rational relation to the share of the market held by that manufacturer.

Similarly, in the Agent Orange Litigation, the Agent Orange sold by defendants was not fungible. Tests of stockpiled Agent Orange demonstrated a marked disparity in the TCDD concentrations among the various defendants. See Dow's Alt. Liability Memo at pp. 21-22 and annexed exhibits. Indeed, plaintiffs acknowledge that by utilizing different manufacturing processes, the levels of dioxin in Agent Orange varied significantly from manufacturer to manufacturer: "[C]learly, different manufacturing processes resulted in different levels of dioxin contamination." Plaintiffs' Alt. Liability Memo at p. 27.

In light of the variation in the concentration of TCDD, the underlying premise of market share liability, equal risk attributable to all defendants' products, cannot be satisfied in this case. There are two reasons for the foregoing.

First, the greater the concentration of TCDD in a particular batch of Agent Orange, the greater the likelihood that a plaintiff would come into physical contact with a molecule of

TCDD. Thus, the risk of exposure to TCDD from one manufacturer's batch of Agent Orange containing, for example, 10 ppm dioxin necessarily differs from the risk of exposure created by another manufacturer's Agent Orange which contained 1 ppm dioxin.

Second, the concentration of TCDD in each defendant's product will directly affect the toxicity, if any, of the product and, in turn, the risk, if any, created by the product.*

Thus, Agent Orange is markedly different from the DES product considered in Sindell. The differing levels of TCDD in each defendant's product makes each manufacturer's Agent Orange unique, and the likelihood that any particular plaintiff was harmed by the Agent Orange sold by Dow would not bear any relation whatsoever to Dow's share of the Agent Orange "market".

Another limitation of the market share liability theory is that it does not reasonably reflect the degree of risk posed by a defendant's product when there are other possible harmful agents which may be a substantial factor in producing the illness or disorder complained of. This flaw in the market-share concept is no more evident than in this case, where there are no injuries unique to Agent Orange exposure and there are many potential

* See, e.g., Murray, Three Generation Reproduction Study of Rats Given 2,3,7,8 Tetrachlorodibenzo-p-dioxin (TCDD) in the Diet, Tox. and App. Pharma. 50, 241-252 (1979). This was a three-generation study of rats given TCDD in their diet. The study evidenced an effect on the animals reproductive capacities at higher dose levels of 0.01 ug. TCDD/kg./day but not at a lower dose of 0.001 ug. TCDD/kg./day.

alternate causative agents that will be at issue in the litigation. See pp. 30-39, supra.

Accordingly, where Agent Orange is only one of a number of purported toxic substances which may have caused plaintiffs' injuries, the Sindell concept of market share which equates the degree of risk posed by one manufacturer's product with his share of the "market" would necessitate creation of a market of all potentially harmful products. Under the Sindell rationale, this would, of course, be impossible because each of these substances would pose a different degree of risk.

There is one final distinguishing characteristic between the Agent Orange Litigation and those few instances in which courts have broken from traditional tort principles and adopted market share liability. In those cases, invariably the causation issue, to wit, the propensity of the product to cause the harm complained of, is not in dispute. For example, in the few DES and asbestos cases cited previously in which market share has been recognized, the causal link between certain diseases and these substances is accepted by the medical and legal communities.* There is, however, no such causal connection in

* Daughters of women who took DES, a man-made estrogen previously used to prevent miscarriages, are suffering from a rare form of cancer, clear-cell adenocarcinoma of the vagina and uterus and adenosis, an abnormality on the cervix or vagina. Before the DES-cancer linked cases, only three cases of clear-cell adenocarcinoma of the vagina had been reported. Subsequently, eighty percent of all such cases had confirmed exposure to DES.

(Footnote Continued)

this case. Absent an accepted cause and effect relationship, imposition of the drastic remedy of market share liability is inappropriate.

In sum, market share liability is inappropriate on fundamental policy grounds and because it cannot rationally be applied in this case. This theory of liability departs drastically and improperly from well-settled tort principles requiring defendant identification. Further, adoption of such a radical theory should be a legislative not a judicial determination. This is particularly true here, where alteration of these traditional tort principles would seriously affect the relationship between the government and its defense contractors. Finally, a market share theory is simply inappropriate under the facts of this case: Agent Orange is not a fungible product, the cause of plaintiffs' alleged injuries is seriously disputed and numerous potential alternative causative agents for plaintiffs' asserted harm exist.

(Footnote Continued)

Ulfelder, The Stilbesterol-Adenosis-Carcinoma Syndrome, 38 Cancer 426 (1976). See also Comment, DES and a Proposed Theory of Alternate Liability, 46 Fordham L. Rev. 963, 964-66 (1978). Asbestosis, a thickening of the chest walls, and mesothelioma, a form of lung cancer, have been linked unquestionably to occupational exposure to asbestos. Borel v. Fibreboard Paper Products Corp., 493 F.2d 1076 (5th Cir. 1973), cert. denied, 419 U.S. 869 (1974).

C. Concert of Action

Plaintiffs contend that Dow participated in a "conspiracy of silence" to conceal information on dioxin from the government and is thus liable under the theory of concert of action. See Plaintiffs' Alt. Liability Memo at 100-02. As discussed more fully herein, plaintiffs' contention is utterly without merit.

First, there was no conspiracy. The undisputed evidence before the Court establishes that Dow acted independently from, not in concert with, the other defendants.

Second, there was no silence. Dow informed the government and many others of the hazards of dioxin in 2,4,5-T manufacture -- actions totally inconsistent with a "conspiracy of silence."

Third, even if a conspiracy had existed, it would have had no effect, since the government was fully aware of the relevant information regarding dioxin and Herbicide Orange from the published scientific literature and other sources.

The principle of concert of action has been applied in instances in which two or more defendants have acted jointly or pursuant to a common design to proximately cause plaintiff's injury. If plaintiff is unable to show which defendant's act was the actual cause of the injury, joint liability may be imposed upon each defendant for their joint conduct. Restatement (2d) of Torts, §876 (1979). As described by one court, "the concert of

action theory is devised from a criminal law concept, aiding and abetting, and renders jointly and severally liable all who intentionally participate in an unlawful activity." Ryan v. Eli Lilly & Co., supra, 514 F. Supp. at 1015. To impose liability under this theory, the common endeavor must be in furtherance of an express or tacit agreement and must be tortious in nature. Prosser, W., Law of Torts § 46 (4th ed. 1971).

The case in which a bystander is injured by a car involved in an illegal drag race best illustrates application of this theory. Under the concert of action theory, all participants in the drag race are held jointly and severally liable to the injured party. The rationale underlying imposition of liability on all participants is that they were all engaged in a common endeavor and it was that endeavor, the drag race itself, that was the cause of the bystander's injuries.

The application of this rationale in a complex product liability case is highly questionable. Indeed, the majority of courts that have addressed the application of a concert of action theory of liability in DES cases have rejected it, expressing concern over its adaptation to product liability cases. See Dow's Alt. Liability Memo at pp. 24-25. The California Supreme Court's comments in Sindell are representative:

Application of the concept of concert of action to this situation would take the theory far beyond its intended scope and would render virtually any manufacturer liable for the defective products of an

entire industry, even if it could be demonstrated that the product which caused the injury was not made by the defendant.

Sindell v. Abbott Laboratories, supra, 607 P.2d at 933.

Aside from this conceptual problem with applying the concert of action theory to a complex product liability case, the analysis utilized by the courts in other product liability litigation of the facts necessary to establish concert of action makes clear that this theory is inapplicable to the facts of the Agent Orange Litigation.

In the DES cases, the courts have concluded, based on an exhaustive analysis of the defendants' actions that:

the DES manufacturers simply did not act in concert as that concept is defined in tort law.

Morton v. Abbott Labs, supra, 538 F. Supp. at 596. The facts surrounding the DES cases are generally undisputed. DES was discovered in the 1930's by a group of British scientists. By 1940, over ten pharmaceutical companies had filed New Drug Applications with the FDA. The FDA subsequently requested that the companies pool their clinical data and develop a uniform label. It is also unquestioned that, although marketed by trade names, the DES sold by all manufacturers was, by agreement, chemically identical. Finally, the record is also clear that no warnings were ever given by the companies regarding carcinogenic or other risks attributable to ingestion of DES.

In the view of the vast majority of courts, these facts did not satisfy the criteria of "joint conduct":

[T]he history of stilbestrol [DES], far from showing joint conduct, demonstrates an independent, competitive response to a widely acclaimed medical discovery, all under the supervision of the FDA.

Ryan v. Eli Lilly & Co., supra, 514 F. Supp. at 1011. The district court in Ryan, citing the holding in Sindell, further concluded that the kind of cooperation engaged in by those manufacturers was common practice throughout the manufacturing industry and simply not in and of itself tortious. Id.

Similarly instructive is Judge Rubin's opinion in In re: Beverly Hills Fire Litigation, Civil No. 77-79, slip opinion (E.D. Ky. November 14, 1979), the lawsuit arising out of the tragic fire at the Beverly Hills Supper Club in Southgate, Kentucky. Plaintiffs cite this decision as an instance where the concert of action theory has been applied in a product liability case. However, under the criteria set forth by the court in Beverly Hills for application of this theory, it is evident that plaintiffs in the Agent Orange Litigation cannot satisfy their burden of proof. Specifically, the court in Beverly Hills required proof: (1) that each defendant marketed and promoted a generically similar product; (2) that the defendants acted by express or tacit agreement to market and promote a defective product; and (3) that this agreement to commit a tortious act was the cause in fact of plaintiff's injuries. Slip op. at 9-10.

After almost two years of intensive discovery, the record before the Court in the Agent Orange Litigation shows much

less evidence of concerted action than was present in the DES cases -- where no concert of action was found. Furthermore, not one of the factors relied upon in Beverly Hills is present in Agent Orange.

First, as set forth at pp. 50-52, supra, Agent Orange is not a generic product. Moreover, the wide variation in the levels of dioxin in Agent Orange demonstrates the lack of joint action among the manufacturers.

Second, there is no evidence of either a tacit or an explicit agreement between Dow and any other defendant to conceal information regarding dioxin from the government. Even the few documents offered by plaintiffs in support of their theory show Dow acting independently from, rather than jointly with, the other defendants. Moreover, plaintiffs ignore the fact that Dow repeatedly informed military and government officials and health professionals around the world of the chloracne problem associated with dioxin in 2,4,5-T manufacture -- a fact totally inconsistent with plaintiffs' supposed "conspiracy of silence."

Finally, the essential information regarding chloracne and dioxin was both readily available in published scientific literature and in fact well known to the government. Thus, even if Dow had failed to inform the government -- which it clearly did not -- Dow's failure would not have caused injury to plaintiffs, since the government already possessed the relevant information.

Before addressing plaintiffs' allegations of conspiracy, it must be emphasized that Judge Pratt previously rejected these allegations when considering defendants' motions for summary judgment on the government contract defense. Addressing counsel for Dow at oral argument on May 4, 1983, the Court stated:

Mr. Rivkin, I read your reply brief while I was eating my sandwich at lunch and I went through all the people you notified in this country and elsewhere.

* * *

I wonder really why you ever address yourself to the so-called conspiracy
. . . . All the oratory about conspiracy I found to be something of a turn-on [sic, should read "turn-off"] and I had to fight my way through words in order to get down to what few facts I could find.

Proceedings before Judge Pratt on May 4, 1983, Tr. at 4862 (emphasis supplied).

Accordingly, plaintiffs' allegations of conspiracy or concert of action as the factual predicate for imposing joint and several liability have already been considered and rejected by the Court as without foundation.

We will first set forth the history of Dow's involvement with chloracne, dioxin, and Herbicide Orange. Then, in light of that history, the documents cited by plaintiffs in support of a "conspiracy" will be discussed and shown to establish that Dow in fact acted independently from the other defendants. Numerous

instances of notice given by Dow during the 1960s to the government and others will be presented. Finally, the government's extensive knowledge regarding chloracne and dioxin, together with the publicly available scientific literature on those subjects, will be summarized.

1. Dow Did Not Act In Concert With Other
Herbicide Orange Manufacturers To
Withhold Information On Chloracne And
Dioxin From The Government

The starting point in considering plaintiffs' allegations of a "conspiracy of silence" is the realization that plaintiffs offer no direct evidence whatsoever in support of their conspiracy. After searching through hundreds of thousands of documents, many of them confidential internal memoranda, plaintiffs cannot point to a single line where Dow agreed with anyone to hide information on dioxin from the government.

Conscious of their lack of any direct evidence, plaintiffs seek to imply a tacit agreement from the actions of Dow and the other defendants. Yet the meetings and documents plaintiffs cite in support of their conspiracy theory in fact prove precisely the contrary. Using primarily the evidence presented in Plaintiffs' Alt. Liability Memo, we will demonstrate, first, that Dow knew the government already possessed the information on chloracne and dioxin which Dow was allegedly conspiring to withhold; second, that Dow and the other defendants acted completely independently regarding the dioxin contaminant in Herbicide

Orange; third, that a 1965 meeting of trichlorophenol manufacturers resulted in no agreement whatsoever among the defendants, was not attended by anyone manufacturing Herbicide Orange, and, in fact, had nothing at all to do with Herbicide Orange; and fourth, that an industry task force on herbicide residues was innocuous and totally irrelevant to dioxin and Herbicide Orange.

In order to appreciate fully the independence of Dow's actions from those of the other defendants, it is necessary to understand the background of Dow's involvement with 2,4,5-T.

- a. Dow Was Aware Of Occupational Health Hazards Associated With Extremely High Levels Of Dioxin In The Waste Stream Of The Trichlorophenol Manufacturing Process, But Not Of Health Hazards To Users Of Its 2,4,5-T Products.

The undisputed evidence establishes that Dow became acutely aware of occupational health hazards associated with the manufacture of trichlorophenol in 1964, when a number of Dow employees developed chloracne following exposure to the trichlorophenol waste stream. Dow identified dioxin as the causative agent and instituted manufacturing process changes and quality control procedures to protect its workers and insure that its trichlorophenol and 2,4,5-T contained no dioxin. Thorough testing by Dow scientists showed that its trichlorophenol and 2,4,5-T posed no health hazards to users.

Dow fully informed the government, the chemical industry and the scientific community of the occupational health hazard

associated with dioxin in the manufacture of trichlorophenol. See pp. 85-97, infra. However, Dow had no reason to warn the government that dioxin in Dow's Herbicide Orange posed a hazard to troops in Vietnam, since extensive testing at the time showed that Dow's Herbicide Orange contained no dioxin and posed no hazard.

The distinction between occupational health hazards of dioxin -- which are severe -- and hazards to users of Dow's 2,4,5-T products -- which are non-existent -- is critical to a proper understanding of Dow's actions during the 1950s and 1960s.

Prior to the time that Dow manufactured and sold herbicides to the United States for use in Southeast Asia, Dow learned that an unidentified chloracnegen -- a chemical agent capable of causing chloracne -- could be present in the waste stream during the manufacturing process of TCP, a precursor in the manufacture of 2,4,5-T. Silverstein, "The Chloracne Problem - Biochem's Contribution," March 11, 1965 at pp. 4-6, Exhibit "32". Utilizing the so-called "rabbit ear" test, pioneered by Dow toxicologists,* Dow tested the waste stream, which consistently produced the characteristic folliculitis on the rabbit ear -- indicating the chloracnegen was present; Dow also tested the finished trichlorophenol product, which consistently produced no response on the rabbit ear -- indicating no chloracnegen. Id.

* See Adams, et al., The Response of Rabbit Skin to Compounds Reported to Have Caused Acneiform Dermatitis, J. Ind. Med. (1941), Exhibit "33". The article is discussed at pp. 111-112, infra.

at p. 2; In the Matter of the Hearing of 2,4,5-T and Silvex, Direct Testimony of V.K. Rowe at pp. 3-5, Exhibit "34".

In or about February, 1964, workers assigned to Dow's Midland, Michigan plant engaged in the manufacture of trichlorophenol began to experience symptoms associated with chloracne. Memo of R. Holmes, re: Manufacture of TCP at 199 Bldg., July 30, 1964, Exhibit "35".

Dow investigated the cause of the symptoms and determined that they were attributable to a recent change in Dow's production process for trichlorophenol which resulted in the formation of high concentrations -- measured at up to 10,000 ppm -- of a chloracnegen in the waste stream.* At the time, Dow also determined that the previously unidentified chloracnegen in the waste oils was dioxin. Memo of R. Holmes, supra, Exhibit "35"; Silverstein, Report on the Chloracne Problem Meeting on 3/24/65, Exhibit "37".

During the course of its investigation, Dow developed an analytical method, utilizing gas chromatography, which was capable of consistently detecting dioxin in trichlorophenol and 2,4,5-T at concentrations as low as 1 ppm. Gill, "The

* Dow's testing in December, 1964 by gas liquid chromatography of the waste stream from the trichlorophenol process showed amounts of dioxin in the waste stream ranging from 0.6 percent to 1.0 percent, which equals 6,000 ppm to 10,000 ppm. Gill, "The Analysis of Caustic Insoluble Oils and Process Samples from the 2,4,5-T Trichlorophenol Process for Compounds Capable of Causing Chloracne, Principally, 2,3,7,8 Tetrachlorodibenzo-p-dioxin," December 22, 1969 at p. 1, Exhibit "36".

Determination of 2,3,7,8 Tetrachlorodibenzo-p-dioxin in 2,4,5-Trichlorophenol (Gas Chromatographic Method)," July 7, 1965, Exhibit "38"; Gill, "The Determination of 2,3,7,8 Tetrachlorodibenzo-p-dioxin in 2,4,5-Trichlorophenoxyacetic Acid by Gas-Liquid Chromatography," June 22, 1965, Exhibit "39". Based upon tests conducted by Dow, it was determined that no chloracnegenic response occurred if the dioxin concentration was below that level.* Exhibit "32", supra, p. 7; Exhibit "37", supra.

Accordingly, Dow established internal specifications for its trichlorophenol and 2,4,5-T products which required that it contain no dioxin whatsoever as measured by its analytical procedure. Memo on Conference re: 2,4,5-T Acid Product Specification, May 4, 1965, Exhibit "40"; Letter fr. Otis to Coulter, April 6, 1965, Exhibit "41".

In order to insure compliance with this specification, Dow instituted the following internal procedures: (1) all cars of trichlorophenol were analyzed for dioxin; (2) two samples per

* For a brief period of time following the identification of dioxin in the trichlorophenol waste stream, Dow was uncertain whether dioxin might also be present in the end product -- trichlorophenol. At that time it notified its trichlorophenol customers and other trichlorophenol manufacturers of the chloracne hazard associated with the impurity. By April 1965, however, laboratory testing had established the safety of trichlorophenol with no detectable dioxin according to Dow's analytical method. Dow then notified its customers that there was no cause for concern since the problem had been solved. The documents indicating some uncertainty regarding Dow's end products all date from early 1965, prior to the completion of laboratory tests -- a period in which Dow sold no herbicides to the government. See pp. 90-92, infra.

tank car of 2,4,5-T were analyzed for dioxin; and (3) a sample for animal toxicity testing was taken from a filter cake utilized during the manufacturing process. Memos re: TCP and 2,4,5-T acid analysis for dioxin, May 4, 1965, Exhibit "42", and May 8, 1967, Exhibit "43".

Dow maintained analytical records reflecting, among other things, the dioxin concentration in Dow's trichlorophenol production. See, e.g., Records of Shipments of Trichlorophenol, Exhibit "44". No trichlorophenol or 2,4,5-T or Herbicide Orange ever left the Dow plant for any purpose unless it satisfied Dow's internal criteria of zero dioxin. Affidavit of Richard Hoff, Exhibit "45"; Gill Tr. at 161-162, Exhibit "46"; Exhibits "41", "42", and "43".

In 1966, after these quality control procedures were well in place, Dow for the first time began shipments of Herbicide Orange to the government.* See Dow's Statement Pursuant to Pre-Trial Order No. 33, April 21, 1982. Since

* Dow had previously supplied Herbicides Purple, Pink, and Green to the government, the last delivery occurring in 1963. See Statement of The Dow Chemical Company Pursuant to Pretrial Order No. 33, April 21, 1982. Prior to 1964, Dow had consistently tested samples of trichlorophenol for chloracne activity, using the rabbit ear procedure, and found none. Results of the gas chromatography test were compared with results of the rabbit ear test, previously utilized by Dow, and it was determined that the rabbit ear test indicated no chloracnegenic tendencies when Dow's analytical procedure showed no dioxin. See pp. 64-65, supra. Thus, Herbicides Purple, Pink and Green, which Dow supplied to the government well before its 1964 chloracne problem, were of the same quality with respect to dioxin as Dow's Herbicide Orange. Report on the Chloracne Meeting, supra, at pp. 3, 5, Exhibit "37". See also Reply Memorandum of the Dow Chemical Company in Support of its Motion for Reargument, June 13, 1983, at 5-7.

Herbicide Orange was a 50% blend of 2,4,5-T and 2,4-D, the dioxin content of Herbicide Orange would have been only half that of the 2,4,5-T -- which was already too low to measure.* Exhibits "42" and "43"; Letter fr: R. Woodward to G. Lynn, March 10, 1970; Exhibit "47".

V.K. Rowe, Dow's chief toxicologist, has stated categorically in his affidavit in support of Dow's motion for summary judgment on the government contract defense that he never believed Dow's 2,4,5-T products constituted a health hazard to humans or animals. Affidavit of V.K. Rowe, Exhibit "48". Indeed, the Court has found that "Dow believed [its] standard to be within a reasonable margin of safety so that hazards to people would be eliminated." 565 F. Supp. at 1276.

Accordingly, Dow's knowledge of dioxin was that high levels might cause occupational health hazards in connection with the manufacture of trichlorophenol. There is no evidence that Dow ever believed or had any reason to believe that its Herbicide Orange -- which contained no dioxin according to Dow's tests -- posed a health hazard to troops in Vietnam.

* Since Dow's trichlorophenol always contained less than 1 ppm dioxin -- the lowest amount its analytical procedure could detect -- Dow's Herbicide Orange always contained less than 1/2 ppm dioxin. More sensitive tests, developed in the 1970s, were performed on stocks of Agent Orange stored under government control in Gulfport, Mississippi, and confirmed that Dow's Agent Orange contained well under 1/2 ppm of dioxin, i.e., an average of 0.12 ppm. See Dow's Alt. Liability Memo at pp. 21-22 and annexed exhibits.

b. The Groth Correspondence.

Plaintiffs argue that certain correspondence related to Dr. David Groth of the Public Health Service shows that Dow conspired to conceal information of its chloracne experience from the government. However, Dow did inform the Public Health Service of its chloracne experience at that time. Thus, plaintiffs' argument fails completely. The Groth correspondence simply demonstrates the extensive knowledge of dioxin and chloracne which the Public Health Service possessed by 1964 and 1965 -- and makes clear that Dow was aware that the government had such extensive knowledge.

On December 3, 1964, Dr. David Groth, a pathologist with the Occupational Health Research & Training Facility of the Public Health Service at Cincinnati, Ohio, which was responsible for investigating occupational health problems, wrote to E. T. Upton of Thompson-Hayward Chemical Co. to request samples of 2,4,5-T and trichlorophenol. Exhibit "49". Dr. Groth identified dioxin as the suspected chloracnegenic contaminant in 2,4,5-T by giving its full chemical name and drawing a structural diagram. He discussed a paper published by Kimmig and Schulz in Dermatologica in 1957 and proposed to test samples of 2,4,5-T and trichlorophenol for dioxin to confirm, if possible, the conclusion of Kimmig and Schulz that the skin and liver toxicity associated with 2,4,5-T manufacture was caused by very small quantities of dioxin created as a by-product of the 2,4,5-T manufac-

turing process. See Kimmig, J., and Schulz, K.H., Occupational Chloracne Caused by Aromatic Cyclic Ethers, Dermatologica 115: 540-46 (1957), Exhibit "50". This significant publication is summarized and discussed at pp. 113-114, infra, as one example of the fact that the presence of dioxin in 2,4,5-T was common knowledge among interested scientists and physicians in the 1960s.

Since Dow supplied trichlorophenol which Thompson-Hayward used to manufacture 2,4,5-T, Thompson-Hayward forwarded a copy of Groth's letter to Dow and asked what levels of dioxin were present in Dow's trichlorophenol. Letters from DeAtley to Dosser, December 11, 1964 and December 28, 1964, Exhibits "51" and "52". A subsequent memo by DeAtley states that Dow replied that it already knew the Public Health Service was studying dioxin but that Dow's trichlorophenol contained no dioxin, according to a test procedure sensitive to "about 1 ppm." DeAtley memo, January 12, 1965, Exhibit "53".

On January 14, 1965, Thompson-Hayward sent Dr. Groth the samples and manufacturing information he requested. Letter from Upton to Groth, Exhibit "54". Both Dow and Thompson-Hayward samples were provided to Dr. Groth. DeAtley memo, supra, Exhibit "53".

At about the same time, Dr. Groth applied for funds to conduct experiments on 2,4,5-T and dioxin. Project Development and Approval form, January 12, 1965, Exhibit "55". Dr. Groth

planned to apply various components of 2,4,5-T to rabbits and feed dioxin to dogs, then perform a full battery of tests on the animals. He had previously obtained a quantity of dioxin from Dr. Krizek of the University of Chicago.* Groth Tr. at 78, Exhibit "56".

His proposal records his knowledge that 2,4,5-T was "widely used in large quantities" and that there had been "many reports of people developing chloracne and liver damage from over-exposure to [2,4,5-T] in industry." Dr. Groth discusses the significance of prior research on 2,4,5-T and dioxin, including unpublished data developed by a co-worker at the Public Health Service, Dr. George Lawton, and includes a list of thirty-two published references on chloracne, 2,4,5-T and dioxin.

The government did not fund Dr. Groth's proposed research, and he did not pursue the matter further. Groth Tr. at 102-03, Exhibit "57".

Plaintiffs' argument regarding Dr. Groth rests entirely on their unsupported allegation that Dow and Thompson-Hayward, having learned of the Public Health Service's interest in dioxin and chloracne, attempted to conceal the Dow chloracne experience from the Public Health Service. As plaintiffs well know, that allegation is completely false. In fact, Dow informed Dr.

* Dr. Krizek was co-author of an important 1962 paper on the acnegenic potency of dioxin. See pp. 118-119, infra.

Groth's superior,* Dr. Herbert Stokinger, of the Dow chloracne problem soon after the Groth correspondence.

Dr. Stokinger, Chief Toxicologist at the Public Health Service's Cincinnati facility, testified that V.K. Rowe, Dow's chief toxicologist, discussed Dow's chloracne incident with him in 1965 or 1966. Stokinger Tr. at 75-77, Exhibit "59". Thus, all of plaintiffs' insinuations regarding the Groth correspondence come to nothing, since Dow did inform the Public Health Service of its chloracne experience.

Furthermore, the information from Dow was hardly a surprise to Dr. Stokinger. Like Dr. Groth, by 1965 he was familiar with the German articles on dioxin and chloracne in the 2,4,5-T manufacturing process. See Stokinger Tr. at 102-04, Exhibit "60"; 565 F. Supp. at 1267. Moreover, as the Court noted in Pretrial Order No. 51, representatives from the Public Health Service had been investigating chloracne episodes among trichlorophenol workers dating back to an incident at a Monsanto plant in Nitro, West Virginia in 1949. 565 F. Supp. at 1255. See also articles summarized at pp. 120-121, infra.

The Groth correspondence actually provides strong evidence against Dow's participation in a "conspiracy of silence" by demonstrating, first, that the Public Health Service was fully

* See Groth Tr. at 146-47, Exhibit "58".

aware of dioxin as an extremely toxic by-product of the 2,4,5-T process which could cause chloracne and other more serious problems, and, second, that Dow knew of the Public Health Service's knowledgeability.

The implausibility of Dow's planning a "conspiracy of silence" against the government in these circumstances is evident. The government already had the information Dow was supposedly conspiring to conceal--and Dow knew it.

c. The Trichlorophenol Manufacturers Meeting.

On March 19, 1965, V.K. Rowe of Dow invited all American producers of trichlorophenol to a meeting to discuss toxicological problems caused by the possible presence of highly toxic impurities in trichlorophenol. Letter fr. Rowe to Kelly, Wilkenfeld, Verhoeze, Kennedy, Chandler, Frawley, Exhibit "61". V.K. Rowe stated that the meeting was called

for the sole purpose of lessening any hazards to health that might be attributed to [trichlorophenol] and related products.

Our discussions will deal only with the toxicological and analytical aspects of the problem. We will not discuss manufacturing know-how, sales, or anything else not dealing with the problems of health.

It is our hope that through this meeting we will acquire a better understanding of the problem and that each company will then proceed independently as it sees fit to institute such self-imposed controls on its production as are necessary to insure the safety of its products.

Id. (emphasis supplied). A copy of Dow's recently developed analytical method for measuring dioxin in trichlorophenol was forwarded with the letter to all invitees.

The meeting of trichlorophenol manufacturers took place on March 24, 1965, attended by representatives of Dow, Hooker Chemical Corp., Diamond Alkali Company, and Hercules Powder Company. None of these companies was selling Herbicide Orange to the government at that time.* See Statement of The Dow Chemical Company Pursuant to Pretrial Order No. 33, dated April 21, 1982; Verified Statement of Defendant Diamond Shamrock Corporation Identifying Herbicide Contracts, Quantities Supplied, and Shipment Dates, April 21, 1982; Contract Documents Submitted by Hercules Incorporated Pursuant to Pretrial Order No. 33, April, 1982.

The five memoranda written by attendees of that meeting confirm that the meeting was limited to the matters described in V.K. Rowe's letter. See Silverstein memo, March 29, 1965, Exhibit "62"; Frawley memo, March 26, 1965, Exhibit "63"; Dunn memo, March 29, 1965, Exhibit "64"; Chandler memo, March 25, 1965, Exhibit "65"; Wilkenfeld memo, March 25, 1965, Exhibit "66".

* Dow did not begin shipments of Herbicide Orange to the government until 1966. See Dow's Statement Pursuant to Pretrial Order No. 33. Hooker never manufactured Herbicide Orange at all.

Dr. Benjamin Holder, Dow's medical director, discussed the Dow experience with chloracne. Harold Gill, an analytical chemist, described Dow's analytical procedure, stating that it could detect the presence of dioxin in trichlorophenol at levels of one part per million or more. V.K. Rowe recounted Dow's toxicological research, concluding that trichlorophenol which contained no dioxin, within the sensitivity of Dow's analytical procedure, did not pose a hazard to humans. In response to a question, he stated that Dow had set a specification for its products of "zero with a confidence of 1 ppm." Silverstein memo, supra, at 4, Exhibit "62".

It is undisputed that there was no mention whatsoever at the meeting either of Herbicide Orange or of sales of any product to the government.

Indeed, the only discussion of the government was in the Frawley memo, which noted briefly that the Michigan State Department of Health had been consulted and that Dow believed the Federal government was aware of the problem. Frawley memo, supra, Exhibit "63".

In a brief "postscript" to the Silverstein report on the meeting, V.K. Rowe commented that

[a]ll participants seemed to appreciate well the problem and all indicated that they would return home and attempt to convince their management to institute safety specifications (really quality control)

Silverstein memo, supra, at 7, Exhibit "62".

This meeting of trichlorophenol manufacturers is the linchpin of plaintiffs' conspiracy allegations -- a meeting at which defendants supposedly met and agreed to conceal the hazards of Herbicide Orange and dioxin from the government. Yet, not only were most of the defendants absent from that meeting, no one present was selling Herbicide Orange to the government at the time. Furthermore, trichlorophenol was used to make many things besides 2,4,5-T, and 2,4,5-T was used to make many things besides Herbicide Orange.

The meeting simply did not deal with sales of Herbicide Orange to the government, and plaintiffs have produced no evidence whatsoever to the contrary.

Nor did the meeting result in any agreement to withhold information from the government. On the contrary, Dow reported that it had called in the Michigan Department of Public Health and believed that the federal government was aware of the problem.*

Furthermore, the attendees were technical and scientific personnel, not management. At the conclusion of the meeting, "all indicated they would return home and attempt to convince their management to institute safety specifications." (Emphasis supplied.) Silverstein memo, supra, at 7, Exhibit "62". These people did not even have the power within their own companies to

* In fact, based on the Groth correspondence, Dow knew for certain that the government had full knowledge of the occupational health hazards posed by dioxin. See pp. 68-72, supra.

set the specifications on the products with which they worked. To suggest that they had the power to commit their companies to an industry-wide conspiracy of many years duration to defraud the federal government strains common sense to the breaking point.

In sum, it is difficult to imagine a more unlikely scenario for a Herbicide Orange conspiracy: the people present at the meeting lacked the power to act, none of the companies represented was manufacturing Herbicide Orange, Herbicide Orange was never discussed, and the supposed goal of the conspiracy was stated to be unattainable. Thus, plaintiffs' contention that the meeting inaugurated a vast conspiracy to unload deadly Herbicide Orange on an unsuspecting government should be seen for what it is -- a product of plaintiffs' imagination.

In addition to demonstrating that the defendants did not agree to conceal information on dioxin from the government, the 1965 meeting and its aftermath show that the defendants did not agree on anything at all related to 2,4,5-T and dioxin.

In particular, it is important to realize that the meeting did not attempt to set an industry-wide standard for dioxin in trichlorophenol. Dow only mentioned its standard in response to a question:

We were asked if we could give levels of dioxin contamination which were permissible limits. V.K. [Rowe] mentioned that at present we are using zero with a confidence of 1 ppm

Silverstein memo, supra, at 4, Exhibit "62" (emphasis supplied).

The other memoranda confirm that Dow merely stated its own standard, and did not suggest an industry-wide specification. See, e.g., Chandler memo, supra, Exhibit "65" ("The Dow people state that they intend to set a limit of zero"); Frawley memo, supra, Exhibit "63" ("Dow . . . is checking all production to be certain that it contains less than 1 ppm 2,3,7,8-TCDD"); Wilkenfeld memo, supra, Exhibit "66" (Dow's "current in plant working limit is 'no response'").

Dow called the meeting not to set an industry standard but to encourage other producers of trichlorophenol to test their product for dioxin themselves and institute whatever quality control procedures they deemed appropriate. For its own part, Dow said it allowed zero dioxin in its trichlorophenol, within the limits of its analytical capabilities. But, as V.K. Rowe stated in his letter announcing the meeting, each company was to "proceed independently as it sees fit." Letter fr. Rowe, supra, Exhibit "61". The people present at the meeting simply took Dow's analytical procedure and said they would report to their management Dow's recommendation that they consider instituting some sort of quality control procedures of their own.

However, within a few months it had become apparent that the other trichlorophenol manufacturers were not in fact using the analytical procedure which Dow had provided to institute quality control procedures. A memo by John Frawley of Hercules

states that on July 9, 1965 Frawley received a telephone call from Earl Farnham of Dow:

[Farnham] stated that on the advice of their toxicologists Dow has gone to great expense to alter their manufacturing conditions in order to produce 2,4,5-T acid which has less than 1 ppm acnegen.

Since several months ago Dow made available to all other producers the same data which convinced their toxicologists to set an internal specification of 1 ppm on the acid, they had assumed that the other producers would take similar action. On the basis of their chemical analyses, they are convinced that no one else has done anything to remove the acnegen from their 2,4,5-T and consequently, they wanted my opinion whether they had been mis-advised by their own toxicologists.

I advised Mr. Farnham that I did not think this was a proper question for me and that he should seek outside advice from a private consultant if he doubted the advice of his own toxicologists. I pointed out that considerable individual professional judgment would be involved in establishing a specification of this type

Note to file by J. A. Frawley dated July 12, 1965 (the "Frawley/Farnham memo"), Exhibit "67" (emphasis supplied). Frawley refused to comment on Dow's internal specification or to say whether Hercules had set an internal specification for dioxin, instead referring Farnham to "someone in ... management." Id.

Obviously, "individual professional judgment" differed widely on the specification issue. In fact, no other manufacturer set a comparable specification for dioxin. Throughout the

period in which Herbicide Orange was manufactured and sold to the government for use in Vietnam, no manufacturer but Dow regularly tested its production to insure that its Herbicide Orange contained no dioxin.* This lack of testing and quality control by other Herbicide Orange manufacturers, combined with the fact that various manufacturers used different manufacturing processes, resulted in greatly varying dioxin levels in Herbicide Orange. See, e.g., Dow's Alt. Liability Memo at 21-22 and annexed exhibits.

Thus, Dow's one recommendation to its competitors at the 1965 meeting -- that they should test their trichlorophenol for dioxin regularly and consider instituting their own quality control measures -- was not followed. Furthermore, Frawley's guarded language and refusal to discuss specifications make clear that Dow and Hercules were wary competitors, not cozy co-conspirators.

Clearly, there was never an industry-wide standard for dioxin.

Plaintiffs attempt to impugn Dow's motives in calling the trichlorophenol manufacturers meeting by citing documents

* Dow's rigorous quality control procedures are described at pp. 64-67, supra. Compare Thompson-Hayward's Memo in Support of its Motion for Reargument of its Motion for Summary Judgment, May 26, 1983 at p. 5; Memo of Uniroyal in Support of its Motion for Reargument, May 26, 1983 at pp. 11-12; Memo in Support of Thompson Chemical Corporation's Motion for Summary Judgment, April 20, 1983 at pp. 1-2; Memo of Hercules in Support of its Motion for Reargument of Plaintiffs' Motion for Reconsideration of Hercules' Summary Judgment Motion, December 9, 1983 at pp. 10-11; Reply Memo of Dow in Support of its Motion for Reargument, June 13, 1983 at pp. 10-11.

referring to Dow's desire to avoid "excessive restrictive legislation" or restrictive "regulatory activities." Frawley/Farnham memo, supra, Exhibit "67"; Letter fr. Rowe to Mulholland, June 24, 1965 (the "Mulholland letter"), Exhibit "68". Plaintiffs' insinuations are totally without merit.

It is entirely proper for a corporation to wish to avoid excessive legislation or regulation. A corporation can certainly do so without entering into a conspiracy to conceal information. In fact, just the opposite occurred. See pp. 85-97, infra. Dow communicated information on chloracne and dioxin to federal and state government officials, the chemical industry, and many individual health professionals.

For example, V.K. Rowe urged in the Mulholland letter that large Canadian trichlorophenol customers be invited to Michigan for a full briefing, stating:

We are not in any way attempting to hide our problem under a heap of sand, but we certainly do not want to have any situations arise which will cause the regulatory agencies to become restrictive.

Mulholland letter, supra, Exhibit "68" (emphasis supplied).

Actions to avoid restrictive government regulation are part of the normal business practices of most large corporations and do not constitute a conspiracy to defraud the government. Thus, in the DES cases, the fact that several corporations acted similarly when their actions were ordinary business practices within industry, was found not to constitute concert of action.

See pp. 57-58, supra; Sindell v. Abbott Laboratories, supra; Ryan v. Eli Lilly & Co., supra.

Nothing in the evidence herein indicates anything other than the "independent, competitive response" which, as the Sindell court found in the DES context, precludes any claims of concert of action. Indeed, the facts in Agent Orange are far weaker regarding concert of action than those in the DES cases, since there was no industry standard for dioxin in Herbicide Orange, whereas all DES was, by agreement, chemically identical. See p. 57, supra. Dow's actions concerning the 1965 meeting were those of an "independent, competitive" corporation acting responsibly to warn its competitors of a potential occupational health hazard.

In any industry today, there is some degree of communication. If the minimal communications present in Agent Orange, communications which in fact show disagreement rather than agreement in the industry, are allowed to support a finding of concert of action, then the prospect decried by the Court in Sindell -- that the concert of action theory would be distorted to "render virtually every manufacturer liable for the defective products of an entire industry" -- will have become a reality. 607 P.2d at 933.

There is nothing in the 1965 meeting, the Mulholland letter, or the Frawley/Farnham memo to suggest a desire on Dow's part to conspire to withhold information on dioxin and chloracne from the government -- information which Dow knew the government

already possessed. Rather, the record is clear throughout that Dow's concern was with regard to its competitors. That concern in no way led Dow into a useless conspiracy to conceal information on dioxin from the government. On the contrary, it underlines the lack of any agreement or concerted action on the part of Dow and its competitors.

There were no Herbicide Orange manufacturers at the 1965 meeting, Herbicide Orange was not mentioned, and the people present did not agree -- and did not have the authority to agree -- on anything. No other manufacturer used the analytical procedure which Dow provided at the meeting to establish any sort of specification for dioxin in its own product. In contrast, Dow regularly tested its production to insure that its Herbicide Orange contained no dioxin.

Accordingly, the 1965 meeting provides no evidence whatsoever that Dow acted in concert with other defendants regarding dioxin or Herbicide Orange.

d. The Industry Task Force

In August, 1966 a number of chemical companies met to form the Industry Task Force on Phenoxy Herbicide Tolerances (the "Task Force") under the auspices of the National Agricultural Chemicals Association. A number of defendants in the Agent Orange Litigation, including Dow, together with other chemical companies, were at some time or another members of the Task Force.

Plaintiffs assert that the fact that a petition prepared by the Task Force did not mention dioxin constitutes evidence that defendants were conspiring to keep the government from learning about dioxin. See Plaintiffs' Alt. Liability Memo at pp. 60-75. However, that petition related to permissible trace levels of 2,4,5-T in crops, so dioxin -- a trace within a trace -- would have been at utterly insignificant levels.

Thus, dioxin was not mentioned in the Task Force's petition simply because it was not relevant. In fact, there is no evidence that dioxin was ever discussed at any Task Force meeting.

The Task Force was formed to compile toxicological data regarding residues of phenoxy herbicides in crops and submit that data to the Departments of Agriculture and Health, Education, and Welfare, in accordance with government regulations. The government had issued regulations requiring such submissions following a report on pesticide residues issued by the National Academy of Sciences ("NAS"). Report on "No Residue" and "Zero Tolerance", 1965, Exhibit "69".

The NAS report noted that new and more sensitive analytical techniques were making possible the detection of minute pesticide residues which had previously been undetectable. Up until that time government regulations had allowed some pesticides to be used only when they left no detectable residue. The

improving technology thus threatened the continued use of many valuable pesticides if the regulations were not changed.

Rather than permit this to happen, the NAS report recommended that pesticides previously registered on a no-residue basis could continue to be used for five years, even though minute residues were now detectable. During that time, industry was to submit data on the effects of those newly detectable residues, so that suitable "negligible residue tolerances" could be determined.

On December 8, 1967, the Task Force submitted its "Petition for the Establishment of Tolerances for the Pesticide Chemical 2,4,5-Trichlorophenoxyacetic Acid on Raw Agricultural Commodities" to the FDA. Exhibit "70". The toxicity data submitted, gathered from a wide variety of sources within industry, the government, and academia, represented the current state of knowledge of the toxicity of 2,4,5-T as it was then being manufactured and used. Any toxicity attributable to the presence of dioxin in 2,4,5-T would have been measured and reported in that data, because actual commercial samples of 2,4,5-T were tested.

The Petition asked that a permissible residue -- a trace amount -- of 2,4,5-T in crops be established. Dioxin -- a trace contaminant within that trace of 2,4,5-T -- could have been present in such a residue only in astronomically small quantities of

parts per quadrillion (1,000,000,000,000,000).^{*} Such levels of dioxin are far below even current limits of detection.

There is of course absolutely no evidence that the members of the Task Force considered such levels to pose any risk whatsoever to anyone or anything. Nor is there any evidence that dioxin was ever discussed at any Task Force meeting. Dioxin was obviously irrelevant to the question of herbicide residues. That -- and not some sinister conspiracy -- was the reason dioxin was not mentioned in the Petition.

Accordingly, the actions of the Task Force provide no evidence that defendants acted in concert to conceal hazards of Herbicide Orange from the government.

2. Dow Communicated Its Knowledge Of Chloracne And Dioxin To The Federal Government, The State Of Michigan, The Chemical Industry, And Interested Health Professionals Around The World.

The most persuasive evidence that Dow was not part of a "conspiracy of silence" is the fact that Dow was not silent. Rather, Dow time and again disclosed to the government, the chemical industry, and numerous interested individuals the information which it supposedly was trying to suppress.

^{*} The FDA envisioned a residue "in the range of 0.1 ppm." Minutes of the Task Force, April 20, 1967, Exhibit "71". Calculating based on the Gulfport measurement of an average of 0.12 ppm of dioxin in Dow's Herbicide Orange yields a dioxin residue within the maximum possible 2,4,5-T residue of 12 parts per quadrillion (0.000000000000012). See Dow's Alt. Liability Memo at p. 22.

Initially, Dow notified the Michigan State Department of Health in 1965 of the presence of a chloracne in the waste stream of the TCP process. In a letter dated March 2, 1965, Russell G. Scovill* of that Department praised Dow for its handling of the problem:

It is an unusual substance that requires such stringent precautionary measures and we must state that those finally adopted are far more restrictive than we ourselves would have recommended

Exhibit "73". Significantly, in 1965, the state health departments, rather than any federal agency, were the appropriate governmental units to notify of industrial health problems; contact with the United States Public Health Service ("USPHS") about such problems was made not by the company but by the state agency. See Birmingham Tr. at 50, Lee Tr. at 17, Exhibit "74".**

Dow also notified Dr. Donald Birmingham, a dermatologist formerly associated with the USPHS and, at the time, a Professor

* Russell Scovill, in addition to being District Engineer for the Michigan State Department of Health, had served on the prestigious Threshold Limit Value Committee of the American Conference of Government and Industrial Hygienists. See "Threshold Limit Values for 1961," at p. 129, Exhibit "72". Dr. Stokinger was also a member of the Threshold Limit Value Committee. That committee fixed the acceptable level of industrial exposure to 2,4,5-T in 1962, which still remained unchanged in 1981. See p. 110, n.**, infra.

** Nevertheless, V.K. Rowe of Dow discussed the chloracne incident with Dr. Herbert Stokinger, Chief Toxicologist at the Occupational Health Research and Training Facility, USPHS, in 1965 or 1966. Stokinger Tr. at 75-77, Exhibit "59".

of Dermatology at the Wayne State University College of Medicine. He was considered an expert in the field of chloracne and his advice and counsel were sought. Dr. Birmingham saw Dow personnel with chloracne and, accompanied by 10 other dermatologists from around the country, he visited the Midland plant for an on-site inspection. Birmingham Tr. at 51-54, Exhibit "75"; letter from B. B. Holder to G. E. Lynn, March 31, 1970, Exhibit "76".

In addition, Dow contacted the Institute for Industrial Health at the University of Michigan College of Medicine. A seminar on chloracne was held for resident physicians and students, and several clinical cases were presented to University professors and senior members of the staff while visiting in Midland. Id. Among the doctors consulted was Dr. Harold Magnuson, formerly chief of the Division of Industrial Health of the USPHS. Magnuson Tr. at 19, 46, Exhibit "77".

As a result of these contacts with the University of Michigan, the incident was reviewed with physicians representing various branches of the federal government, such as the United States Navy and the Atomic Energy Commission, private industry, such as General Motors and Ford Motor Company, and even the government of Canada, through the Ontario Department of Labor. Exhibit "76". Dow also communicated extensively about the incident with physicians at the University of Texas College of Medicine in Galveston, Texas. Id.

Dow discussed the incident with physicians and other health-oriented individuals from all over the world, including the Netherlands, England, South America, and the Institute of Health in Russia. Id.

As early as December 1964, Dow provided information about dioxin's hazards for workers manufacturing trichlorophenol, together with several citations to the scientific literature on dioxin, to the Manufacturing Chemists' Association ("MCA"). See Rowe letter of Dec. 13, 1964 to Stephenson, Exhibit "78". A Mr. Drew of Cambridge Research, Inc. had asked MCA for information on safety in the manufacture of trichlorophenol, and MCA had in turn asked Dow. Rowe's letter concludes: "You are free to pass this information on to [Mr. Drew] as you see fit."

Similarly, when Dow received an inquiry from Drs. J. Bleiberg and R. H. Brodtkin dated April 6, 1965 (Exhibit "79"), Dow promptly answered, providing technical information on dioxin's chemical properties, the methods and results of Dow's toxicological work on dioxin, and possible therapy for chloracne patients. Letter fr. B. B. Holder to Bleiberg and Brodtkin dated April 13, 1965, Exhibit "80".

Interestingly, Drs. Bleiberg and Brodtkin had enclosed a reprint of an article on chloracne, apparently the one they had written and published the preceding year. See Bleiberg, J., et al., Industrially Acquired Porphyria, Arch. Dermatolog 89: 793-97 (June 1964), Exhibit "81"; see summary at pp. 119-120, infra. Dow

could certainly anticipate that they might publish whatever information they received, yet Dow provided its information on dioxin with no restrictions whatsoever.

Furthermore, Dow advised Dr. Charles Minarik around 1965 that it had experienced a chloracne problem during the manufacture of 2,4,5-T. Minarik Tr. at 302-04, Exhibit "82". Dr. Minarik, the chief of the Crops Division of the Army Biological Laboratories at Fort Detrick, was the man who developed Herbicide Orange for the government and recommended it as the herbicide of choice for use in Vietnam. See Memorandum of The Dow Chemical Company in Support of its Motion for Summary Judgment on the Government Contract Defense, at pp. 37-45 (hereinafter "Dow's Summary Judgment Memo").

Dow also reported its 1964 chloracne incident to its competitors. A letter of March 19, 1965, from Dow to Monsanto, Hooker, Diamond Alkali and Hercules (Exhibit "61") refers to earlier discussions between Dow and the other companies about the chloracne problem. The meeting of trichlorophenol manufacturers held as a result of that letter is discussed at pp. 72-82, supra.

On February 19, 1965, representatives of Thompson-Hayward visited Dow and were briefed on Dow's chloracne problem and analytical method for dioxin. DeAtley memo, February 23, 1965, Exhibit "83". Dow's presentation was essentially the same as that made to the group of trichlorophenol producers in March

1965.* At the request of Thompson-Hayward, Dr. Charles E. Lewis, chairman of the Department of Preventive Medicine of the University of Kansas Medical Center also visited Dow in regard to the chloracne and dioxin problem. Id.; DeAtley memo, April 26, 1965, Exhibit "84".

At about the same time, other purchasers of Dow's tri-chlorophenol were being told of the presence of a chloracnegenic impurity in trichlorophenol. Dow warned its customers during the brief interval in early 1965 after Dow learned that trace amounts of dioxin might be present in its trichlorophenol but before completion of the laboratory tests which established the purity and safety of Dow's trichlorophenol products.

The following memo from F. H. Riley of Dow dated February 15, 1965 (Exhibit "85") was sent to "All Chemical Sales Managers or Office Managers, cc: One Inside Salesman each office":

The following information should be passed on to each customer of Dowicide 2 and Dowicide B.** In order to be certain that there are no misunderstandings, it is suggested that a letter be sent so the customer has it in writing.

* Since Thompson-Hayward manufactured only 2,4,5-T and not tri-chlorophenol, it was not invited to the March meeting of tri-chlorophenol manufacturers.

** Dowicide 2 and Dowicide B are trichlorophenol products.

Impurities have been found in Dowicide 2 and Dowicide B which are potentially capable of causing chloracne. The impurities were discovered as a result of more advanced analytical techniques. The levels are probably about the same as always; but lacking analytical confirmation of this, we feel obliged to advise our customers.

At this point in time, we do not know if the levels are safe or not. Lab tests on animals are being run to determine safe levels, but will not be completed for three to four weeks.

The general feeling is that customers should have no more trouble than in the past. However, they should be careful and should be warned. Our problem is that our knowledge on the safety of the impurities is sufficient to warn our customers, but is not great enough to know the precise safety levels.

In view of this, we would advise against applications involving frequently repeated exposures to the skin. In all probability, normal industrial applications would not present any significant hazard.

Each Dowicide 2 and Dowicide B customer should be warned prior to further shipments of either product. We will insist on confirmation of same prior to releasing orders now on hand or those which may be received in the future.

The Riley memo in no way suggested that customers keep secret Dow's warning regarding the chloracnegen in trichlorophenol. One such customer, Van Waters & Rogers, Inc., passed on Dow's warning regarding chloracnogens to Magna Corp.; Magna then wrote to Dow asking for further information, which Dow supplied. See letter fr. Dow to Van Waters & Rogers, Inc., March 4, 1965,

Exhibit "86"; letter fr. Magna Corp. to Dow, April 6, 1965,
Exhibit "87"; letter fr. Dow to Magna Corp., April 15, 1965,
Exhibit "88".

By late April of 1965 Dow's testing had demonstrated that its trichlorophenol posed no chloracne hazard. See p. 65, supra. Dow immediately sought to allay the fears expressed by a few of its customers regarding continued use of trichlorophenol:

We have had some indication that a few customers expressed fears of continuing the use of these two products since our warning regarding impurities which could cause an outbreak of chloracne. As was expressed in a letter dated April 20, 1965, we again wish to advise that a great deal has been learned about this impurity; and we believe that we can give complete assurance that the amounts which might have been present in Dowicide 2 or Dowicide B could not cause chloracne, even with gross over-exposure.

The situation which occasioned earlier caution about impurities has now been brought completely under control. All of the product being produced now is carefully monitored to assure its appropriateness for the recommended applications of these products.

In the event that further information relative to the impurities is requested, please contact us and we will be very happy to assist in providing additional factual information from our Biochemical Research Department to back up your sales story.

Memo fr. Haling of Dow to All Chemical Sales Managers or Sales Office Managers, Designed Chemical Salesmen and Office Salesmen dated July 8, 1965, Exhibit "89".

Later, in 1967, Dow learned that the government was to open its own plant in Weldon Springs, Missouri, for the production of Agent Orange. Dow considered bidding on the construction of the Weldon Springs plant. During the negotiations which followed, Dow advised the government on numerous occasions about potential industrial hygiene problems associated with the manufacture of TCP:

1. On February 24, 1967, A.P. Beutel, Vice-President and Director of Government Affairs at Dow, wrote to Brig. Gen. J.A. Hebbeler, Director of CBR and Nuclear Operations, concerning the proposed government-owned Herbicide Orange plant. In his letter, Beutel notes Dow's concern over "certain health problems" inherent in the present process. Beutel letter at p. 3, Exhibit "90".
2. On April 20, 1967 A.P. Beutel of Dow wrote to H.G. Fredericks, Deputy Director of Procurement and Production, Edgewood Arsenal, Army Chemical Corps, concerning "a serious potential health hazard to production workers . . . involved in the production of 2,4,5-T." Beutel goes on to advise that Dow has told other manufacturers of the danger and "methods to detect." Finally, he advises that "even with this specific hazard eliminated, care must be taken in handling of the products and intermediates involved." Beutel letter at p. 3, Exhibit "91".
3. In August, 1967 A.P. Beutel and two other Dow representatives visited Carl Rolle and his assistant Leon Davis of the Office of the Secretary of Defense, Installation and Logistics, to discuss the Weldon Springs project. During the course of the meeting, the Dow representatives suggested to Davis that every caution be exercised in terms of the health hazard associated with the production of 2,4,5-T. Salesmen's Call Report at p. 1, Exhibit "92".
4. On September 26, 1967, A.P. Beutel advised Andrew Anderson of Edgewood that Dow would not be presenting a bid at that time on the Weldon Springs project. One of the reasons for this decision was that:

The Chlor-Acne problem associated with the manufacture of Trichlorophenol could not be solved without first receiving permission from a European Chemical Manufacturer.

The Chlor-Acne problem is one of Human Health which Dow has had to combat in the design of its own plants at its Midland operations.

Beutel Letter, at p. 2, Exhibit "93" (emphasis supplied). A copy of this letter was also sent to Col. C.G. Shead of the Directorate of Air Force Aerospace Fuels and to W.G. Kratz of the Army Corps of Engineers. Exhibit "94".

The contract for the Weldon Springs project was eventually awarded to a joint venture between Thompson Chemical Company and Stearns-Roger, Inc. While Dow generally believes it appropriate to allow each defendant to set forth for itself the extent to which it communicated its knowledge of chloracne and dioxin (and thus has not attempted to do so herein), it is worth noting that Thompson Chemical Company, in the course of meetings with the government in January 1968 to plan the Weldon Springs project, fully disclosed the dangers of dioxin and the methods of avoiding its creation in the 2,4,5-T manufacturing process.* Thompson had requested and received such information from Dow only a few months before. Letter fr. Rowe to Buckley, February 15, 1967, Exhibit "95".**

* Those meetings are discussed in more detail at pp. 104-106, infra.

** Two scientific articles on dioxin and chloracne by Bauer, et al., and Bleiberg, et al., which Dow sent to Thompson are discussed at pp. 117-18 and pp. 119-20, infra.

At about the same time, Dow also notified Jane Lewis, a Commodity Industry Analyst, Chemicals Division, Department of Commerce, that Dow had experienced a chloracne problem in its 2,4,5-T plant -- and that dioxin had been determined to be the cause. Lewis was responsible for insuring that the government had adequate supplies of Herbicide Orange. Lewis was concerned that other manufacturers might encounter a chloracne problem as Dow had and asked if Dow had notified other Herbicide Orange manufacturers of dioxin. Dow said that it had done so, and that it had also notified the Department of Health, Education & Welfare.* Lewis believed that no further action was warranted. In any event, Lewis informed her superior in the Department of Commerce, Wes Koster, of Dow's chloracne incident. Lewis Tr. at 64-67, 70, Exhibit "96".

Finally, there is the May 25, 1967 letter from Dr. Benjamin Holder, Dow's Medical Director, to Aaron J. Reiches, M.D., Exhibit "97". In response to a telephone inquiry from Dr. Reiches, Dr. Holder sent him a list of chemicals which can produce chloracne. "Tetrachlorobenzodioxane" was "listed first" by Dr. Holder as the "probable main offender." Dr. Holder referred to the published scientific literature on dioxin and even pointed out that increased heat or pressure in the manufacturing process could cause the creation of dioxin.

* As discussed previously, Dow had notified Dr. Stokinger of HEW in 1965-66. See pp. 70-71, supra.

This last information is the crucial element in reducing the amount of dioxin created in the 2,4,5-T manufacturing process--the element Dow was supposedly conspiring so diligently to hide. In fact, the letter to Reiches, written when Dow's Herbicide Orange sales were at their peak and the "conspiracy" should have been most intense, displays a complete openness regarding information on chloracne and dioxin.

All it took for Dr. Reiches to crack the supposed sinister, industry-wide conspiracy was a telephone call. Dow then mailed him its information on dioxin.

It is obvious from the Reiches letter that Dow considered dioxin to be common knowledge. Dr. Holder simply summarized the basic information and referred Dr. Reiches to the published scientific literature for further details.

Certainly, Dow's repeated disclosures of information on chloracne and dioxin to the government and others during the middle 1960s are totally inconsistent with any conspiratorial attempt to hide such information from the government.

Plaintiffs do not dispute the evidence presented above. They simply try to ignore it. For the evidence establishes that Dow repeatedly disclosed its chloracne experience and its knowledge of dioxin and could not possibly have been part of any "conspiracy of silence."

Accordingly, Dow did not act jointly with the other defendants to conceal information on dioxin from the government

and cannot be held liable to plaintiffs on a theory of concert of action.

3. The Information Regarding Chloracne And Dioxin Which Dow Allegedly Conspired To Withhold From the Government Was Known To The Government And Was In Fact Publicly Available In The Scientific Literature

The evidence of pervasive government knowledge of dioxin in the 1960s and earlier which has been developed through discovery on government contract defense issues is also directly relevant to -- and dispositive of -- plaintiffs' conspiracy allegations. The evidence of government knowledge establishes that any "conspiracy of silence," even if one had existed, could not have caused injury to plaintiffs, since the government obtained all the relevant information on dioxin from other sources.

After reviewing voluminous submissions from all parties on the extent of government knowledge of dioxin, Judge Pratt summarized this "uncontradicted and uncontested evidence" in Pre-trial Order No. 51, 565 F. Supp. 1263. We have excerpted at length below Judge Pratt's findings regarding the breadth and depth of the government's knowledge. We ask the Court's indulgence for including such a lengthy quotation, since a full exposition of relevant government knowledge supported by citations and exhibits would have been many times longer.

Even when all doubts are resolved in favor of the plaintiffs, as required by SEC v. Research Automation Corp., 585 F.2d 31, 33 (2d Cir. 1978), the record

demonstrates that the government and the military had a considerable amount of knowledge about 2,4,5-T, about dioxin, and about the health hazards associated with both. The following general chronology, while not all-inclusive, gives some indication of both the extent of government knowledge in this area and of the fact that it was continually increasing.

During World War II, the military discovered the herbicidal properties of 2,4,5-T and conducted extensive testing of various possible herbicides. This was conducted under the supervision of the Crops Division of the Army Chemical Corps. at Camp Detrick, Maryland.

Several years later, in 1949, Dr. Donald Birmingham of the Public Health Service visited Nitro, West Virginia, where there had been an explosion at Monsanto's 2,4,5-T plant. The report of Dr. Birmingham's colleague, Dr. Louis Schwartz, indicated a connection between chloracne and the chemicals produced in the plant.

There is uncontradicted evidence in the record that a number of people knew in the 1950s that dioxin was toxic although they may not have connected it with 2,4,5-T. Several factors contributed to this awareness.

First, in the early 1950s, C.H. Boehringer Sohn Company of Germany had serious cases of chloracne among workers engaged in the production of TCP, a precursor chemical used inter alia to manufacture 2,4,5-T. By 1955, the Boehringer company was forced to halt production at two plants. Dr. K.H. Schulz, a skin specialist, investigated the problem and in 1957 together with Professor J. Kimmig, reported his findings in an article entitled Chlorinated Aromatic Cyclic Ethers As the Cause of Chloracne. 44 Die Naturwissenschaften 337 (1957). In this article, the authors stated that they were able to isolate dioxin, which

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they believed to be the contaminant in TCP that was causing the health problems. While it is not established that anyone in the government read the Kimmig & Schulz article at the time it was published, the article was available as part of the scientific literature and it appeared in a note to the report written by Friedrich Hoffmann concerning his trip to Europe in 1959.

The "Hoffmann Trip Report" was a second factor contributing to government knowledge during this period. Dr. Hoffmann, who was searching on behalf of the military for potential chemical warfare agents, reported that he had received "startling information" regarding the toxicity of the compound dioxin. In his report, he described the deaths of several workers in a plant that produced wood preservatives containing trace amounts of dioxin. In addition, he reported that the compound could cause severe, indeed liver damage. At least 10 copies of the Hoffmann report were sent to the Army Chemical Corps Chemical Warfare Laboratories at Edgewood Arsenal, the governmental body responsible for investigating toxicity and analyzing chemical agents. Thus, the Hoffmann report on dioxin, coupled with the Kimmig & Schulz article connecting dioxin to TCP, raises a strong possibility that personnel at Edgewood, even before 1960, were aware of the connection between dioxin and TCP as well as the use of TCP to make 2,4,5-T.

Deposition testimony of Edgewood research personnel confirms that people at Edgewood knew about the toxicity of dioxin. Dr. Bernard Jandorf, chief of the Army Chemical Research Laboratory, testified that people at Edgewood had been familiar with this fact since the late 1950s. Dr. Richard Horton, a toxicologist, testified that he knew dioxin was toxic in 1959, as did Dr. Thomas Simmons, who worked in the Agents Research Branch. Walter Sultan, a

pharmacologist in the Toxicity Screening Branch, testified that he had read the Hoffmann report.

Further evidence of governmental knowledge is found in the article written by Dr. Birmingham of the Public Health Service in 1959, stating that in the manufacture of 2,4,5-T, intermediate hydrocarbons of the chlorine group had caused chloracne in more than 200 chemical workers at a manufacturing plant. Birmingham, New Causes of Occupational Dermatoses, 20 Industrial Health 489, 492 (1950). Dr. Marcus Key of the Public Health Service testified that he had learned of the association between hydrocarbons and chloracne and other diseases at the Harvard School of Public Health in 1953.

In the early 1960s, Dr. Bernard McNamara, Chief of the Toxicology Division at Edgewood, performed a study at Edgewood Arsenal of the toxicity of Agent Purple, another defoliant containing 2,4,5-T that was used by the military. This testing was conducted at the request of General F. J. Delmore, Commanding General, U.S. Army Chemical Corps, Research & Development Committee. While the testing indicated that there was some toxicity, the results were not conclusive. At a meeting held at Edgewood Arsenal in 1963 to discuss and evaluate the toxicity of 2,4,5-T, the overall thrust of those reporting was that both 2,4,5-T and 2,4-D were safe for humans.

Other events occurring in 1963 give additional indications of governmental knowledge. The Institute for Defense Analysis wrote a report for the Advanced Research Project Agency, an agency within the Department of Defense. This report stated that herbicides were safe when used commercially, but that there could be increased hazards in military use because greater concentrations might be applied by less experienced personnel

under the pressures inherent in battle-field use. The report noted the connection between chloracne and skin and respiratory irritations and their association with herbicides.

Dr. Key of the Public Health Service testified at his deposition that in 1963 he placed a sample of 2,4,5-T herbicide on his forearm to see if it would induce chloracne. He did this three times a week for three weeks and developed chloracne on his forearm. He also testified that he had read Kimmig & Schulz and learned of dioxin from that article. When questioned concerning a June 1964 article by Dr. Jacob Bleiberg, Industrially Acquired Porphyria, 89 Archives of Dermatology 793 (1964), which discussed chloracne and porphyria in workers engaged in 2,4,5-T production, Key stated that he had reviewed the article at the time it was written and that it was only a more complete version of what they already knew.

The level of government knowledge appears to have increased much more rapidly during the mid-to-late 1960s. Defendants point to numerous instances of governmental knowledge which are not disputed by plaintiffs. Dr. Herbert Stokinger, the chief toxicologist of the Division of Occupational Health, testified that he knew dioxin was an impurity in 2,4,5-T sometime around 1965. Colonel Robert A. Shade, who was chief of the Chemical Operation Branch of Military Assistance Command-Vietnam and later on the staff of the chemical branch of the Assistant Chief of Staff Force Development, testified that he learned of the connection between dioxin and 2,4,5-T sometime between mid-1966 and summer 1968.

In July 1966, the director of the National Academy of Sciences wrote to the chief of the Bureau of Medicine and Surgery for the Navy advising him of the connection between 2,4,5-T and porphyria

and chloracne. In August 1966, the National Academy of Sciences, in response to a request for information, wrote to the Army Surgeon General telling him that 2,4,5-T was toxic and that chloracne was associated with it.

Recent deposition testimony indicates that people closely associated with the White House were aware of hazards involved in the use of defoliants. Dr. Gordon MacDonald, a member of President Johnson's Science Advisory Committee (PSAC), testified that the issues of herbicides and dioxin in herbicides were informally discussed by a subgroup of PSAC sometime between April and June 1965. Dioxin as an impurity in 2,4,5-T was also discussed. He said there was discussion of the potential toxicity of dioxin, and while it was considered that the evidence was fragmentary and inconclusive, the subject of dioxin contamination deserved continuing attention. Dr. MacDonald testified that human health effects were discussed, and that he attended a meeting where the effectiveness of herbicides and the presence of dioxin in 2,4,5-T were discussed. According to MacDonald, Secretary of Defense Robert MacNamara attended this meeting.

Dr. Donald Hornig, Special Assistant to President Johnson for Science and Technology and Chairman of PSAC, testified at his deposition that by 1966 PSAC was discussing impurities in 2,4,5-T. He stated that this discussion occurred sometime between 1964 and 1966. He said that when he learned of the impurity, he felt that "one ought to be concerned" about what the magnitudes of the toxicological effects and of the exposures might be. He testified that he understood dioxin was a health hazard to human beings. However, he also testified that he did not relay the information to President Johnson.

An additional element of knowledge is found in a 1967 Rand report commissioned by the Advanced Research Project Agency of the Department of Defense. This report described "actual experience" of health hazards associated with the use of defoliants in Vietnam.

Finally, there is the study commissioned by the National Cancer Institute, Evaluation of Carcinogenic, Teratogenic, and Mutagenic Activities of Selected Pesticides and Industrial Chemicals (Bionetics Report). This study evaluated the carcinogenic, teratogenic, and mutagenic effects of various chemicals. The study was commissioned in 1963, and the report is dated August 1968. The study did result in a finding of some teratogenic effects connected with the use of 2,4,5-T. While it is not clear that defendants are correct in their assertion that portions of the study were available to the government earlier than August 1968, it is clear that by 1968 and 1969, the results of the study were available to the government.*

565 F. Supp. at 1266-1268.

The government knowledge set forth above, running through the military and numerous federal agencies and ranging as high as the President's Science Advisory Committee and the Secretary of Defense, was, as noted above, undisputed. 565 F. Supp. at 1266. The Court concluded that "the government and the military possessed rather extensive knowledge" regarding the health effects of Agent Orange, noting further that "much of the

* The significance of the Bionetics report, as it pertains to the government's level of knowledge, is addressed in detail in the Memorandum of Hercules, Inc. in Support of Its Motion to Dismiss, January 16, 1984.

government's knowledge was classified and not shared with the defendants." 565 F. Supp. at 1268.

Several highly significant additional facts have been discovered since Judge Pratt's opinion was written. For example, Jane Lewis, an official of the Department of Commerce responsible for insuring that the government had adequate supplies of Herbicide Orange, has testified that Dow informed her that dioxin was a toxic contaminant present in Herbicide Orange. See p. 95, supra.

Also, documents and testimony relating to the proposed government Herbicide Orange plant at Weldon Springs have established that by 1968 the government was familiar with the intimate details of the 2,4,5-T manufacturing process--including the causes of dioxin contamination, the methods of minimizing the amount of dioxin created, and techniques for detecting the presence of dioxin.

This new evidence fully disposes of the few, limited concerns regarding the extent of government knowledge which led the Court to deny Dow's motion for summary judgment on the government contract defense.

The documents reveal that meetings between chemical industry and government representatives were held during the week of January 15, 1968, to review the manufacturing process for the government-owned Agent Orange production facility at Weldon Springs. An Engineer Status Report summarizes, under the heading

"Health Considerations," the discussions which took place regarding dioxin:

1. In the production of TCP, a compound known as dioxen [sic] is formed which causes Chloracene [sic]. The formation of the dioxen is generally controlled by the temperature of the TCP reaction in the autoclave. Montrochem's experience indicates that dioxen is not formed if the temperature is held below 160 C. However, John Angel has experienced the operators contracting Chloracene even though the 160 C temperature conditions were maintained.

2. Montrochem recommended that T-S-R* contact the C. H. Boehringer Company of Ingelheim, Germany, for advice in the control of the dioxen. This company had developed a gas chromatograph test procedure for the finding of dioxen in the process streams.

Exhibit "98" (emphasis added).

Listed as attending this meeting are three United States Army representatives. These individuals were engineers assigned to the Weapons Development and Engineering Laboratory at Edgewood Arsenal and were responsible for overseeing the design and construction of the Weldon Springs production facility. Two of these individuals, Robert Cox and Charles Bushey, have previously testified to an awareness of the presence of dioxin as an impurity in the manufacture of 2,4,5-T and, to a degree, concerning risk reduction techniques. Dow's Summary Judgment Memo at 62-63; Dow's Reply Memo in Support of its Summary Judgment Motion at p. 31.

* "T-S-R" stands for Thompson-Stearns-Roger, a joint venture of Thompson Chemical Company and Stearns-Roger, Inc.

In its decision on Dow's motion for summary judgment, the Court listed the following limited issues of material fact which remained with respect to the level of government and manufacturer knowledge: the discovery that dioxin was the chloracne in TCP; the development of a test to determine dioxin levels (gas chromatography); and the development of techniques to reduce dioxin levels during the manufacturing process. 565 F. Supp. at 1270. It is evident from the above language of the minutes of the 1968 meeting that all these matters were discussed and made known to the government at this meeting, a meeting which took place over two years before the military stopped using Agent Orange.

The Weldon Springs documents completely answer Judge Pratt's only reservations regarding the relative knowledge of Dow and the government. The documents set out in no uncertain terms that the military was aware of (1) the health hazards presented in the manufacture of 2,4,5-T; (2) the source of the hazard; (3) a method for detecting the source; and (4) a method for eliminating the hazard. Thus, the military personnel responsible for the manufacture of Agent Orange intended for military use in Vietnam clearly had the same degree of sophisticated manufacturing process information as the defendants.

Based on the government knowledge outlined by Judge Pratt, the government was aware that dioxin could be formed during the manufacture of 2,4,5-T and could cause chloracne and other more serious injuries in workers in the manufacturing plant

since at least the early sixties, and perhaps the late fifties. Furthermore, the Weldon Springs evidence shows that the government was aware of the details of the manufacturing process relating to the detection and prevention of dioxin formation. Dow had no other information on dioxin to give the government. Thus, any failure by Dow to communicate its knowledge to the government -- though no such failure occurred -- would nevertheless have been irrelevant and harmless. The government had the information already.*

In addition to the actual knowledge of dioxin outlined above, there is also constructive knowledge--based primarily on publications in the open scientific literature.

* Even if one assumes, contrary to the foregoing facts, that the government had no knowledge of dioxin during the period that Agent Orange was used in Vietnam, there is substantial evidence to support the conclusion that the absence of such knowledge would not have altered the government's decision to use Agent Orange. The record is replete with assertions by Defense Department officials that the use of Agent Orange was an essential part of the war effort, that its use saved the lives of countless servicemen, and that its use was only terminated for political reasons, e.g., to undercut accusations made against the United States regarding its use of chemical warfare, the infliction of ecological damage on Vietnam, to offset the political controversy surrounding the release of the Bionetics report and to insure ratification of the Geneva Protocol by the United States Senate. See Dow's Summary Judgment Memo at pp. 82-87.

In any event, it is clear that the absence of knowledge of dioxin would not have altered the government's decision to use Dow's Agent Orange. Dr. Charles Minarik, Chief of the Crops Division of the Army Biological Laboratories at Fort Detrick, was the government's principal expert consultant and advisor on the use of herbicides throughout the defoliation program. Id. at 37-45. Dr. Minarik concluded in 1971, after the use of Agent Orange had been terminated, that use of Agent Orange with less than 1 ppm dioxin was safe. Id. Dow's Agent Orange, which could not have had more than 1/2 ppm dioxin, and in fact averaged .12 ppm dioxin, met this criterion. See pp. 66-67, supra.

The Court has indicated that the parties may be held accountable for what they "should have known" about dioxin during the 1950s and 1960s. Hearings before Judge Weinstein on October 21, 1983, Tr. at 6813. There is no plainer example of information that the parties should have known than the information published in the open scientific literature.

For example, highly sophisticated scientists from a number of government agencies, including the United States Public Health Service, Department of Agriculture, Army Chemical Corps. and the Offices of the Surgeon General for the Army, Navy and Air Force, were responsible for, among other things, keeping abreast of the world scientific literature on occupational health and herbicide research and development. Thus, the fact that certain information was openly published in scientific journals should conclusively establish government knowledge of that information.

The Court reached precisely that conclusion in its recent discussion of the government contract defense:

The Court: Well, was this [the fact that 2,4-D* might cause peripheral neuropathy] in the literature in 1961?

* * *

Mr. Krohley: In the published scientific community, yes. These reports go back to the 1950's.

* 2,4-dichlorophenoxyacetic acid.

The Court: Then you have all you need
 on the Government contract
 defense.

Proceedings before Judge Weinstein on December 21, 1983 at 96-97 (emphasis supplied). Obviously, the same standard -- that open publication conclusively establishes government knowledge -- must apply for 2,4,5-T and dioxin as well as 2,4-D.*

Thus, the extensive body of early scientific publications on chloracne, 2,4,5-T, and dioxin outlined below must all be considered to have been known to the government.

Since the early 1900s, cases of chloracne have been reported in industrial health literature, and it was common knowledge that there was a potential risk of chloracne inherent in the manufacturing process of certain chlorinated hydrocarbons, including chlorophenols.** Accordingly, in 1941 Dow biochemists developed and published the rabbit ear test, which they utilized extensively to monitor Dow's production of chlorinated naphthalenes and crude chlorinated phenols for potential chloracne problems. Exhibit "33".

Dr. Herbert Stokinger of the PHS testified that he became aware of the possibility that 2,4,5-T might cause

* The fact of publication must be conclusive as to government knowledge, as the Court indicated; otherwise, the denial of any discovery for defendants on 2,4-D would clearly violate defendants' right to a fair trial on the government contract defense for 2,4-D.

** See a 1941 article by Adams, et al., Exhibit "33", citing reports appearing in the open literature dating back to 1901 on chloracne incidents from exposure to chlorinated hydrocarbons. See p. 63, supra; pp. 111-12, infra.

chloracne in the early 1950s due to an article published by V.K. Rowe of Dow and V. Drill.* Furthermore, he stated that the association of chloracne with chlorinated hydrocarbons such as 2,4,5-T was "common knowledge" by the 1950s. Additional illnesses associated with chloracne at that time included liver disease and porphyria. Stokinger Tr. at 61-65, Exhibit "99".

Most importantly, Dr. Stokinger testified that the fact that dioxin was the impurity in 2,4,5-T "was getting to be common knowledge when we met in the American Industrial Hygiene Association meetings." He fixed the time period when dioxin became "common knowledge" as "the mid-sixties . . . or maybe earlier."** Stokinger Tr. at 108-09, Exhibit "101".

Many other government scientists from many agencies, including the Public Health Service, the National Cancer Institute, the Air Force, and the Department of Defense, have testified similarly. Key Tr. at 159, 230-31, Exhibit "102"; Lee Tr. at 29-31, Exhibit "103"; Baker Tr. at 63-64, Exhibit "104";

* Dr. Stockinger was chief toxicologist at the Public Health Service Division of Occupational Health. He further testified that V.K. Rowe discussed Dow's chloracne problem in its tri-chlorophenol plant with him in 1965 or 1966. See pp. 70-71, supra.

** Dr. Stokinger served as chairman of the prestigious Threshold Limit Value Committee of the American Conference of Government Industrial Hygienists from 1962 to 1977. That committee set a tentative acceptable level of industrial exposure to 2,4,5-T in 1962, based on the work of V.K. Rowe and Victor Drill. That level was formally adopted a few years later and remained unchanged in 1981. Stokinger Tr. at 26-28, Exhibit "100". Thus, the committee did not modify the threshold limit value for 2,4,5-T in response to information regarding dioxin.

Coates Tr. at 134-35, Exhibit "105"; Melvin Tr. at 31-33, Exhibit "106"; Birmingham Tr. at 43-44, 102-03, Exhibit "107"; Lawton Tr. at 16, Exhibit "108"; Magnuson Tr. at 53, Exhibit "109".

In order to make clear the extent of information readily available to government scientists during the 1960s, we have prepared the following annotated list of representative scientific publications. In considering that list, the Court should bear in mind that it is far from complete, and that there is extensive evidence that the government was actually aware of the listed articles during the 1960s. See p. 125, n.*, infra. In fact, many of the articles were written by government employees or pursuant to government research grants.

1. Adams, E.M., Irish, D.D., Spencer, H.C., and Rowe, V.K., The Response of Rabbit Skin to Compounds Reported to Have Caused Acneform Dermatitis, Journal of Industrial Medicine (January 1941), (Exhibit "33").

Twenty-nine articles describing previous industrial experiences of acneform dermatitis and chloracne are cited. Among the causative agents listed are chlorinated diphenyls and crude chlorinated phenols.

Experiments were performed applying various materials to the skin and ears of rabbits. The response of the rabbit is described in detail. The results greatly resembled the response of human skin. Thus, it appeared probable that the "rabbit ear test," as it came to be called, could be used to detect substan-

ces which would cause chloracne and acneform dermatitis in humans.

The article was written by Dow scientists. The rabbit ear test has since been extensively employed at Dow and throughout the world to detect the presence of acnegens and other skin irritants.

2. Birmingham, D. J., and Campbell, P. C.:

Occupational and Related Dermatoses, Chloracne, pp. 43-44

(Abstracts from the Literature -- July 1943 to December 1953).

(Exhibit "110".)

Ten articles on chloracne dated between July 1943 and December 1953 are abstracted. Among the substances associated with chloracne are chlorinated hydrocarbons, chlอร์ดипhenyls, chlอร์ดипhenyloxide, chlorophenols, and pentachlorophenol.

Dr. Birmingham was Senior Surgeon with the Occupational Health Program of the USPHS at the time.

3. Schulz, K.H.: Clinical and Experimental Studies on

the Etiology of Chloracne, Arch. Klin. Exp. Dermatol. 206:589-96

(1957). (English translation) (Exhibit "111".)

Thirty-one workers engaged in the manufacture of 2,4,5-T from trichlorophenol developed chloracne. The symptoms of chloracne and the 2,4,5-T manufacturing process are described. Animal experiments (predominantly on rabbit ears) revealed that chloracne was caused by a by-product of the manufacturing process, not the trichlorophenol itself. A number of likely by-

products were tested. Although proof was incomplete, "tetrachlorodiphenylene dioxide"* (with the positions of the four chlorine atoms "uncertain") was suspected as a causative agent. Further investigations were underway.**

4. Kimmig, J., and Schulz, K. H.: Occupational Chloracne Caused by Aromatic Cyclic Ethers, Dermatologica 115: 540-46 (1957). (English translation) (Exhibit "50".)

Thirty-one cases of chloracne developed among workers in a trichlorophenol and 2,4,5-T production plant. In three cases, the liver was also affected. Tests on rabbits' ears showed that pure trichlorophenol did not cause chloracne, but technical grade trichlorophenol did. Thus, the chloracnegen was demonstrated to be a toxic by-product formed during the manufacturing process. The process by which tetrachlorobenzene is converted into trichlorophenol and then 2,4,5-T is described. Several compounds which might arise in the production process were tested and found to be chloracnegenic, the most toxic of which was "2,3,6,7-tetrachlorodibenzodioxin [2,3,7,8-TCDD].***

* Tetrachlorodiphenylene dioxide is another name for tetrachlorodibenzo-p-dioxin.

** See pp. 113-14, infra, where Schulz reports the isolation and identification of 2,3,7,8-tetrachlorodibenzo-p-dioxin ("2,3,7,8-TCDD," "TCDD," "dioxin").

*** The compound is 2,3,7,8-TCDD, though the German system results in a slightly different numbering. See, e.g., the diagram in Exhibit "112," another 1957 article by Kimmig and Schulz.

Further investigation established that TCDD was present in residues of the trichlorophenol process. The reaction by which TCDD formed during the manufacture of trichlorophenol was demonstrated. Kimmig and Schulz thus concluded that "tetrachlorodibenzodioxin is responsible for the observed cases of chloracne if not entirely, certainly to a considerable extent."

5. Kimmig, J., and Schulz, K. H.: Chlorinated Aromatic Cyclic Ethers as a Cause of the So-called Chloracne, Naturwissenschaften 44:337-38 (1957). (English translation) (Exhibit "112".)

Personnel engaged in the manufacture and further processing of trichlorophenol developed chloracne and, in some cases, liver damage. The principal intoxicating factor was a by-product of the manufacturing process, occasionally present as an impurity in trichlorophenol and its subsequent derivatives: "2,3,6,7-tetrachlorodibenzodioxin (2,3,6,7-tetrachlorodiphenylene dioxide)."* Results of ear and peroral toxicity tests on rabbits demonstrated the "high general toxicity" of TCDD. The chemical reaction by which TCDD is formed in the trichlorophenol process is described and diagrammed. The fact that high temperature and pressure contribute to dioxin formation is made clear. This article was cited in the Hoffmann Trip Report. See pp. 99, supra.

* A diagram shows that these names represent 2,3,7,8-TCDD, though the German numbering system differs.

6. Hoffman, H., New Experiences with Highly Toxic Chloro Hydrocarbons, Arch. Exper. Pathol. and Pharm., 232(1): 228-30 (1957). (English translation) (Exhibit "113".)

An accident in a trichlorophenol plant caused a "sudden increase of pressure and temperature." Many workers developed "the classical Perna disease" [chloracne]. Attempts to clean the plant were unsuccessful; rabbits placed in the plant after it was cleaned died. Samples from the contaminated plant proved highly toxic in animals. Many compounds were tested to determine the "highly toxic decomposition product" in trichlorophenol which was responsible. Thus, a decomposition product, and not the trichlorophenol itself, was assumed to be responsible for the chloracne problem associated with trichlorophenol production.

7. Sandermann, W., Stockmann, H., and Casten, R., Pyrolysis of Pentachlorophenol, Chem. Ber. 90:690-92 (1957). (German original and English translation) (Exhibit "114".)

The synthesis of "tetrachlorodiphenylene dioxide" [2,3,7,8-TCDD]* from chlorophenol is described. Physical characteristics of TCDD are recorded. The compound was "very effective" against wood-destroying fungi and insects, but caused chloracne "even in very small quantities." This article was cited in the Hoffmann Trip Report. See p. 99, supra.

8. Dugois, P. Marechal, J., and Colomb, L.: Chloracne Caused by 2,4,5-trichlorophenol, Arch. Mal. Prof. 19:626-27

* A diagram clearly identifies the compound as 2,3,7,8-TCDD.

(1958). (English translation) (Exhibit "115".)

Seventeen cases of chloracne occurred in a trichlorophenol plant. The symptoms of chloracne, which presented the "classical picture," are described. The toxic material was found to be concentrated in the waste tars. Modification of operating procedures to minimize contact with the tars eliminated the problem.

9. Tomita, M., Ueda, S., Narisada, M.: Dibenzo-p-dioxin Derivatives, Pharm. Soc. of Japan 79:186 (Japanese) (1959). (Exhibit "116".)

In response to another article by Sandermann containing information on dioxin similar to that recorded in the Sandermann article discussed supra, at p. 115, Tomita synthesized a number of dibenzo-p-dioxin (diphenylene dioxide) compounds and determined their physical properties, including infrared absorption spectra. One of the compounds synthesized and tested was 2,3,7,8-tetrachlorodibenzo-p-dioxin. See p. 118, infra.

10. Birmingham, D. J.: New Causes of Occupational Dermatoses, American Medical Association Arch. of Industrial Health 20:489-92 (Dec. 1959). (Exhibit "117".)

Numerous developments in occupational dermatology are discussed.

Chlorinated aromatic hydrocarbons, notably the diphenyls, diphenyloxides and chloronaphthalenes, are well-known chloracnogens In the manufacture of 2,4,5-T Weed Killer, intermediate aroma-

tic hydrocarbons of the chlorinated group were discovered as the cause of chloracne in more than 200 chemical workers in one plant engaged in the manufacture of the weed killer.

Dr. Birmingham was Medical Director and Chief Dermatologist of the USPHS Occupational Health Program. The paper was presented at the 18th Annual Congress on Industrial Health in January 1958.

11. Bauer, H., Schulz, K.H., and Spielberg, U.:

Occupational Intoxication in the Manufacture of Chlorophenol Compounds, Arch. Gewerbepathol. Gewerbehyg. 18:538-55 (1961).
(English translation and German original) (Exhibit "118".)

Several German chemical companies experienced chloracne outbreaks during the 1950s. The trichlorophenol and 2,4,5-T manufacturing processes involved are discussed and the associated symptoms are reported in detail. Publications and incidents of chloracne world-wide since the late 1800s are summarized. A long series of investigations eventually led to the finding of Kimmig and Schulz that trichlorophenol itself was not the chloracnegen. Rather, chloracne was caused by a by-product of the manufacturing process.

The precise conditions in which TCDD forms are described:

alkaline hydrolysis of 1:2:4:5-tetrachloro benzene to 2:4:5-trichloro phenol which is carried out technically under pressure at temperatures of about 180° C in the presence of methanol and sodium hydroxide.

The chemical reaction by which TCDD is formed in the trichlorophenol process is also described. TCDD was successfully isolated from process materials. Finally, Schulz applied TCDD to his own forearm and induced chloracne. Thus, the authors considered the fact that TCDD caused the chloracne associated with the trichlorophenol process "sufficiently proven." A change of manufacturing process eliminated the chloracne problem.

12. Jones, E. L., and Krizek, H.: A Technic for Testing Acnegenic Potency in Rabbits, Applied to the Potent Acnegen, 2,3,7,8-tetrachlorodibenzo-p-dioxin, Journal of Investigative Dermatology 38:511-17 (1962). (Exhibit "119".)

A quantitative method for measuring the acnegenic potency of chemicals by applying them on the rabbit ear is described. TCDD was selected as the test compound to demonstrate the method because it was known to be an extremely potent acnegen. TCDD is suitable for use as a standard against which the acnegenicity of other compounds can be measured.

The preparation of TCDD by heating the sodium salt of trichlorophenol is described in detail and compared with the virtually identical mode of origin of TCDD in the trichlorophenol process as described by Kimmig and Schulz. See Exhibit "50", pp. 113-14, supra. The physical characteristics of the prepared TCDD sample were comparable to values previously reported for TCDD in three different articles by Tomita et al., supra, Exhibit "116", Sandermann et al., and Narisada. The report concludes that

"[a]ttention should be called to the great toxicity of [TCDD]."

The research was performed at the University of Chicago and supported by grants from the Office of the Surgeon General of the Army and the United States Public Health Service. The paper was presented at the Twenty-third Annual Meeting of the Society for Investigative Dermatology on June 26, 1962.

13. Birmingham, D. J.: Occupational Dermatology, Skin 3:38 (1964). (Exhibit "120".)

The article surveys the current state of occupational dermatology, identifying two principal problem areas: photosensitivity reactions and chloracne. Several episodes of chloracne are described, including one in which forty out of sixty production employees in a 2,4,5-T plant were reported to be experiencing mild to severe chloracne symptoms at the time the article was published. The article concludes that "[t]he presence of chloracnegens in American industry is common" (emphasis in original).

14. Bleiberg, J., Wallen, M., Brodkin, R., and Applebaum, I. L.: Industrially Acquired Porphyria, Arch. Dermatology 89:793-97 (June 1964). (Exhibit "80".)

A severe outbreak of chloracne occurred in a plant manufacturing 2,4-D and 2,4,5-T. Twenty-nine workers with chloracne were examined; eleven of these also showed evidence of porphyria cutanea tarda, a disturbance of porphyrin metabolism with asso-

ciated skin manifestations. The outbreak provides evidence that porphyria is not necessarily genetic, but may be acquired following insult to the liver. The article expressed appreciation for the assistance of Drs. Birmingham, Key, and Olivier of the Public Health Service.

Drs. Bleiberg and Brodtkin wrote to Dow for information on dioxin shortly after the publication of their article, and Dow provided the information requested. See pp. 88-89, supra.

15. Birmingham, D. J.: Preventable Occupational Dermatoses, American Medical Association Arch. Environ. Health 12:639-43 (June 1966). (Exhibit "121".)

Various types of preventable occupational dermatoses are discussed. A number of cases of industrial chloracne have resulted from exposure to chloronaphthalenes, chlordiphenyls, and chlordiphenyloxides. Cases have been reported in chemical workers making herbicides.

Recently, Bleiberg* reported chloracne accompanied by porphyria in a number of chemical workers making herbicides. This is a preventable disorder, but only when efficient engineering controls are installed and maintained.

Id. at 641. The paper was presented at the 25th American Medical Association Congress on Occupational Health.

16. Birmingham, D. J., and Key, M. M.: Occupational Chloracne, Proceedings of the International Congress on Occupational Health (September 1966). (Exhibit "122".)

* See Exhibit "80", p. 119, supra.

The history of chloracne incidents and publications dating back to 1899 is briefly summarized. The Public Health Service has been "interested in chloracne since the middle 1930's." A table of some of the incidents known to the Public Health Service includes two involving 2,4,5-T.

Outbreaks of chloracne in chemical plants manufacturing 2,4,5-T herbicide (Bleiberg et al., 1964; Dugois and Colomb, 1956; Kimmig and Schuz [sic], 1957) and recent reports to the Division of Occupational Health of chloracne among herbicide users, has prompted us to attempt to identify the chloracnegenic contaminant(s) in commercial 2,4,5-T. Several investigators . . . have ascertained . . . that on a theoretical basis, the contaminant may be a chlorinated dibenzop-dioxin (Kimmig and Schuz, 1957; Jones and Krizek, 1962).

Dr. Key worked in the Division of Occupational Health of the USPHS; Dr. Birmingham, author of many of the preceding articles while with the USPHS, is now a professor at Wayne State University. The paper was presented at the International Congress on Occupational Health in Vienna in 1966.

17. Zielinski, W. L., and Fishbein, L.: Gas Chromatographic Measurement of Disappearance Rates of 2,4-D and 2,4,5-T Esters in Mice, J. Agr. Food Chem. 15:841-44 (Sept.-Oct. 1967). (Exhibit "123".)

Gas chromatography was used to determine the rate of disappearance of 2,4-D and 2,4,5-T from the bodies of mice. The body residence time of 2,4,5-T was found to be longer than that of 2,4-D. A number of previous studies which used gas chroma-

tography in the early and mid sixties to measure levels of 2,4-D and 2,4,5-T were cited. The samples used in the study were obtained from Dow, and were "used as received following a purity check by gas chromatography and infrared spectra."

Zielinski and Fishbein were affiliated with the Bionetics Research Laboratories. This research was an outgrowth of their work on the ongoing Bionetics study of pesticides, see p. 103, supra, and was supported by the National Cancer Institute and the Public Health Service.

18. Schulz, K.H.: Clinical Picture and Etiology of Chloracne, Arbeitsmed. Socialmed. Arbeitshyg. 3(2):25-29 (1968). (English translation) (Exhibit "124".)

The history and symptoms of chloracne are described. Outbreaks in chlorophenol plants in the United States, the Netherlands, and Germany are discussed.

The trichlorophenol manufacturing process is described, and various possible chloracnogens formed during that process are identified -- chief among them being TCDD. TCDD has been synthesized and, in addition, isolated from residues of the trichlorophenol process. The chemical reaction by which TCDD is formed in the process is diagrammed. Toxicological data on TCDD showed "an extreme high toxicity." One investigator [Schulz] applied TCDD to his own skin and produced chloracne. Thus, TCDD "played an important role" in the outbreaks of chloracne associated with the manufacture of trichlorophenol.

19. Dugois, P., Amblard, D., Aimard, M., Deshors, G., A Collective and Accidental Chloracne of a New Type, Bull. de la Societe Clinique de Derm. et Syphil. 75:260-61 (1968). (hand-written English translation) (Exhibit "125".)

In 1966, there was an accident in a 2,4,5-T plant in the Grenoble region of France. "[O]ver-pressure caused the plumbing to burst." Shortly after the accident the workers experienced lesions and edema. Subsequently, they developed chloracne. The rapid development of lesions and edema distinguished this outbreak from previous reported chloracne episodes. The article noted that the causative agent had been isolated: etheroxyde tetrachlore [apparently TCDD].

20. Innes, J. R. M., et al., Bioassay of Pesticides and Industrial Chemicals for Tumorigenicity in Mice: A Preliminary Note, Journal of the National Cancer Institute 42:1101-14 (June 1969) (with attached list of test compound sources) (Exhibit "126").

The tumorigenicity of 120 selected pesticides and industrial compounds was tested by continuous oral administration to mice. Eleven of the compounds induced a significantly elevated incidence of tumors; twenty compounds were marginal and require further evaluation; eighty-nine gave no significant indication of tumorigenicity. Both 2,4-D and 2,4,5-T* showed no

* The sample of 2,4,5-T tested was obtained from Diamond Alkali in 1964 and contained about 30 ppm dioxin. See p. 124, infra.

tumorigenicity. The study was performed for the National Cancer Institute by Bionetics Research Laboratories. See pp. 103, 107 n.*, supra.

21. Courtney, K. D., Gaylor, D. W., Hogart, M. D., Falk, H. L.: Teratogenic Evaluation of 2,4,5-T, Science 168:864-66 (1970). (Exhibit "127".)

The herbicide 2,4,5-T was found to be teratogenic in two strains of mice when administered subcutaneously and orally and in one strain of rats with oral administration. The 2,4,5-T used in the study was manufactured by Diamond Alkali. It contained approximately 30 ppm of TCDD, according to analysis performed by Dow. Both dioxin and purified 2,4,5-T will be investigated further.

The study was performed at Bionetics Research Laboratories under contract from the National Institute of Health. See pp. 103, 107 n.*, supra. Dr. H.L. Falk of the National Cancer Institute was a co-author of the study.

* * *

It must be emphasized that the above list is by no means exhaustive. There are many other publications on chloracne and dioxins from the 1960s, 1950s, and earlier. However, the above sampling establishes conclusively that all relevant information on dioxin was publicly available in the open scientific litera-

ture by the early 1960s.*

The articles included the following significant information regarding dioxin and 2,4,5-T:

- 1) The chemical structure and properties of dioxin;
- 2) Methods of synthesis of dioxin;
- 3) Dioxin is a by-product of the trichlorophenol process potentially present at varying levels in trichlorophenol and 2,4,5-T;
- 4) Dioxin at sufficiently high levels can cause chloracne, liver damage, porphyria cutanea tarda, and other serious health problems;
- 5) Dioxin can be formed as a by-product during the portion of the 2,4,5-T process in which tetrachlorobenzene is converted to trichlorophenol;
- 6) The 2,4,5-T manufacturing process is described in detail;
- 7) High temperature (180° C) and pressure in the manufacturing process can cause increased dioxin formation;

* We have refrained from documenting the government's extensive familiarity with the above articles, since to do so would greatly expand the size of this memorandum. However, it is worth noting that the articles by Sandermann and by Kimmig and Schulz, pp. 114-115, supra, were cited in the Hoffmann Trip Report in 1959. See p. 99, supra. The thirty-two references on chloracne and dioxin in Dr. Groth's 1965 research proposal include many of the most significant early articles discussed above. See pp. 68-72, supra. Finally, when Dr. Walter Melvin, Commander of the Air Force Environmental Health Laboratories, reviewed phenoxy herbicides in the 1960s, his review of the scientific literature included the articles by Kimmig and Schulz. Exhibit "106".

- 8) Suitable modifications of the manufacturing process result in the production of 2,4,5-T and trichlorophenol without the formation of dioxin at levels which cause chloracne or other health effects;
- 9) The rabbit ear test was available to determine whether 2,4,5-T might cause chloracne;
- 10) Gas chromatography was capable of detecting low levels of chemical contaminants in the 1960s.

The extent of the publicly available information on dioxin as shown by the above list renders absurd plaintiffs' charges that Dow conspired to conceal such information from the government. The information which Dow supposedly conspired to conceal was published in the scientific literature before the "conspiracy" even began.

As set forth at pp. 62-67, supra, Dow's knowledge of dioxin was limited to occupational health hazards; Dow had no knowledge of hazards to users of its 2,4,5-T products. Since the information regarding occupational health hazards associated with dioxin is fully set forth in the above articles -- information available both to Dow and the government -- the government clearly possessed the same information as Dow. Thus, again, any failure on Dow's part to warn the government could not have caused injury to plaintiffs.

* * *

Accordingly, Dow cannot be held liable to plaintiffs on grounds that it acted in concert with other defendants to conceal

information on dioxin from the government and thus caused harm to plaintiffs. Dow acted independently from the other defendants on all aspects of the dioxin problem, telling the government, the chemical industry, its customers, and health professionals around the world about chloracne and dioxin and regularly testing its production to insure that its Herbicide Orange contained no dioxin.

Moreover, the government was clearly fully informed regarding dioxin's potential hazards, which were discussed in the open scientific literature.

The answer to plaintiffs' allegations of a "conspiracy of silence" is simple and abundantly apparent. There was no conspiracy. And there was no silence.

Accordingly, the concert of action theory does not justify relieving plaintiffs of their burden to prove that Dow in fact caused them harm before they can hold Dow liable for their alleged damages.

D. Enterprise Liability

The principle of enterprise liability, sometimes referred to as industry-wide liability, was first announced by this Court in Hall v. E. I. Du Pont de Nemours & Co., 345 F. Supp. 353 (E.D.N.Y. 1972). There, plaintiffs had sustained injuries when blasting caps, which allegedly had not been accompanied by appropriate warnings as to the dangers inherent in their improper use, were detonated and exploded. Most of the plaintiffs were unable to identify which of the defendants had

manufactured the specific blasting cap which had caused his injury. Among the defendants was a trade association of which each of the defendants was a member.

Plaintiffs alleged that the decision not to include appropriate warnings, and indeed to lobby against legislation which would require such warnings, was made by the manufacturers jointly through its trade association. Therefore, rather than attempting to fix liability on a specific defendant, plaintiffs in effect alleged negligence by an entire industry, acting as a unit.

The Court, in a landmark decision, sustained the causes of action. Using the accepted doctrine of concert of action as a starting point, the Court reasoned that in this instance joint liability need not necessarily be predicated on a showing of joint action or common design. Rather, when defendants exercise joint control of the risk and their control proves insufficient, joint liability is appropriate. 345 F. Supp. at 374. Thus, under the Hall rationale, whenever an industry-wide standard of safety is insufficient to protect product users, that standard "becomes itself the cause of plaintiff's injury, just as defendant's joint plan is the cause of injury in the traditional concert of action plea." Comment, DES and a Proposed Theory of Enterprise Liability, 46 Fordham L. Rev. 963, 997 (1978).

The Court determined, therefore, that the allegations of the complaint, if proven, would be sufficient to shift the burden

of disproving causation to the defendants. The Court did emphasize, however, the nature of the control of the risk exercised jointly by the defendants which must be shown:

To establish that the explosives industry should be held jointly liable on enterprise liability grounds, plaintiffs, pursuant to their pleading, will have to demonstrate defendants' ... joint capacity to reduce or affect those risks.

345 F. Supp. at 378 (emphasis added).

It is this requirement that the defendants, between them, exercise control of the risk and the ability to reduce it that has led courts to consistently decline to apply the theory of enterprise liability in DES cases. See Dow Alt. Liability Memo at pp. 32-33.

As this Court recognized in Pretrial Order No. 66, Hall and the principle of enterprise liability are not applicable in the context of the Agent Orange Litigation. For the reasons expressed in the DES and asbestos cases, the Court's rejection of Hall in this instance is correct.

It is clear that, unlike Hall, there was no industry standard for dioxin in Agent Orange. The widely varying levels of dioxin in the various manufacturers' Herbicide Orange speak for themselves.

The 1965 meeting of trichlorophenol manufacturers also supports the lack of any industry standard.* There was no

* The trichlorophenol manufacturers meeting is discussed in full at pp. 72-82, supra. The lack of an industry standard is dealt with specifically at pp. 75-80, supra.

suggestion of such a standard at the meeting. Rather, each manufacturer was to take the information provided by Dow and evaluate and apply it independently.

The Frawley/Farnham memo, written several months after that meeting, shows that Dow exercised no control whatsoever over the dioxin levels in its competitors products. Note to file by John Frawley, supra, Exhibit "67". See pp. 77-78, supra. Indeed, Dow's recommendation that the other manufacturers test their products using the analytical procedure which Dow had supplied and set suitable safety specifications at their own discretion was not followed by the other manufacturers. See pp. 76-82, supra.

Since Dow demonstrably had no power to affect its competitors' actions regarding dioxin, whether by imposing an industry standard or otherwise, the "joint capacity to reduce or affect . . . risks" required by Hall for the imposition of enterprise liability simply does not exist in Agent Orange. If there was a "risk" in the manufacture of Agent Orange which created a potential health hazard from exposure to the end product, each manufacturer had individual control over that risk. The record is clear that there was no uniform standard adopted nor even a tacit understanding among defendants as to the need for a safety standard.

Furthermore, the government unquestionably controlled the use of Agent Orange in Vietnam. Any risk attributable to the

use or, more accurately, the misuse of herbicides by the government and the capacity to reduce that risk was within the exclusive control of the United States government.

Accordingly, any effort to impose liability on a defendant who had neither control over the manufacture of his competitor's Agent Orange or the use of Agent Orange would be unfair and contrary to the standard of industry-wide liability set forth in Hall.

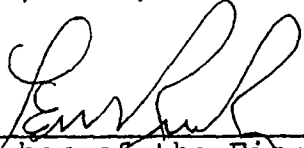
CONCLUSION

For the reasons set forth herein, Dow's motion to dismiss should be granted.

Dated: Garden City, New York
January 16, 1984

Respectfully submitted,

RIVKIN, LEFF, SHERMAN & RADLER

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UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF NEW YORK

FILED
IN CLERK'S OFFICE
U. S. DISTRICT COURT E.D. N.Y.

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P.M. 10

In Re	)	
"AGENT ORANGE"	)	MDL No. 381
	)	(All Cases)
Products Liability Litigation	)	Plaintiffs Demand Trial by Jury

FIFTH AMENDED VERIFIED COMPLAINT

NOW COME each of the Plaintiffs hereinafter set forth, by and through the undersigned attorneys, each of them in their individual and representative capacities, and complaining of the various Defendants, both individually and collectively, as and for their Fifth Amended Verified Complaint, allege as follows:

Federal Diversity Jurisdiction

1. Jurisdiction of this Court is invoked under 28 U.S.C. §1332. The amount in controversy herein and the amounts in controversy with respect to each of the individual claims of the representative Plaintiffs herein exceeds the sum or value of TEN THOUSAND AND NO/100 DOLLARS (\$10,000.00), exclusive of interests and costs.

2. In this action brought as a class action, the following Plaintiffs have been selected as representative members of the class. Plaintiffs reserve the right to seek leave of the Court to add additional representative Plaintiffs.

a) Plaintiff CHARLOTTE BLACKMON, as surviving spouse and as the personal representative of the veteran ORVILLE E. BLACKMON, deceased, and as mother and next friend of their children, REBECCA, VALERIE, BRENT and KAREN, is a resident of the State of Georgia.

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b) Plaintiff CAROLYN CHAMPION, as surviving spouse and as the personal representative of the veteran THOMAS B. CHAMPION, deceased, and as mother and next friend of their children, THOMAS, JR., JOY and DEDRIC, is a resident of the State of Georgia.

c) Plaintiff veteran GEORGE EWALT and his spouse, SHEILA, and as parents and next friends of their child, TERA CATHERINE, are residents of the State of Pennsylvania.

d) Plaintiff veteran DANNY L. FORD and his spouse, CHRISTINA, are residents of the State of Michigan; the Dow Chemical Company is not a defendant to these Plaintiffs' claims.

e) Plaintiff veteran DAVID G. LAMBIOTTE is a resident of the State of Virginia.

f) Plaintiff CAROL QUINN, as surviving spouse and as the personal representative of the veteran BRIAN T. QUINN, deceased, and as mother and next friend of their child, KEVIN, is a resident of the State of Illinois.

g) Plaintiff veteran DAN G. JORDAN and his spouse, DONNA, individually and as parents and next friends of their children CHAD and MICHAEL, are residents of the State of Texas.

h) Plaintiff veteran EARLIE ROBINSON and his spouse, SHEILA ANN, individually and as parents and next friends of their child, MICHAEL ANTHONY, are residents of Washington, D.C.

i) Plaintiff veteran MICHAEL F. RYAN, and his spouse, MAUREEN, individually and as parents and next friends of

their child, KERRY, are residents of the State of New York.

j) Plaintiff veteran WILLIAM SINGLEY, and his spouse, DIANE, both individually and as the surviving parents of their child, WILLIAM, deceased, are residents of the State of Pennsylvania.

k) Plaintiff veteran STEVE ZARDIS, is a resident of the State of Maryland.

3. Upon information and belief, defendant Dow Chemical Company is a corporation organized and existing pursuant to the laws of the State of Delaware and having its principal office in the State of Michigan.

4. Upon information and belief, defendant Monsanto Corporation is a corporation organized and existing pursuant to the laws of the State of Delaware and having its principal office in the State of Missouri.

5. Upon information and belief, defendant Hercules, Incorporated is a corporation organized and existing pursuant to the laws of the State of Delaware and having its principal office in the State of Delaware.

6. Upon information and belief, defendant T-H Agriculture & Nutrition Company, Inc., is a corporation organized and existing pursuant to the laws of the State of Delaware, and having its principal office in the State of Kansas.

7. Upon information and belief, defendant Diamond Shamrock Corporation is a corporation organized and existing pursuant to the laws

of the State of Delaware and having its principal office in the State of Ohio.

8. Upon information and belief, defendant Uniroyal Incorporated is a corporation organized and existing pursuant to the laws of the State of New Jersey, and having its principal office in the State of Connecticut.

9. Upon information and belief, defendant Thompson Chemical Corporation, formerly a division of William T. Thompson Company, is a corporation organized and existing pursuant to the laws of the State of Missouri, and having its principal office in the State of Missouri.

Federal Question Jurisdiction

10. Jurisdiction of this Court is invoked under 28 U.S.C. §1331. The amount in controversy herein and the amounts in controversy with respect to each of the individual claims of the representative Plaintiffs herein exceeds the sum or value of TEN THOUSAND AND NO/100 DOLLARS (\$10,000.00) exclusive of interests and costs. These causes of action arise under the Constitution, laws or treaties of the United States, as more fully and at length hereinafter set forth and alleged.

11. Upon information and belief, the "corporate defendants" have violated the common law of the United States as hereinafter alleged and/or the statutory laws of the United States of America.

12. The genesis of these causes is the Vietnam War, a federal military undertaking empowered at least in part by Article I, Section 8

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of the United States Constitution (The War Powers Act) and such of the federal statutes governing the Armed Forces and defense procurement and production, including, inter alia, the Defense Production Act of 1950, U.S.C. app. sec. 459(b) §§2061, et seq.

13. As is more specifically hereinafter set forth, the corporate defendants and each of them committed tortious acts alleged herein while engaged in interstate and/or foreign commerce, and/or through the use and violation of federal contractual relationships and through the use in part of the United States mails, federal air waves and federal procurement and distribution channels and facilities in connection with the marketing, manufacture, sale and distribution to the United States Government of herbicides for use in Southeast Asia during the Vietnam War.

14. That federal interests and relationships, multistate and international contracts crossing State or National boundaries on an almost daily basis as the result of Defendants' conduct are predominate in these causes; that the choice of federal common law rules of decision is necessitated thereby.

15. That on November 24, 1980, the United States Court of Appeals, Second Circuit in 635 F.2d, 987 (cert. den. sub. nom. Chapman v. Dow Chemical Co., 454 U.S. 1128 (1981)) rejected federal common law as the basis for federal question jurisdiction therein, stating that there was as yet no identifiable federal policy at stake in this litigation that warranted the creation of federal common law rules (635 F.2d 987 at 993), and that while the federal government had obvious interests in the welfare of the

plaintiff/veterans and the defendant/war contractors, the federal government's interest in the outcome of the litigation, i.e., in how the parties' welfares should be balanced, was as yet undetermined (635 F.2d 987 at 995).

16. That subsequently, as the record of these causes has developed, important federal policies and interests have become identifiable.

17. That these include the relationships between the federal government and the suppliers of weapons to the military during war-time, the interpretation of government contracts, the liability of such suppliers for damages due to their tortious conduct and breach of contract and warranty causing injury to military personnel; that this is reflected in the decision of this Court of February 24, 1982 at 534 F.Supp. 1046, 1054, 1055.

18. That among the federal statutes from which causes of action are implied are:

- a) The Defense Production Act of 1950, 50 U.S.C. app. sec. 459(b), §§2061, et seq.;
- b) The Federal Insecticide, Fungicide and Redenticide Act (FIFRA), 7 U.S.C. §§135-135k, as amended by The Federal Environmental Pesticide Control Act (FEPCA), 7 U.S.C. §136-136y.

Venue

19. Venue is laid in the Eastern District of New York based upon the residences of the plaintiffs and upon the prior Orders of the Judicial Panel on Multidistrict Litigation together with this Court's certification of these causes as class actions.

Class Action Allegations

20. That these actions are maintainable as a "class action" under the provisions of Fed.R.Civ.P. 23(b)(1)(A), 23(b)(1)(B), 23(b)(2) and 23(b)(3).

21. That the class consists of persons who were in the United States, New Zealand or the Australian Armed Forces assigned to Vietnam during the hostilities from 1961 to 1972, who claim injury from exposure to Agent Orange (and other phenoxy herbicides) and their spouses, parents and children born before January 1, 1984 (or such later date as may be fixed by this Court) who claim direct or derivative injury as a result of such exposure.

22. That class action certification is appropriate under Rule 23(b)(3) in that:

a) The members of the plaintiffs class as of the date hereof exceed 100,000 persons and may include substantial numbers of additional claimants and are, therefore, so numerous that joinder of all members of the class in this action is impracticable;

b) These actions raise numerous questions of law and fact common to the class relating, among other issues, to the facts that:

- i) the herbicides manufactured by the defendants and sold to the United States Government were toxic and dangerous to health and could and would cause the injuries complained of by plaintiffs;
- ii) Defendants knew or should have known such facts;

- iii) the Defendants knew or should have known the means of avoiding or reducing such hazards;
- iv) the Defendants failed to warn the United States Government and the Plaintiffs and the public at large of such hazards and means of risk reduction when the defendants and each of them individually and collectively had the duty to so warn;
- v) the Defendants and each of them individually and collectively conspired or acted in concert or as an enterprise to breach their aforesaid duty to warn;
- vi) the Defendants negligently designed and produced such herbicides;
- vii) such herbicides produced by the Defendants and sold to the United States Government contained the deadly contaminant known as 2,3,7,8, tetra-chlorodibenzo para dioxin, more commonly referred to as "TCDD" or "dioxin";
- viii) exposure to dioxin contaminated herbicides could and would cause the injuries complained of by the Plaintiffs;
- ix) the Defendants defectively designed and produced such herbicides;
- x) the herbicides were defective and unreasonably dangerous;
- xi) the Defendants breached the duties imposed upon them by the contracts entered into between them and the United States Government;
- xii) the Defendants breached their implied warranty of merchantability;
- xiii) the Defendants breached the express warranties required by the Government contracts; and
- xiv) the Defendants misrepresented to the Government their knowledge with respect to the hazards associated with the herbicides that they were supplying to the Government and withheld such information from the Government and the public;

c) That the claims of the representative Plaintiffs are typical of the claims of all members of the class except as to the issues of specific proximate causation and individual damages;

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d) That the representative parties will fairly and adequately protect the interests of the class; since the inception of this action, the Plaintiffs have been represented by experienced counsel who have shown themselves willing to undertake the considerable commitment of time, energy and money necessary for the vigorous prosecution of the claims herein asserted;

e) That the class is readily identifiable as the persons described in Paragraph 21, supra;

f) That the class representatives are members of the class;

g) That class action is the most productive and efficient means of managing the litigation;

23. That class action certification and treatment is also conjunctively and alternatively appropriate and necessary under Rule 23(b) (1) (B) because Defendants' conduct exposes them to compensatory and punitive damages in excess of the "limited fund" comprised of their net worths, either individually or collectively, giving rise to the risk that if Plaintiff/litigants are allowed to proceed on an individual basis, those who sue first will deplete the fund and leave nothing for subsequently successful Plaintiff/litigants.

24. That class certification under Rule 23(b) (1) (A) is also appropriate and necessary to avoid inconsistent adjudications establishing incompatible standards of conduct for the Defendants on issues which involve important federal policies and interests and which should be resolved by application of a uniform rule of decision. These federal policies and

interests include:

a) The need for consistency, in the interests of national security, in negotiating and determining price and terms of performance in and compliance with government military contract procurement processes which would be disrupted or rendered uncertain by the application of differing or non-existent state tort and contract laws, which would lead to disparate results as to potential liabilities involved so that the price and terms of performance in government contracts for the supply of military ordnance would vary depending on what state laws were applied;

b) The need for consistency in the administration of veterans' benefits and programs, in determining whether Vietnam veterans' injuries were service connected, hence entitling them to payment for service connected disability and other benefits; that the issue of "service connected" may in large part depend on how the issues of medical causation are resolved, the application of differing state laws on such issues of causation would lead to disparate results as to liability so that some veterans would be deemed to have proven causation and others not;

c) The federal interest in securing compliance with government contracts with military suppliers.

AS AND FOR A FIRST CAUSE OF
ACTION, PLAINTIFFS ALLEGE:

Negligence: Breach of Duty to Warn As
To Defendants' Products

25. That all of the individual representative Plaintiffs and members of the plaintiffs class were persons who were in the United States, New Zealand or Australian Armed Forces assigned to Vietnam during the hostilities from 1961 to 1972 who claim injury from exposure to Agent Orange (and other phenoxy herbicides), or whose spouses, parents and children born before January 1, 1984 claim direct or derivative injuries as a result of such exposure.

26. That during the period of 1961 to 1972 each of the corporate Defendants designed, manufactured and sold to the United States Government pursuant to Government contracts, the phenoxy herbicides (hereinafter collectively described as Agent Orange herbicides), known as Agents Orange, Orange II, Purple, Pink and Green, and whose basic component formulations were:

- a) Agent Orange was a 50/50 mixture of the n-butyl esters of 2,4-D and 2,4,5-T (2,4,5-trichlorophenoxyacetic acid);
- b) Agent Orange II was a 50/50 mixture of the isooctyl ester 2,4,5-T and the n-butyl ester of 2,4-D;
- c) Agent Purple was a 50/30/20 by weight mixture of the n-butyl ester of 2,4-D, n-butyl ester of 2,4,5-T and isobutyl ester of 2,4,5-T;
- d) Agent Pink was a 60/40 by weight mixture of n-butyl ester of 2,4,5-T and the isobutyl ester of 2,4,5-T;
- e) Agent Green was a single component formulation consisting of n-butyl ester of 2,4,5-T.

27. The Agent Orange herbicides manufactured and sold by the Defendants to the United States Government for use in Vietnam during the aforesaid period contained deadly toxic contaminants known as dioxins which were dangerous to human health and capable of causing severe injuries to persons exposed thereto, one of which dioxins was the most toxic and deadly, that being 2,3,7,8-tetrachlorodibenzo para dioxin, more commonly referred to as "TCDD" or "dioxin".

28. The Defendants, individually and collectively, knew or should have known of the following:

a) That exposure to the herbicides would be harmful to humans by reason of historical experiences involving occupation related injuries to workers following exposure to dioxin-contaminated materials in the Defendants' manufacturing facilities in addition to substantial scientific information in the Defendants' possession, custody and control, evidencing the extreme toxicity of such material;

b) That dioxin, its extreme toxicity, its presence in the manufacturing process and the herbicides themselves, and variables determining levels of dioxin in the chemical herbicides' manufacturing processes, and its existence in the herbicides, created a substantial risk to human health;

c) That the levels of dioxin contamination in the herbicides manufactured for use in Vietnam could be reduced by the use of appropriate analytical and detection procedures, coupled with alternative and careful methods of manufacture or quality control and the use thereof, could have eliminated the substantial risk

to human health involved in the use of the herbicides in Vietnam;

d) That information in the form of judgments and assessments of the risks to health had already been arrived at by the chemical companies themselves; and

e) That the deployment and use of the herbicides manufactured by the Defendants in Vietnam could and would cause substantial adverse health effects to persons who were exposed to the herbicides.

29. That during the period 1961 to 1972, the United States Government decision-makers responsible for the decision to deploy the Agent Orange herbicides in Vietnam were not knowledgeable about the aforesaid types of information with respect to Agent Orange herbicides' manufacturing processes, dioxin as a contaminant, detection and risk reduction methods, and health hazards associated with human exposure to such herbicides.

30. That during the period 1961 to 1972, the Defendants were under a duty to, but failed to warn and share with the Government, the aforesaid information which Defendants knew or should have known with respect to the Agent Orange herbicides they were supplying to the United States Government for use in Vietnam.

31. That during the period 1961 to 1972, the Defendants also knew that the dioxin contaminated Agent Orange herbicides which they were supplying to the Government would be contained in drums unmarked

with any corporate identification and mixed together with other contaminated Defendants' products before being sprayed in Vietnam.

32. That by reason of Defendants' failure to warn the Government of the health hazards accompanying the use of the dioxin contaminated Agent Orange herbicides being sold to the Government, and by reason of Defendants' failure to share with the Government all they or any one of them knew or should have known with respect to the Agent Orange manufacturing processes, dioxin as contaminant and detection and risk reduction methods, the resulting ignorance on the Government's part affected not only what was put into or omitted from the contract specifications, but also the standards applied to determine whether each Defendant's product conformed to the specifications.

33. That by reason of each Defendant's breach of its duty to warn and to share such information with the Government and military, the Government and military were prevented from:

- a) making an informed decision not to use a particular Defendant's dioxin contaminated herbicide;
- b) imposing a contractual duty upon each Defendant to supply Agent Orange herbicides free of dioxin contamination;
- c) imposing protective safety measures in connection with the use of Agent Orange herbicides in Vietnam; or prescribing their use in a manner that would have protected the risk of exposure to the military servicemen;
- d) providing exposed soldiers prophylactic medical examinations and treatment to avert or mitigate injuries caused by such exposure; and

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e) deciding not to use such herbicides in the Vietnam conflict whatsoever, or, alternatively, to sharply curtail their use in a limited fashion designed to prevent human exposure and injury.

34. That each Defendant's failure to warn the responsible Government and military decision-makers and to share its information as above alleged prevented the military and Government from taking the actions described in Paragraph 33, supra.

35. That as a direct and proximate result of each Defendant's breach of its aforesaid duties, each of the Plaintiffs were exposed to Defendants' herbicides and were thereby caused to suffer severe injuries, diseases, physical disorders and irritations, and in some cases, death, for which Plaintiffs are entitled to and seek to recover monetary damages from the Defendants.

36. That by reason of the foregoing, each Defendant is individually, jointly and severally liable as tortfeasors to pay such damages to the Plaintiffs.

AS AND FOR A SECOND CAUSE OF
ACTION, PLAINTIFFS ALLEGE:

Breach of Duty to Warn As To
Other Defendants' Products

37. Plaintiffs adopt, repeat, reiterate and reallege each and every allegation contained in Paragraphs 1 through 36 as though fully set forth herein.

38. That each Defendant knew or should have known that the other Defendants were manufacturing and selling to the military dioxin contaminated Agent Orange herbicides for use in Vietnam during the period 1961 to 1972.

39. That each of the defendants knew or should have known that the Agent Orange herbicides being supplied by other Defendants to the military for use in Vietnam was dangerous to human health.

40. That each of the Defendants knew or should have known that the other Defendants failed to warn the Government as to the health hazards associated with the use of their products and that the other Defendants had also failed to share with the Government what they knew or should have known with respect to the Agent Orange manufacturing processes, dioxin as a contaminant and detection and risk reduction methods.

41. That each Defendant knew or should have known that none of the barrels of Agent Orange they sold to the Government contained any company identifying marks, and that the Agent Orange herbicides shipped to Vietnam would be mixed and sprayed without discrimination as to which Defendant's product was being utilized and that Plaintiffs and all members of the class of Plaintiffs would be exposed to such dioxin contaminated herbicides and would suffer the injuries complained of.

42. That each Defendant's breach of its duty to warn and to share with the Government the information with respect to the other Defendants' dioxin contaminated herbicides, the health hazards associated therewith and the means of detection, risk avoidance and

risk reduction, was a substantial factor in preventing the military from taking the action described in Paragraph 33, supra. By reason of the foregoing, each Defendant is individually, jointly and severally liable as the cause in fact of the indivisible injuries suffered by Plaintiffs and is responsible for the payment of damages to the Plaintiffs.

AS AND FOR A THIRD CAUSE OF
ACTION, PLAINTIFFS ALLEGE:

Negligent Design and Production

43. Plaintiffs adopt, repeat, reiterate and reallege each and every allegation contained in Paragraphs 1 through 42 as though fully set forth herein.

44. That each corporate Defendant negligently designed and produced the Agent Orange herbicides it supplied to the United States Government for use in Vietnam in that each Defendant:

- a) failed to design its herbicides so that they were free from the toxic contaminant dioxin;
- b) failed to follow reasonable manufacturing methods and procedures that would avoid the formation of or eliminate the toxic contaminant dioxin;
- c) failed to test the Agent Orange herbicides to insure that they were free from the toxic contaminant dioxin.

45. That Defendants owned or controlled virtually all of the Agent Orange herbicide market and product capacity and supplied to the military, the sole source purchaser, over 99% of the herbicides contracted for, and received over 99% of the purchase price paid.

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46. That each of the Defendant's herbicides was toxic and harmful to human health, contaminated with dioxin in varying degrees, and as such, violated their contractual obligations to the military. Each Defendant knew its product was hazardous to human health and contaminated. Each Defendant knew that the other Defendants' herbicides were hazardous and contaminated with dioxin. Each Defendant knew, with varying degrees of expertise, how to eliminate or reduce the dioxin. None of the Defendants ever warned the uninformed, less expert, military, or informed it either of the toxicity of the herbicides or of the dioxin contamination and the means of its avoidance or elimination.

47. That the Defendants instead conspired and acted in concert secretly and persistently to deceive the military and other governmental agencies about the matters hereinbefore alleged through misrepresentations, suppression and withholding of information and other schemes. The Defendants knew that each other's herbicides were dangerous to human health and contaminated with dioxin; that each other's products constituted a breach of duty to warn, and that each was negligent in the design and production of the Agent Orange herbicides being supplied to the Government for use in Vietnam and that exposure to such herbicides could and would cause injuries to many thousands of individuals.

48. That notwithstanding such knowledge, the Defendants, in pursuit of a common plan or design to continue the production and sale of herbicides contaminated with dioxin to the military at a substantial profit and pursuant to a common scheme to avoid governmental investigation and restrictive legislation or regulation which would reduce Defendant's profits, conspired and acted in concert to misrepresent the safety of such

herbicides to the military and other Governmental agencies and suppressed and withheld from the military and other Governmental agencies the information described in Paragraph 29, supra, thereby preventing the military from undertaking the actions described in Paragraph 33, supra.

49. That during the period from 1961 to 1972, the chemical industry-wide standard of safety as to the manufacture of Agent Orange herbicides was inadequate to protect the health of the plaintiffs and the Defendants knew or should have known of that fact.

50. That the Agent Orange herbicides manufactured by all the Defendants were produced in accordance with identical military specifications set forth in their Government contracts and were generically similar.

51. That the Government contracts, pursuant to which the Defendants manufactured their Agent Orange herbicides, did not order, request, or put limitations on any permissible level of the toxic contaminant dioxin. The herbicides produced by the Defendants were generically similar except that they contained varying degrees of the toxic contaminant dioxin. The Defendants jointly controlled all of the manufacturing processes used in the production of the Agent Orange herbicides supplied to the military. Each of the Defendant's products was defective and dangerous to human health, especially in view of the presence of the toxic contaminant dioxin. Each of the Defendant's dioxin contaminated herbicides was a cause in fact of the injuries suffered by the Plaintiffs.

52. That as a direct and proximate result of Defendants' conspiracy and concerted action, the Plaintiffs were caused to suffer the injuries complained of hereinabove.

53. That by reason of the foregoing, each Defendant is individually, jointly and severally liable as the proximate cause of the indivisible injuries suffered by plaintiffs and is responsible for and must be required to pay all special, general, compensatory and punitive damages suffered by the Plaintiffs.

AS AND FOR A FOURTH CAUSE OF
ACTION, PLAINTIFFS ALLEGE:

Strict Liability

54. That Plaintiffs adopt, repeat, reiterate and reallege each and every allegation contained in Paragraphs 1 through 53 as though fully set forth herein.

55. That at various times during the period 1961 through 1972, each Defendant was engaged in the business of manufacturing, shipping and delivering Agent Orange herbicides to the military for use in Vietnam. Each Defendant's Agent Orange herbicides, as so supplied to the military for use in Vietnam, contained the toxic contaminant dioxin, were in defective condition, and were unreasonably dangerous to the Plaintiffs.

56. That Plaintiffs' exposure to the Defendants' dioxin contaminated herbicides directly and proximately caused or contributed to the Plaintiffs' injuries and damages hereinabove alleged.

57. That by reason of the foregoing, the Defendants are individually, jointly and severally liable for Plaintiffs' injuries

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and responsible for and must be required to pay all special, general, compensatory and punitive damages suffered by the Plaintiffs.

Breach of Implied Warranty

58. That Plaintiffs adopt, repeat, reiterate and reallege each and every allegation contained in Paragraphs 1 through 57 as though fully set forth herein.

59. That each Defendant impliedly warranted the merchantability of the Agent Orange herbicides which they supplied to the Government and that such herbicides would be reasonably fit for the ordinary purposes for which they were to be used by the military in Vietnam, and that they were relatively non-toxic to humans and animals.

60. That each Defendant breached its implied warranty of merchantability in that the Agent Orange herbicides it supplied to the Government were not reasonably fit for the purposes for which they were to be used, especially so because of the presence of the toxic contaminant dioxin. Each Defendant breached its implied warranty that the Plaintiffs exposed to such herbicides would be safe from personal injury attributable to such exposure in that such exposure did in fact directly and proximately cause or contribute to the Plaintiffs' serious injuries as hereinbefore alleged.

61. That by reason of Defendants' breach of their implied warranties, the Defendants are individually, jointly and severally liable for the Plaintiffs' injuries and responsible for and must be required to pay Plaintiffs' resultant special, general, compensatory and punitive damages.

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Breach of Express Warranty
And Misrepresentation

62. That Plaintiffs adopt, repeat, reiterate and reallege each and every allegation contained in Paragraphs 1 through 61 as though fully set forth herein.

63. That the contracts between the military and the Defendants imposed specific specifications which did not call for or permit the presence of the toxic contaminant dioxin in the Agent Orange herbicides produced pursuant to such contracts. The Defendants breached their duty to comply with such Government contracts and specifications in that the Agent Orange herbicides produced by the Defendants contained dioxin which was dangerous to the health of the Plaintiffs exposed thereto in Vietnam.

64. That the Defendants concurrently, with their conspiracy of concealment and failure to warn the military as hereinbefore alleged, misrepresented the safety of their herbicides to the military and other Government agencies. Despite its extensive knowledge of health hazards, the Defendant, DOW CHEMICAL COMPANY, made the following misrepresentation to the United States military:

"(W)e have been manufacturing 2,4-D and 2,4,5-T for over ten years. To the best of our knowledge, none of the workmen in these factories have shown any ill effects as a result of working with these chemicals."

Subsequently, during the years 1966 and 1967, at times when all the Defendants were selling dioxin contaminated herbicides to the military, they formed a Joint Industry Task Force, under the auspices of the National Agricultural Chemicals Association, an organization owned, operated, managed and controlled by the chemical industry whose purpose it was to declare the Defendant's Agent Orange herbicides to be toxico-

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logically safe. During the period of its existence, the Defendants' Task Force misrepresented to and deceived the Government concerning the nature and the extent of the toxicological data as to hazards which was locked within the Defendants confidential files.

65. That the Defendants and each of them knew of health hazards associated with exposure to such herbicides and each of them during the period in question either made affirmative statements misrepresenting material facts concerning such hazards or wilfully failed to disclose such material facts by conscious and willful omission.

66. That by reason of the Defendants' breach of express warranty and such misrepresentations, the military and the Government were lulled into a belief that the Defendants' Agent Orange herbicides were safe to human health, and the military was prevented from taking the actions described in Paragraph 33, supra.

67. That as a direct and proximate result of Defendants' breach of warranty and express misrepresentations, the plaintiffs suffered injuries and are entitled to damages, both special and general, compensatory and punitive.

68. That the Defendants are individually, jointly and severally liable for the payment of Plaintiffs damages.

AS AND FOR A FIFTH CAUSE OF
ACTION, PLAINTIFFS ALLEGE:

69. That Plaintiffs adopt, repeat, reiterate and reallege each and every allegation contained in Paragraphs 1 through 68 as though fully set forth herein.

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70. That Defendants' conduct constituted an intentional and fraudulent concealment of the facts hereinabove alleged from the Government and the Plaintiffs, and prevented them from discovering that the injuries suffered by Plaintiffs were caused by Defendants' wrongful conduct and Plaintiffs' exposure to Defendants' defective and dangerous dioxin contaminated Agent Orange herbicides. As the result of such fraudulent concealment and Defendants' misrepresentations, Plaintiffs' domiciled in states whose statutes of limitations governing claims for damages caused by tortious conduct such as that of the Defendants, begin to run from the date of injury, were prevented through Plaintiffs' lack of knowledge of the facts, from instituting suit on such claims against Defendants within the times prescribed by such statutes of limitations.

71. That by reason of the foregoing, Defendants are estopped from asserting such statutes of limitations as a bar to any of Plaintiffs' claims.

AS AND FOR A SIXTH CAUSE OF
ACTION, PLAINTIFFS ALLEGE:

Punitive Damages

72. That Plaintiffs adopt, repeat, reiterate and reallege each and every allegation contained in Paragraph 1 through 71 as though fully set forth herein.

73. That each Defendant knew, or had reason to know that its conduct and the other Defendants' conduct not only created an unreasonable risk of harm to Plaintiffs, but also that there was a strong probability that the harm would result. Nevertheless, each Defendant

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proceeded with its conduct in reckless or conscious disregard of such consequences to Plaintiffs.

74. That as a direct and proximate result, Plaintiffs suffered the injuries complained of, and are entitled to punitive damages, in addition to special, general and compensatory damages.

WHEREFORE, the Plaintiffs, individually and collectively demand judgment of the "corporate Defendants", THE DOW CHEMICAL COMPANY, MONSANTO CO., HERCULES INCORPORATED, T-H AGRICULTURE & NUTRITION COMPANY, DIAMOND SHAMROCK CORPORATION, UNIROYAL, INC., and THOMPSON CHEMICAL CORP., for the following relief:

A) Judgment in such sums as this Court and jury shall find in favor of each of the representative Plaintiffs as shall fully, adequately and completely compensate them for all usual and customary elements of damage awardable in cases of personal injury and wrongful death, both general and special, including but not limited to physical pain and mental suffering, both past, present and future, the reasonable and necessary costs of medical and hospital services and treatments, both past, present and future, loss of earnings, disability, disfigurement, loss of society, consortium, services and companionship, pecuniary losses to the widows and next of kin of deceased veterans, including but not limited to losses of support, companionship, services and society, funeral and other familial expenses incurred thereby and all other recognized losses, costs and damages incurred by such representative Plaintiffs, their widows, families and next of kin with direct and derivative claims;

B) Judgment in favor of the Plaintiff class members as and for their punitive damages in an amount to be determined by the Court and jury of sufficient magnitude to adequately punish the Defendants and each of them, jointly and severally, by reason of their willful and wrongful conduct and the great magnitude of damages which it has wrought;

C) A determination by this Court in the form of its judgment that there is a substantial risk based upon the damages awarded the individual representative Plaintiffs herein and based upon the special verdicts of the jury favorable to the Plaintiffs as to the issues common to the class of Plaintiffs, that the total damages suffered by the class of Plaintiffs and recoverable from the Defendants or Defendants adjudged liable, are likely to exceed the ability of any such Defendant or Defendants to pay such damages, impressing an equitable trust upon the assets and future earnings of such Defendant or Defendants in order to create a fund for the full or pro rata satisfaction of the present or future damage claims of the members of the class;

D) Together with such other and further relief as to this Court shall seem just and proper under the circumstances, plus interest, reasonable counsel fees and the costs and disbursements of this action.

DATED: December 14, 1983

Respectfully submitted,

PLAINTIFFS' MANAGEMENT COMMITTEE

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Stephen J. Schlegel

By: Irving Like
Irving Like,
Chairman, Law Committee

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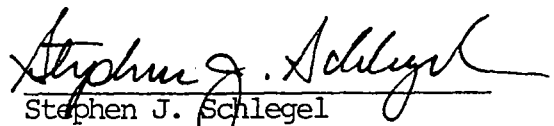
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VERIFICATION

The undersigned, being a duly appointed member of the Plaintiffs' Management Committee and Lead Counsel Group, affirms under penalties of perjury that he has read the above and foregoing Fifth Amended Complaint, by him subscribed, and that the contents are true.


Stephen J. Schlegel

CERTIFICATION OF SERVICE

The undersigned does hereby certify that she has served a true and correct copy of the foregoing Fifth Amended Complaint on all those shown on the attached Service List by Federal Express Mail, this 14th day of December, 1983.



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