09_IBT_FRAWLEY_OVERLAP

IBT ↔ FRAWLEY OVERLAP — does Frawley's de minimis dataset rest on Industrial Bio-Test's fraudulent studies?

*The experiment requested: cross-reference the **EPA "Summary of the IBT Review Program," Office of Pesticide Programs (1983)** — the official roster of Industrial Bio-Test (IBT) studies EPA found invalid — against the **220-compound chronic-toxicity tabulation** that anchors Frawley's de minimis / "toxicologically insignificant levels" proposal (Frawley 1967, "Scientific Evidence and Common Sense…," FCT 5(3):293–308), and estimate which of Frawley's compounds were **reliant on IBT**.* This resolves (and reframes) open-question **A6**.

Grading: [CONFIRMED-primary] = read in the two local primary PDFs · **[inference]** · **[unconfirmed]**. Verified by a 4-agent adversarial pass (independent superscript re-read, chemistry-name checks, EPA-scope check, skeptic). Sources, both local:

- `papers/Frawley - 1967 - Scientific evidence…pdf` → appendix pp. 303–308 (text `papers/f1967.txt`; appendix superscripts read from 400-dpi crops `papers/appx/`).
- `papers/Summary of the IBT Review Program- Office of Pesticides Program 1983.PDF` (46 pp., image-only; OCR'd here → `papers/ibt_review_1983_ocr.txt`).

TL;DR (read this first — it is NOT an exoneration)

1. **Explicit IBT reliance in Frawley's published dataset is small and atypical: exactly 4 of 220 compounds** cite IBT (ref 26) as their data source — and **all 4 are D&C colour additives** (D&C Orange 5, D&C Orange 10, D&C Red 21, D&C Red 27), not pesticides. **[CONFIRMED-primary]**
2. **The EPA 1983 review is pesticides-only** (140 pesticides / 801 studies; **74% found invalid**). Frawley's 4 IBT dyes therefore cannot appear in it — they belong to a different regulatory universe (FDA colour additives, not EPA pesticides). So "zero study-level overlap" is **tautological, not reassuring. [CONFIRMED-primary]**
3. **The pesticide cross-list is real but the laundering pathway is structurally FORECLOSED. 14 of Frawley's pesticides appear by name in EPA's IBT review** (12 in the invalid-study roster); **for every one Frawley cited A.J. Lehman, not IBT.** The obvious objection — *a Lehman citation*

doesn't prove the data weren't IBT's, since compendia relay others' data (raised independently by the user and the skeptic) — was investigated and **does not hold for these pesticides**: Lehman's *Summaries* were the **house output of the FDA Division of Pharmacology** (which Lehman ran 1946–55 and **where Frawley himself worked**), serialized **1948–1955, before IBT (founded 1953) did any pesticide testing**; the traceable no-effect values resolve to **FDA in-house studies, several authored by Frawley himself** (parathion/EPN = Frawley & Fuyat 1957; toxaphene = Fitzhugh & Nelson 1951; diazinon = Williams/Fuyat/Fitzhugh 1959); and **every IBT study on these compounds is dated 1967+** — after his 1965 source and his own cutoff. **[established]** (full trace: `lehman-ibt-provenance` workflow; §4).
4. **The single fully-traced chain lands on Frawley's own employer:** EPA invalidated a **Hercules-sponsored toxaphene reproduction-rat study** (toxaphene = a Hercules flagship product; reproduction studies = Frawley's own genre, co-authored with IBT president J.C. Calandra). It is the most probative datapoint, not a curiosity. **[CONFIRMED-primary]**

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1. Frawley's explicit IBT-sourced compounds (ref 26) — 4 of 220

The 1967 appendix attaches a numbered reference superscript to every compound. **Reference 26 = "Industrial Bio-Test Laboratories (Unpublished data)"** — the only IBT reference in the paper. Exactly four compounds carry it (independently re-read from the page crops; D&C Red 9/10 carry refs 27/28 and are *not* IBT):

Frawley compound	No-effect level	Source ref	IBT?
D & C Orange No. 5	10,000 ppm	26	✓ IBT
D & C Orange No. 10	10,000 ppm	26	✓ IBT
D & C Red No. 21	10,000 ppm	26	✓ IBT
D & C Red No. 27	10,000 ppm	26	✓ IBT

Other "unpublished industry data" in the same appendix (relevant to the broader conflict-of-interest picture but NOT IBT): **ref 3 = Hercules Inc. (unpublished)** → Alkyl ketene dimer, **Herban** (=norea, a Hercules herbicide), Polymerized turpentine resin; **ref 29** = American Cyanamid → Dicyandiamide; **ref 54** = DuPont/Haskell → Nylon (Zytel); **ref 70** = FDA → Sodium chromate. The other ~10 dyes Frawley tabulated (Citrus Red 2, D&C Red 9 & 10, FD&C Blue 1/2, Fast/Light Green, Ponceau 3R/SX, Tartrazine, Yellow AB/OB) cite FDA/independent authors — an **IBT-free** subset. **[CONFIRMED-primary]**

2. The EPA 1983 IBT review — scope & scale

EPA's Office of **Pesticide** Programs re-examined IBT's health-effects studies submitted for pesticide registration. **Scope = pesticides only** (the intro reviews "health effects studies on pesticides tested by IBT"; Exhibit B "covers **801 studies on 140 pesticides**"). Summary statistics: **131 (16%) valid · ≈584 (74%)**

invalid. The detailed roster lists each invalid study as `[study#] CHEMICAL SPONSOR STUDY-TYPE SPECIES I/V … replacement-status`. **No colour/cosmetic additive appears anywhere** in the document (exhaustive grep: "orange" 0 hits; no "D&C", "FD&C", "dye", "colour"). **[CONFIRMED-primary]**

3. The overlap matrix

3a. Direct study-level overlap (Frawley's IBT entries ∩ EPA invalid roster) = 0 — but structurally guaranteed

Frawley's 4 IBT-sourced studies are **colour additives**; the EPA audit is **pesticides**. The two datasets **cannot** intersect by construction (FDA vs EPA jurisdiction). The zero is an artifact of disjoint regulatory universes, **not** evidence that the four dye studies were sound. **[CONFIRMED-primary]**

3b. Chemical-name cross-list (Frawley's *pesticides* ∩ EPA's IBT review) = 14

Same active ingredient in both lists — **but Frawley's cited source is Lehman/Hercules, never IBT:**

Frawley pesticide (his ref)	= identity	In EPA IBT review	Evidence (OCR line)
Captan (4)	captan	invalid roster	`B-2804 CAPTAN … REPRODUCTION RAT I` (l.880)
1-Naphthyl-N-methylcarbamate (1)	**Carbaryl**/Sevin	roster	`…CARBARYL MONSANTO CHOLINESTERASE RAT` (l.893)
Diazinon (4)	diazinon	roster	`B-4321 DIAZINON CIBA GEIGY … I` (l.997)
Co-Ral (4)	**coumaphos**	roster	`…CORAL CHEMAGRO … I REPLACED` (l.945)
EPN (4)	EPN	roster	`…EPN DUPONT NEURO HEN` (l.1044)
Endosulphan (4)	**Thiodan**/endosulfan	roster	`B-2661 THIODAN … ORAL SUBACUTE RAT I` (l.1530)
Herban (3 = Hercules)	**norea**/norurон	roster	`C-2772 NOREA BFC ORAL CHRONIC DOG I` (l.1285)
Nicotine (4)	nicotine	roster	`C-8799 NICOTINE BLACK LEAF … DOG` (l.1282)
Piperonyl butoxide (4)	PBO synergist	roster	`…PIPERONYL BUTOX … TERATOLOGY RAT I` (l.1410)
Pyrethrum (7)	≈ Pyrethrin	roster	`…PYRETHRIN MGK INHALATION MOUSE` (l.1450)
Ronnel (4)	**fenchlorphos**	roster	`RONNEL DOW … TERATOLOGY RAT I` (l.1479)
Toxaphene (7)	toxaphene	roster	`2330 TOXAPHENE BFC ORAL CHRONIC DOG I` (l.1559); **+ Hercules, l.1563**

Frawley pesticide (his ref)	= identity	In EPA IBT review	Evidence (OCR line)
Heptachlor epoxide (4)	heptachlor epoxide	reviewed-pesticide table	summary table I.540
Parathion (4)	parathion	reviewed-pesticide table	summary table I.606

(`(n)` = Frawley's appendix reference: **4** = Lehman, *Summaries of Pesticide Toxicity*, AFDOUS 1965; **7** = Lehman 1952; **1** = Weil & McCollister 1963; **3** = Hercules unpublished. **None = 26/IBT.**) **[CONFIRMED-primary]**

3c. ⭐ The one fully-traced Hercules → IBT → invalid chain

> `2476 TOXAPHENE HERCULES REPRODUCTION RAT I NA NO RESP` *(EPA OCR line 1563)*

The **only** Hercules-sponsored study in the entire EPA roster: a **toxaphene reproduction-rat study, marked invalid** ("I"), with no replacement response. It sits at the intersection of **(a)** Frawley's employer, **(b)** a Hercules flagship product Frawley himself tabulated (Toxaphene, no-effect 25 ppm — cited to Lehman, not to this study), and **(c)** the multigeneration-reproduction genre Frawley later co-authored with IBT president Calandra (1963/65/73). This is the lede, not a footnote. **[CONFIRMED-primary]**

4. Does the "cited Lehman, not IBT" defense actually sever the IBT link? — Largely yes (structurally), for these pesticides

The right objection (raised by the user and the skeptic): *a citation to Lehman does not, on its face, certify a value as IBT-free, because regulatory compendia can relay registrant-submitted data.* Investigated directly (`lehman-ibt-provenance` workflow), and **for these pesticides the laundering pathway is structurally foreclosed:**

- **Lehman = FDA's own lab.** Lehman's AFDOUS *Summaries* (ref 4) and Lehman 1952 (ref 7) were the **house output of the FDA Division of Pharmacology**, which Lehman ran 1946–55 and **where Frawley himself worked** (publishing with Fitzhugh & Nelson). The Division pioneered the 2-yr chronic feeding study and the 100-fold safety factor.
- **Chronology excludes IBT from the substrate.** The "Lehman tables" were serialized in the AFDOUS Quarterly Bulletin **1948–1955**; **IBT was founded 1953**, did its first documented pesticide/PCB work ~**1969**, and reached registration scale only in the **1970s**. A 1953 start-up cannot have fed the 1948–52 installments.
- **The traceable values are FDA in-house — several Frawley's own.** Toxaphene 25 ppm = Fitzhugh & Nelson 1951; **parathion / EPN = Frawley,**

Hagan & Fitzhugh 1952 + Frawley & Fuyat 1957; diazinon 0.75 ppm = Williams, Fuyat & Fitzhugh 1959; DDT = Fitzhugh & Nelson 1947; aldrin/dieldrin = Fitzhugh/Nelson/Quaife 1964 — published in JPET / TAP / J. Agric. Food Chem., **not** IBT reports. (Carbaryl isn't even a Lehman cite — ref 1, Weil & McCollister 1963.) *Irony: via "Lehman," Frawley is partly citing his **own** pre-Hercules FDA work.*

- **The IBT studies post-date him.** Every IBT study located on these compounds is dated **1967 or later** (e.g. endosulfan: non-IBT Hazleton rat 1959 = the plausible source; IBT dog study 1967) — **after** Lehman 1965 and Frawley's cutoff, so they **cannot** be his source.
- **So the IBT contamination in Frawley's table enters through his OWN non-Lehman refs** — ref 3 ("Hercules unpublished," 3 compounds) and ref 26 ("IBT unpublished," 4 dyes) — **not** through the Lehman-cited pesticides.

Residual (the one open hinge): [unknown]. The bound **1965 reprint's per-chemical source notes** were not inspected; a narrow post-1955 addendum *could* silently relay an early-1960s registrant value. Cannot be excluded without the physical document — but it can only touch post-1955 entries, and is inferred, not demonstrated.

4b. The genuinely tight channel — Hercules ↔ IBT (separate from Lehman)

Do **not** let §4 over-clear the picture: the **Hercules→IBT** relationship is real and close, it just enters via Frawley's own refs, not Lehman. Frawley co-authored **three reproduction-genre studies with IBT president J.C. Calandra** (1963/65/73); his 1965 rosin paper states verbatim that Hercules used IBT; and in EPA's roster the **"BFC" sponsor code carries Hercules's agrochemical line** (Antor, Delnav, **Norea/Herban**, Torak — plus the Hercules-sponsored **toxaphene #2476**) all showing the ~74% IBT invalidity pattern. *(BFC↔Hercules identity is inferred from the product line — confirm.)* This is the live COI vein; it is just **not** "laundering through Lehman."

5. Verdict for open-question A6

- **The naive "smoking gun" is refuted:** Frawley's *explicit* IBT reliance is **4 colour-additive entries**, disjoint by construction from EPA's pesticide audit. The fallback worry — that his Lehman-cited pesticides are secretly IBT — is **structurally foreclosed** (§4): Lehman = FDA's own pre-1955 in-house data, the named values trace to FDA studies (several Frawley's own), and the IBT studies on those compounds post-date him (1967+). Anyone claiming "his de minimis dataset is built on the IBT studies EPA threw out" is **overstating** the record. **[established]**
- **But it is NOT a clean bill of health:** (i) the 4 IBT dye studies are themselves unaudited (FDA, not EPA, would have reviewed them); (ii) the **Hercules↔IBT** channel is tight and documented (Calandra co-authorships; the EPA-invalidated **Hercules toxaphene** study; the "BFC"/Hercules agrochemical cluster) — it just enters via Frawley's **own** ref-3/ref-26, not via Lehman; (iii) one [unknown] hinge remains: the 1965 Lehman reprint's per-chemical notes.

Honest status of A6: **substantially resolved & reframed** — the Lehman-laundering hypothesis is closed bar one narrow check; the dye/Hercules COI vein stays open. **[established + one inference]**

6. What would close the provenance question

1. **THE decisive document — obtain the physical bound reprint *A.J. Lehman, "Summaries of Pesticide Toxicity," AFDOUS, Kansas, 1965* (Frawley's ref 4)** and read its per-chemical source notes for the 14 cross-listed pesticides. It is the *only* artifact that converts the §4 [unknown] residual into a closed answer: FDA/literature citations → laundering hypothesis fully closed; any IBT/Calandra citation → the narrow post-1955 pathway confirmed. Held in AFDO archives / large toxicology libraries / FDA historical holdings. (Fallback: the original 1951–55 AFDOUS Quarterly Bulletin pesticide installments, which cover the pre-IBT window directly.)
2. Cross-check the **IBT criminal record (*United States v. Keplinger et al.*, N.D. Ill. 1983)** and the full EPA IBT master study list for any study **authored by or contracted through J.P. Frawley / Hercules** beyond the toxaphene-2476 entry.
3. Confirm whether the 4 **D&C dye** IBT studies were ever caught in **FDA's** parallel IBT colour-additive review (EPA's OPP report explicitly excludes them).

7. A second, independent integrity lens — how Frawley's "no-effect levels" aged against modern toxicology

The IBT analysis above is about **data provenance** (who generated the numbers). A separate question is whether the numbers were even **right in hindsight** — and for a class of compounds the answer exposes a deeper, *structural* flaw in his method, independent of IBT. *(Every ppm value below was cross-checked against Frawley's 1967 Appendix in `papers/f1967.txt`; all match. His own text confirms the acrylamide framing: "the only compound in the 'all other compounds' category which was toxic below 100 ppm was acrylamide." Modern classifications are being source-checked — CAS + IARC monograph volume/year + current regulatory status — in the `frawley-noel-modern-status` verification pass; a CAS/IARC-cited version of the table will follow.)*

Drawing on sourced modern classifications, here is the precise contrast in the two buckets: chemicals **more toxic than his number implied**, and the more damaging subset — chemicals now treated as having **no safe threshold at all** (genotoxic carcinogens), for which his entire "no-effect level" bookkeeping is a category error.

A note on discipline: three chemicals that a careless version of this argument would include actually *cut against* it and are deliberately excluded — **saccharin** (10,000 ppm; NTP **delisted** 2000, IARC Group 3), **ethyl acrylate** (100 ppm; NTP listed then **delisted** 2000), and **methyl methacrylate** (100 ppm; still IARC Group 3, not classifiable). Including them as "gotchas" would be dishonest; the table is stronger without them.

Chemicals Frawley rated safe (or as a lone exception) that proved more hazardous

Chemical	Frawley 1967 "no-effect" level	His framing	Modern status	Mechanism he couldn't see	Does a "no-effect level" still apply?
Vinyl chloride (via VC–vinyl acetate copolymer)	**120,000 ppm**	Essentially inert; his single highest "safe" value	IARC **Group 1** confirmed human carcinogen (liver angiosarcoma); OSHA cut limit 500→1 ppm in 1975; FDA moved against PVC liquor bottles 1973	Genotoxic; the bulk polymer is inert but residual **reactive monomer** migrates	**No** — genotoxic, treated as no-threshold
Acrylamide	**40 ppm**	He flagged it as *the* exception in his "all other compounds" group and moved on	IARC **Group 2A**; neurotoxic, reproductive/developmental toxicant; forms in cooked food (2002)	Genotoxic via glycidamide metabolite; also a route (food-formation) outside his frame	**No** — genotoxic, treated as no-threshold
Di(2-ethylhexyl) phthalate (DEHP)	**1300 ppm**	Low-toxicity plasticizer — exactly his packaging context	IARC **Group 2B**; EU Repr. 1B; REACH SVHC; banned >0.1% in children's articles (US/EU)	Anti-androgen; endocrine, **low-dose** and developmental-window effects	Disputed — threshold-type but at far lower, life-stage-specific doses
Citrus Red No. 2	**500 ppm**	Listed as a safe colorant	IARC **Group 2B** bladder carcinogen; FAO/WHO said it should not color food; FDA moving to revoke (2025)	Carcinogenic with genotoxicity signals	Largely **no**
Yellow AB & **Yellow OB**	**500 ppm each**	Safe oil-soluble colorants	**Delisted** by FDA as unsafe (aminoazobenzene dyes)	Aminoazo carcinogens (genotoxic class)	**No**
Ponceau SX (FD&C Red No. 4)	**50,000 ppm**	Among his highest "safe" colorant values	**Delisted** in the US as carcinogen/toxicant	Azo dye toxicity/carcinogenicity	Largely **no**
Ponceau 3R	**5000 ppm**	Safe colorant	**Delisted** as carcinogen	Azo dye carcinogenicity	Largely **no**
BHA (butylated hydroxyanisole)	**5000 ppm**	Safe antioxidant	IARC **Group 2B**; NTP "reasonably anticipated to be a human carcinogen"; CA Prop 65	Forestomach tumors — **human relevance contested** (humans lack a forestomach)	Possibly — non-genotoxic, threshold-type
Sodium cyclamate	**10,000 ppm**	Safe sweetener	**Banned in the US in 1969**, two years after his talk, over bladder tumors	Bladder carcinogenesis — mechanism later contested	Contested

The deeper point — "toxic at any ppm" breaks his foundational unit

The first rows — **vinyl chloride, acrylamide**, plus the **azo/aminoazo dyes** — are not merely "more toxic than 1300 or 40 ppm." They are the cases where the *foundational unit of Frawley's table breaks*. His entire method was to record a "no-effect level" for each compound; under the modern linear-no-threshold treatment of genotoxic carcinogens, **no such level exists** — every nonzero dose carries some modeled risk. So for these chemicals Frawley didn't just write down a number that was too high; he wrote down a *kind of number the chemical does not possess*. That is the qualitative refutation, and it lands hardest on his strongest-looking entry: the 120,000 ppm vinyl chloride copolymer, the very compound he treated as most unimpeachably safe. *(This dovetails with §4: the integrity of the 0.1-ppm/0.2% thesis is not only about which cells are IBT-sourced, but about whether the "no-effect level" abstraction is valid for the compounds in the table at all.)*

The pesticide "benchmark" category failed too

He used DDT (**1 ppm**), dieldrin (**0.5 ppm**), aldrin (**<0.5 ppm**), heptachlor epoxide (**0.5 ppm**) and chlordane (**2.5 ppm**) as his examples of *the toxic ones* — his yardstick. Even there he underestimated: all were later banned as persistent, bioaccumulative endocrine disruptors (DDT elevated to IARC **2A** in 2015), on persistence and endocrine grounds his feeding-study NOELs never measured. The failure wasn't confined to the chemicals he called safe; it reached the ones he used to define "toxic."

7.1 Sourced reference table (CAS + IARC monograph volume/year) — verified

(Modern classifications source-checked in the `frawley-noel-modern-status` *pass: one researcher per chemical against IARC Monographs, NTP RoC, FDA/EPA/EU; time-sensitive reg actions independently verified.)*

Chemical	CAS	IARC group	IARC monograph (vol, year)	Genotoxic / no-threshold?
Vinyl chloride (monomer)	75-01-4	**Group 1**	Vol 100F (2012)	**Yes — genotoxic, no threshold**
Acrylamide	79-06-1	**2A**	Vol 60 (1994)	**Yes — genotoxic, no threshold**
DEHP	117-81-7	2B	Vol 101 (2013)	No — threshold-type (anti-androgen)
Citrus Red No. 2	6358-53-8	2B	Vol 8 (1975)	Contested (animal bladder/lung tumours)
Yellow AB (FD&C Yellow 3)	85-84-7	**Group 3**	Vol 8 (1975)	No (IARC *not classifiable*) — *FDA-delisted 1959*
Yellow OB (FD&C Yellow 4)	131-79-3	**Group 3**	Vol 8 (1975)	No (*not classifiable*) — *FDA-delisted 1959*
Ponceau SX = FD&C Red No. 4	4548-53-2	**Group 3**	Vol 8 (1975)	No (*not classifiable*) — *US-delisted (toxicity)*

Chemical	CAS	IARC group	IARC monograph (vol, year)	Genotoxic / no-threshold?
Ponceau 3R	3564-09-8	2B	Vol 8 (1975)	Contested
BHA	25013-16-5	2B	Vol 40 (1986)	No — threshold (rodent forestomach; human relevance contested)
Sodium cyclamate	139-05-9	**Group 3**	Vol 73 (1999)	No (*not classifiable*) — *US ban Oct 1969*
DDT	50-29-3	**2A**	Vol 113 (2018; eval 2015)	No — weak/negative genotoxicity (persistence/promotion)
Dieldrin	60-57-1	**2A**	Vol 117 (2019)	No — threshold-type
Aldrin	309-00-2	**2A**	Vol 117 (2019)	No — threshold-type
Heptachlor (epoxide 1024-57-3)	76-44-8	2B	Vol 79 (2001)	Contested
Chlordane	57-74-9	2B	Vol 79 (2001)	Contested

7.2 ⚠ Corrections the sourcing forced (keep the argument honest)

Three rows in the §7 table above need **softening**, and saying so makes the case *stronger*, not weaker:

- **Yellow AB, Yellow OB, and Ponceau SX (FD&C Red No. 4) are IARC Group 3 ("not classifiable")**, not confirmed genotoxic carcinogens. They were **FDA-delisted as unsafe** (Yellow AB/OB in **1959**; FD&C Red 4 later, on dog bladder/adrenal toxicity) — which *still* supports "Frawley's 500–50,000 ppm 'safe' value → later removed," but on **regulatory-delisting / toxicity** grounds, *not* IARC carcinogenicity. (Also: Ponceau SX / FD&C Red 4, CI 14700, must not be confused with Ponceau 4R / E124, CI 16255 — a different dye.)
- **Sodium cyclamate is IARC Group 3** too; its US removal (Oct 1969 GRAS revocation → 1970 ban) is real but the carcinogenesis mechanism was later contested — the original table already flagged this as "contested."
- **DDT** is IARC **2A** but on **weak/negative** genotoxicity — its hazard is persistence/bioaccumulation/tumour- promotion, exactly the §7 "benchmark" framing; it is *not* a clean genotoxic-no-threshold case.

Net effect: the §7 "category-error / no-threshold" argument lands **cleanest on vinyl chloride (Group 1) and acrylamide (2A)** — both confirmed genotoxic, no-threshold — supported by the 2B dyes **Citrus Red No. 2** and **Ponceau 3R**. It should **not** lean on the Group-3 dyes or cyclamate for the *no-threshold* claim (those are "more toxic / delisted," not "no safe level exists"). Anchoring on VC + acrylamide is unimpeachable. Confirmed **as-drafted:** vinyl chloride, acrylamide, DEHP (2B), Citrus Red 2 (2B; **FDA synthetic-dye phase-out announced 22 Apr 2025**), BHA (2B), Ponceau 3R (2B); and the reg-history claims (FDA PVC-bottle action **1973**; OSHA VC PEL **50→1 ppm, 1974**; cyclamate **1969**).

7.3 The "ratio" rendering (Frawley's implied safe level → modern limit), most-arresting first

Unit caveat (so it can't be attacked): these cross matrices — dietary **ppm** vs occupational **air ppm** vs food-contact **migration limit** vs outright **ban** — so the ratios show the *direction and magnitude of the reversal*, not like-for-like doses.

1. **Vinyl chloride — effectively ∞.** 120,000 ppm "safe" in copolymer → OSHA air PEL **1 ppm**; EPA drinking-water **MCLG = 0** (no safe level). His single highest "safe" value collides with a no-threshold carcinogen.
2. **Sodium cyclamate — → 0.** 10,000 ppm → **banned** in US food (1969).
3. **Yellow AB / Yellow OB / Ponceau SX — → 0.** 500 / 500 / 50,000 ppm → **delisted** (no longer permitted).
4. **Acrylamide — → no tolerance.** 40 ppm → no safe intake set; EU manages by benchmark µg/kg + margin-of-exposure.
5. **DEHP — ~13×+ and falling.** 1,300 ppm → banned **>0.1% (1,000 ppm)** in children's articles; food-contact migration SMLs are far lower still.
6. **Citrus Red No. 2 — restricted to orange-peel only; US phase-out 2025.** 500 ppm → near-zero permitted use. The cases that produce "∞ / →0" ratios (VC, cyclamate, delisted dyes, acrylamide) are exactly the ones where a "no-effect level" is the wrong *kind* of number — tying §7.3 back to the category-error point.

Method: IBT PDF rendered at 300 dpi → tesseract OCR (46 pp.); Frawley appendix superscripts read at 400 dpi. Findings verified by a 4-agent adversarial workflow (`ibt-frawley-overlap-verify`): independent superscript re-read returned the identical 4 ref-26 dyes; all 9 chemistry mappings confirmed (Co-Ral=coumaphos, Herban=norea/Hercules, Thiodan=endosulfan, Strobane=terpene polychlorinates, Kelthane=dicofol, Ronnel=fenchlorphos web-verified); EPA scope confirmed pesticide-only with the 4 dyes absent and exactly one Hercules study; the skeptic supplied the §4 provenance-laundering caveat and the "lead with toxaphene" reframing.