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<b>In re</b>	:	
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<b>"Agent Orange"</b>	:	<b>MDL No. 381</b>
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<b>Product Liability Litigation</b>	:	
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<b>JOE ISAACSON AND</b>	:	
<b>PHYLLIS LISA ISAACSON, h/w</b>	:	
	:	
<b>Plaintiffs,</b>	:	<b>Civ. No. 98-6383 (JBW)</b>
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<b>-against-</b>	:	
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<b>DOW CHEMICAL COMPANY, et al.,</b>	:	
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<b>Defendants.</b>	:	
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<b>DANIEL RAYMOND STEPHENSON,</b>	:	
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<b>Plaintiffs,</b>	:	
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<b>-against-</b>	:	<b>Civ. No. 99-3056 (JBW)</b>
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<b>DOW CHEMICAL COMPANY, et al.,</b>	:	
	:	
<b>Defendants.</b>	:	
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**CHART OF DEFENDANTS' KNOWLEDGE**

DOCUMENT DATE	DEFENDANTS' OFFICER	DESCRIPTION	PLAINTIFFS EXHIBIT #
01/00/76 (RE: 1933)	Rowe, V.K. [DOW]	1933: Dow hired first biochemist [Don Irish]. A fatal accident to worker exposed to phenol on skin inspired creation of Dow Toxicology Laboratory & Industrial Hygiene Laboratory.	B-1
00/00/40	Rowe, V.K. [Former Director of Toxicology for DOW]	Before 1940s, Dow knows that PCB's and other chlorophenols cause chloracne. Deposition of V. K. Rowe in <u>Keister v. Dow</u> , U.S.D.C. Eastern District of Arkansas. Dow develops rabbit ear test for chloracne.	B-1
1940s	Rowe, V.K. [DOW]	Dow begins testing for chloracnegenic properties of chlorophenols. Deposition of V. K. Rowe in <u>Moyer v. Dow</u> , 9 <sup>th</sup> Circuit District Court	B-2
00/00/47	Smith, Hillard L. [DOW]	Dow begins using 2,4,5-T on a small scale.	Exhibit 8 Plaintiff's Remand Brief
01/00/76 (REFERRING TO: 1948)	Rowe, V.K. [DOW]	1948. Dow registers 2,4,5-T [Reg. No. 464-069]. Dow was immediately concerned about chloracnegenic "impurities" in 2,4,5-T. They already know that waste tars from 2,4,5-TCP manufacture contained chloracnogens.	B-1
00/00/1948	Smith, Hillard L. [DOW]	In 1948 Dow distributes 2,4,5 T on a limited commercial basis.	Exhibit 8 - Plaintiff's Remand Brief

00/00/49	Smith, Hillard L. [DOW]  Britton, J.W. Arnold, J.B. Highhill, C.A. MacCutcheon, S.M. Gay, H.H., Dr.	Dow now selling commercial products combining 2,4-D and 2,4,5-T for purpose of defoliating rights of way. Railroads and utilities particularly use this combination. Use for defoliating rights of way expands greatly in next few years	Exhibit 8 - Plaintiff's Remand Brief
00/00/50	[MONSANTO] Wallace Testimony p. 2559	Monsanto is aware that something in its chlorinated hydrocarbon process was making its workers sick.	B-3
03/00/50	[MONSANTO]  Halley, P.	Monsanto is told by the Industrial Hygiene Foundation that animal experiments conducted by the foundation in which rabbits were subjected to Nitro Plant TCP samples and dust residue from its Building 41 incident resulted in the death of most of the rabbits from fatty liver changes and lung injuries.	B-4
00/00/1953	[MONSANTO]	The Kettering Laboratory notifies Monsanto that based upon an examination of 36 workers, persons exposed to both the autoclave incident and the production of 2,4,5-T developed a syndrome consisting of skin changes with or without a variety of other symptoms. The report noted that symptomatically the substance or substances were capable of exerting a toxic effect on nerves, endocrines, and perhaps on the liver.	Exhibit H - Plaintiffs' Response to the Court's Four Questions
01/26/1953	Smith, Hillard L. [DOW]	Dow reports to Toronto Railway Club about history of 2,4,5 T and 2,4 D being used together to defoliate utility and railroad rights of way.	Exhibit 8 - Plaintiff's Remand Brief

03/01/53	[MONSANTO]  Wallace Testimony p.2468	Monsanto knew that two hundred and fourteen (214) of its workers at the Nitro plant had symptoms clearly referable to either the Building 41 autoclave incident or regular operations in the production of 2,4,5-T, including injury to peripheral nerves	B-3
04/01/53	[MONSANTO]  Wallace Testimony p. 2468	Nitro plant physicians realize that TCP was causing at least temporary damage to the peripheral nervous systems of exposed workers	B-3
05/20/1953	Hymas, T.A. [DOW]	Report to V.K. Rowe, cc: Johnson, Britton, Van Horn, Southwick, Smith, Irish. Steer fed 0.5 grams/kg Esteron Brush Killer (equal acids of 2,4-D & 2,4,5-T) for two consecutive days: third day rumen motility had ceased, steer off feed for 24 hours, then recovered. Second, heavier steer receiving 0.5 g/kg for three consecutive days showed no toxic symptoms. Single dose 1g/kg in one steer produced no perceptible symptoms of toxicity. Steer fed 1 g/kg for three consecutive days died on third day following last dose: off feed, incoordination of hind quarters, reduced temperature, marked depression and lassitude, slowed, weakened heartbeat, respiration labored, rumination ceased. On autopsy, strong odor of Esteron present, abomasum impacted, intestinal contents completely fluid, no fecal material, mesenteric vessels in viscera markedly congested, spleen shrunken, excessively dark & pulpy. Sections from liver, kidney & spleen taken. Handwritten note dated 2-12-54 from V.K. Rowe: "Can't find any record of tissues being in here."	B-5

02/18/1954	Oyen, F. [DOW]	Report to V.K. Rowe, apparently on steer, p. B17055. Notes on kidney: "very slight interstitial edema and congestion in the medulla and cortical medullary region." On liver: "moderate pathology characterized by areas of focal hemorrhagic necrosis surrounded by areas of moderate fatty degeneration." Conclusions: "The lesions in the liver are characteristic of toxic necrosis."	B-6
00/00/1955	Silverstein, Larry [DOW]	The German manufacturer, Boehringer, requests information about chloracne problems and that request was forwarded to Dow. In response Dow provides information about hazards and precautions for safe handling of 2,4,5-Trichlorophenol.	B-7
05-06/00/55	[DIAMOND]	Diamond experiences a "major outbreak of chloracne cases"	B-8
06/15/1955	[DIAMOND]	John Burton, plant manager wrote to Dr. J.M. York, Corp. Medical Director concerning a "skin rash" problem at the plant.	B-9
06/29/1955	[DIAMOND]	Dr. York forwarded a memo to L.P. Scoville, a corporate manager in Cleveland about Dr. York and James Advey's, Corp. Safety Director, visit to Newark. He wrote that the skin disease is serious and there must be a diminution of the air contamination at the plant.	B-10
07/06/55	[DIAMOND]	Corporate manager Scoville wrote a confidential memo to plant Manager Burton. Scoville directed that any consideration of a consultation with Dr. Sulzger be delayed until it is found out what action can be taken to remove the cause of trouble	B-11

07/12/1955	Rowe, V. K. [DOW]  Goesl, Dr. Andrew G. - cc'd: Gay, Dr. H. H. Crandall, R. A. Smith, H. L. Williams, G. J.	V.K. Rowe writes to a doctor who has a patient with liver damage after exposure to Esteron 2,4,5 (2,4,5-T). Rowe denies that there could be liver damage without massive exposure, that there were no known cases of systemic toxicity, that there was only "an occasional case of dermatitis" and that those cases usually were caused by the diluting agent, not the 2,4,5-T.	B-12
11/03/1955	[MONSANTO]	Monsanto is aware that animal experiments involving the inhalation of 2,4,5-T dust revealed mucosa irritation in living animal subjects while autopsies of dead animals showed pneumonia, heart damage, changes in liver structure, necrosis and changes in kidney structure. Further, Monsanto is aware that human experiments showed pneumonitis and some liver trouble in all subjects exposed to 2,4,5-T.  <del>(Plaintiff's Exhibits 41 and 42).</del>	B-13
11/14/1955	Schmidt, Dr.  Knecht, Dr. Wildhirt, Dr. [DOW]	A0000132-3 in English A0000134 in German - Letter to Dr. Knecht (Boehringer) re: six cases of trichlorophenol intoxication (original, in German, A000134) translation and original from Dow files. Notes liver damage from exposure to 2,4,5-T; "we definitely conclude that there is an effect of 2,4,5-T on the liver.	Exhibit O - Plaintiffs' Response to the Court's Four Questions
06/22/1956	Weger, L.C. [MONSANTO]	Monsanto is aware that its sodium trichlorophenate was producing chloracne and that there were parallel symptoms between the German and Nitro workers.	B-14

06/12/1956	Wheeler, Elmer P. [DOW]  Kelly, R. Emmet, M.D. Nason Soden Weger	Representatives from Monsanto learned that on Nov. 17, 1953, Badische had a trichlorobenzene "explosion" similar to the 1949 Nitro incident, causing 50-60 cases of chloracne [at Badische] over the next 12 months, with additional symptoms of fatigue, vertigo, loss of libido, painful joints, etc. Rabbits placed in cages in the operating area died, as did rabbits later placed in cages that had previously been in the area, all as a result of liver necrosis. They learned that German scientists suspected problems during trichlorophenol processing. The Germans described the most potent chloracne gen as a compound similar to chlorinated diphenyl oxide with additional oxygen atoms (dioxin). The Germans had corresponded with representatives from Dow who had reached the same conclusion.	B-15
00/00/1957	Silverstein, Larry [DOW]	Boehringer communicates to Dow information about the "very, very toxic" chemical dioxin, about chloracne, and about the preparation of trichlorophenol.	B-7
01/22/1957	Boehringer [DOW] - Attn: Rivkin, Leonard	Dow receives results of Boehringer's research on avoiding "chloracne excitors." Dated and handwritten notes on the documents show that Dow knew then that the formation of 2,3,7,8-TCDD dioxin from chlorophenols occurred over 155 degrees C. . . Boehringer provided to Dow its methods for the synthesis of 2,4,5-T to avoid formation of "chlorakne exciting," impurities that can be formed by the usual conventional process.	B-16
02/11/1957	[Wehland] Boehringer [DOW] - Attn: Leonard Rivkin	Cover letter to results of Boehringer's research on avoiding "chlorakne excitors". Handwritten at top: "Attention: Leonard Rivkin." Handwritten at bottom and dated 5/8/57 is drawing of synthesis of 2,3,7,8-TCDD from chlorophenols at 155 C. or higher. note: "Very very toxic / Attacks liver.	B-16

02/22/1957	Smith, Frank B., Technical Director [DOW]  Krahn, Otto Way, Dr.	The German manufacturer, Boehringer, requests information about chloracne problems and that request was forwarded to Dow. In response Dow provides information about hazards and precautions for safe handling of 2,4,5-Trichlorophenol.	B-17
07/17/1957	Rowe, V.K. [DOW]	Discusses animal reactions to 2,4-D,2,4,5-T, MCP, and silvex: gastrointestinal irritation, lung injury, liver injury, kidney injury, and myotonia. Suggests oil formulations are more toxic. Suggests inducing vomiting, gastric lavage, minimize liver damage with diet low in fat and high in protein.	B-18
09/18/57	[DIAMOND]	Dr. Kudszus of Boehringer met with Diamond. Boehringer had a similar chloracne problem that caused Boehringer to shutdown its plant. He told Diamond that dioxin was not formed if the temperature in the trichlorophenol autoclave was not allowed to exceed 155c. Boehringer also explained other steps taken at it's plant.	Exhibit B - Plaintiffs' Response to the Court's Four Questions
00/00/1955- 1957	[DIAMOND]	A 1957 article in Dermatologica noted that German doctors treating patients at Boehringer's trichlorophenol plant in 1954 found that on testing on rabbits ears with more than 100 substances, the doctors isolated TCDD as a byproduct of the reaction leading them to the conclusion that TCDD was the causative agent.  Chloracne was not the only symptom at Boehringer, as several patients developed conjunctivitis, appetite loss, debility, leg weakness, liver disorders, fatigue and emotional disorders.	Exhibit F - Plaintiffs' Response to the Court's Four Questions
09/09/60	[MONSANTO]	Dr. Ottel, the German scientist with whom Monsanto met in June 1956, identifies dioxin as the toxic agent in 2,4,5-T.	B-19



00/00/61	Bauer, H. Schultz, K.H. Spiegelberg, U. [DOW]	Translation for V.K. Rowe of article from Archiv fur gewerbepathologie und Gewerbehygiene, 18, 538-555 (1961) - summarizing chloracne and related systemic effects in chlorophenol workers in Germany; 100 of them examined extensively for effects on liver found as well as profound psychological effects; "the substances which cause chloracne have a pronounced liver toxicity." Most potent cause is TCDD [here called tetrachlorodibenzo dioxane] - Original in German at B0002896.	B-20
07/00/62	[DIAMOND]	The Diamond plant reopens in 1961 with new, higher operating temperatures. Dr. Bleiberg was concerned about the continuing chloracne problem.	B-21
07/00/62	[DIAMOND]	At this time, Diamond was also experiencing problems with chloracne among its customers.	B-22
00/00/63	Widiger, Alex  Coulter, K. E. [DOW] - cc'd: - Haberstroh, W. H. Sauers, R. C. Bender, S. L. Staehling, E. C. Silverstein, L.	Higher temperatures to boost production at 199 Building cause many "mild" and two "severe" cases chloracne.	B-23
04/17/63	[DIAMOND]	Two employees, Baisley and Kalena were hospitalized on 4/17/63. On April 30, 1963 plant manager Guidi objected to further hospitalization in a confidential memo to Dr. McBurney	B-24

05/20/63	[DIAMOND]	In a letter from Dr. Bleiberg to Guidi, urinalysis profiles performed on 25 of 26 employees showed liver abnormalities and the entire worker population at Diamond was at risk.	B-25
05/28/63	[DIAMOND]	Dr. Applebaum provided a final report on Baisley and Kalena which found that Baisley's liver was enlarged and both men showed histologic signs of liver damage and both men were diagnosed with chloracne and acquired porphyria. The doctor stated that it is reasonable to suggest that 2, 4, 5 -22 Trichlorophenol is the common denominator responsible for both diseases.	B-26
11/25/63	[DIAMOND]	New plant manager Kennedy, posted a notice in the Newark plant that a urinalyses was to be performed to control and eliminate the chloracne problem. The tests were really to check for Porphyria.	B-27
04/26/64	Olson, K. [DOW]	At a meeting attended by a number of Dow scientists a literature review on chloracne was presented by Mathews, describing the disease and current attempts at treatment. Rowe reviewed German work and discussed the structure of "tetrachloro benzodioxane" [dioxin].	B-28
07/30/64	Holmes, Ray [DOW] [199 Bldg]  - Hoyle, H.R., Environmental Research 1701 Bldg	In a memo to H.R. Hoyle, Ray Holmes, the manager of building 199 in Midland traces the history of manufacture of 2,4,5 Trichlorophenol in 199 building beginning in mid-1946. Process changes were made in 1952, 1962, 1963. In Nov. 1963 - Feb. 1964 when production was running at limit of hydrolyzing capacity, more caustic insoluble oils were produced than normal. Two supervisors, three operators and one lab employee developed chloracne.	B-29

12/11/64	Boehringer  Lueck, A. Silverstain, L. Trapp, W. [DOW]	“The continuous process [used by Dow] operates at temperatures that are 60-70 degrees higher than the highest temperature we have found to be safe. ... The yield contains 4% mixture of anisols and 1% tetrachlorodibenzodioxin (determined via gas chromatography), which is a horrifying amount.”	Exhibit A - Plaintiffs' Response to the Court's Four Questions
12/11/64		Dow reached extraordinarily high temperatures in the production process after constantly increasing the temperature of their operation. This was despite being warned in 1957 by Boehringer of the danger of increasing temperature.	Exhibit B - Plaintiffs' Response to the Court's Four Questions
12/15/64	Kudszus, Dr. Merz, Dr. [DOW]	In follow up to these meetings Boehringer transmitted a report to Dow on "the isolation of chloracne active substances as well as conclusions concerning operating procedures." Boehringer attached a "special value" to its report because "the extraordinary danger of the tetrachlorobenzodioxin is not generally known." Boehringer was sending it, because Dow has also isolated dioxin from byproducts of its trichlorophenol process.	B-30
01/26/65	Trapp, W.B. [DOW]	Trapp of Dow writes an internal memo to L.C. Chamberlain, Executive Research, providing a summary of problems concerning "Trichlorophenol-Chloracne" and warning of its dangers. Trapp provides suggestions for research with a goal to design a manufacturing process for 2,4,5-trichlorophenol "which is economical and safe particularly from the standpoint of workers' exposure to chloracne excitors."	B-31

01/28/65	<p>Trapp, Walter B. [DOW]</p> <p>Merz, Dr. Hans -</p> <p>cc'd: Hamberg Office Griess, G. A. Dylewski, S. W. Silverstein, L.</p>	<p>Trapp writes to Dr. Hans Merz, of Boehringer, confirming phone conversation between Merz and Dow representatives Trapp, Silverstein, Tolkmith, and Dylewski where they discussed dioxin isomers and their comparative toxicity: Trapp acknowledges that Boehringer "stopped research -- it was too dangerous." Secrecy is again emphasized.</p> <p>Rowe claims that Dow had no chloracne problems related to trichlorophenol production for 25 years until process changes in 1964 (despite years of historical chloracne problems.) At the meeting the participants decided that Rowe should contact U.S. Public Health Service and USDA at such time as scientific data "is [sic] better correlated." Rowe was also to contact Diamond, Monsanto, Hercules, &amp; Hooker regarding the "exciter" problem. Some batches of Monsanto T-acid showed 10 ppm 2,3,7,8-dioxin.</p>	B-32
02/12/65	<p>Frawley, J.P.</p> <p>-</p> <p>Copeland, J.C.</p>	<p>Hercules note to file regarding chloracne associated with Dow manufacture of 2,4,5-T</p>	B-33
02/15/65	<p>DeAtley, Lindlay S. [DOW]</p>	<p>Despite the numerous meetings during this time with German producers to try to solve its chloracne problems, Dow continued to deny any problem to other U.S. chemical companies. For example, in a report of a meeting between Thompson Hayward, (after its 1964 incident) and Dow to discuss chloracne and Dow's inability to meet its contractual obligation to supply 1 million pounds of trichlorophenol to Thompson-Hayward in 1965 the author from Thompson Hayward reported that Dow had claimed that they "never had any problem with chloracne from their trichlorophenol."</p>	B-34

02/24/65	Kelly, R. Emmet [Monsanto]	Emmet Kelly from Monsanto has a conversation with V.K. Rowe of Dow regarding Dow's analysis of Monsanto 2,4,5-T, containing 3-10 ppm "3,4,7,8-trichlorodibenzodioxane" [meaning 2,3,7,8-TCDD]. Dow was trying to decide whether to use five carloads of Monsanto product because Dow was receiving complaints from customers who were developing chloracne. Dow has now 20 cases of chloracne. Dow wanted to prevent Public Health Service looking into chloracne in Dow customers. Rowe wanted to call a crash meeting with all producers to eliminate TCDD contamination "before the PHS got into the act." Kelly and Monsanto were going to contact Amchem and Thompson Co. "To see if the PHS has been after them."	Exhibit B - Plaintiffs' Response to the Court's Four Questions
03/01/65	Doedens, J.D. [DOW]  Rowe, V.K.	Trichlorophenol and derivatives producers are Dow, Monsanto, Hercules, Diamond and Hooker. One of the exciter is 2,3,7,8-tetrachlorodibenzodioxin. Chemical structure and biological activity of each has been confirmed. "It is one of the most toxic materials known causing not only skin lesions, but also liver damage." We have demonstrated positive action at 40 ppb and equivocal results at 4 ppb.	Exhibit 19 - Plaintiff's Remand Brief
03/2/65	G. E. Lynn, [DOW AND MONSANTO]	Minutes of "exiter" contaminant. Two participants felt "we were right on the margin with respect to safety to the custom weed killer applicators .people at Monsanto at first indicated they were not aware of any problem in their current production of 2,4,5-T acid later Dr. Kelly indicated that they had two or three dermatitis problems a year vs. 200 in their old plant."	B-35

03/10/65	memo [DOW AND MONSANTO]	Dow finds dioxin in Monsanto product by rabbit ear test-VPC analysis shows 10 ppm. "In my opinion their products should not be sold until animal tests show these products to be free of significant hazards from the (TCDD) and related materials."	B-36
03/11/65	Silverstein, Larry [DOW]	<p>In 1957, Boehringer communicates to Dow information about the "very, very toxic" chemical dioxin, about chloracne, and about the preparation of trichlorophenol.</p> <p>One 1965 report found that "The materials known to cause chloracne in humans are usually chlorinated complex organic molecules." That report specifically stated that one of the chemicals apparently causing chloracne was an impurity in its herbicides, namely dioxin. The report stated: "This compound (dioxin) and others which have been shown to cause chloracne have also been shown by animal tests and some human experience in other companies to produce liver damage if the exposure is more extensive."</p> <p>Larry Silverstein, Dow's first Industrial Hygienist, prepares a detailed report on the history of chloracne problems at Dow as a background to the more recent 1965 outbreak of chloracne in trichlorophenol process in the 199 Building and 349 Building. He describes a chloracne latency period of 2 months after exposure, with recovery taking 2-5 years. He describes their knowledge of liver damage that had occurred in some non-Dow cases. He describes TCDD as the cause and reviews toxicology research from 1944 to 1965. He describes extensive contamination of 199 Building in repeated tests.</p>	B-7

03/15/65	O'Hare, C.P. [DOW]	Internal Dow memo, single injections of TCDD to rabbit ear produced discernible folliculities. Interesting note that is not mentioned in text the, table shows a level too low to produce folliculitis (0.000002%) still has effects on the liver.	B-37
03/17/65	Kelly, R. Emmet, M.D. [DOW] Stephens, John [MONSANTO] cc'd: Hoffman, Dr. Paul	Dow sends to Monsanto a sample of TCDD for calibration of analytical methods. Dow advises Monsanto that it "is the most toxic compound they have ever experienced. It presumably is toxic by skin contact, as well as by inhalation." According to Dow it is 100 times as toxic as parathion and capable of causing an incapacitating chloracne. Dow recommends "extreme care" in handling. Dow advises that trace amounts (200ppb) have caused chloracne in rabbits.	B-38
03/19/65	V. K. Rowe, Dow, to Kelly, Monsanto, and other defendants. [DOW AND MONSANTO]	Invites them to a meeting to discuss the toxicological problems caused by the presence of certain highly toxic impurities.	Exhibit 4, Sub-ex. 1 - Plaintiff's Remand Brief

3/26/65	[HERCULES] John P. Frawley	<p>In notes on Midland Michigan meeting, John Frawley indicates that Dow “recommended that all manufacturers immediately begin analyses of its process and determine fate of process materials, whether destroyed, burned, or discharged.... I recommend that Hercules take immediate steps to determine whether any acnegens are formed in our TCP process... we should determine the fate of these materials in our plant whether they are chemically destoryed, burned or discharged in the waste stream, etc.” It recommended constant monitoring of TCP &amp; 2,4,5-T production "to protect against illegitimate claims of acne from users of our 2,4,5-T products." Dow also indicated that manufacturers needed to minimize presence of TCDD to prevent Federal Government from becoming involved.</p> <p>ONLY MENTION OF GOVERNMENT: “The Michigan State Department of Health has been consulted on this problem because of labor relations problems. Dow suspstects that the Federal Government has become aware of the problem.”</p>	B-39
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3/26/65	C.L.D. [HERCULES]  - Copeland, J.G	Memo to J.G. Copeland of Hercules' Synthetic Department regarding Midland Michigan meeting. John Frawley of Hercules medical department reports that Dow had a major outbreak of chloracne in its TCP production. Chloracne "is believed to be a systemic disease and requires several years after exposure for the condition to disappear." Frawley also reported the cause of chloracne as 2,3,7,8-TCDD dioxin which has "also been demonstrated to be a potent liver toxicant . . . ." Notes that there is no effective therapy for chloracne. "Liver damage is severe , and a no-effect level based on liver response has not yet been established." Recommends monitoring program of current production of TCP and TCP waste, and system of sample retention and periodic testing of TCP and 2,4,5-T be set up for future production.	B-40
03/30/65	[MONSANTO]	Monsanto identifies dioxin as very conceivably a potent carcinogen.	Exhibit 25 - Plaintiff's Remand Brief

03/25/65	<p>_____</p> <p>Rowe, V. K.</p> <p>Riley, F. H.</p> <p>Smiley, R. N.</p> <p>Grant, L. B.</p> <p>Hutchenreuther, C. O.</p> <p>Amstutz, F. C.</p> <p>Falsey, W. P.</p> <p>Lynn, g. E.</p> <p>Gill, W. M.</p> <p>Wiltse, M. G.</p> <p>Pletcher, J. E.</p> <p>Tucker, J. C.</p> <p>Harris, J. W.</p> <p>Feinauer, H. W.</p> <p>Staehling, E. C.</p> <p>Otis, C. E.</p> <p>Hansen, K. Y.</p> <p>Hoff, R. C.</p> <p>McCoy, W. J.</p>	<p>Dow hosts a major meeting of manufacturers at Midland. V.K Rowe, Holder, Gill and others from Dow report on Dow's history with chloracne problems and their knowledge of the toxicology and industrial hygiene. Rowe claims that there had been no chloracne at Dow for 25 years, but they had recently discovered a Dow plant contaminated with chloracnogens on tools, walls, piping, and all surfaces. "The plant was found to be completely blanketed with chloracnogens."</p> <p>Dow analysis of other manufacturers' products showed "surprisingly high" amounts of TCDD.</p> <p>They identify the causative agent of chloracne as 2,3,7,8 TCDD. Dow knows of no effective therapy for chloracne. Chloracne can recur 30 years after exposure. Likewise "liver damage is severe, and a no-effect level based on liver response has not yet been established." TCDD causes response on rabbit ear test at concentrations even below detection limits</p> <p>The participants were concerned about the problem of "customers using the product under far less desirable conditions of health control than we can provide our workmen in our own plant."</p>	<p>Exhibit 20 - Plaintiff's Remand Brief</p> <p>B-41</p> <p>B-42</p> <p>B-43</p>
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03/26/65	Frawley, John P., [HERCULES]	Dow suspects that the Federal Government might have become aware of the problem. Dow recommends that all manufacturers immediately begin analyses of their process and determine fate of process materials, whether destroyed, burned, or discharged. It recommends constant monitoring of TCP and 2,4,5-T production "to protect against illegitimate claims of acne from users of our 2,4,5-T products." Manufacturers needed to minimize presence of TCDD to prevent Federal Government from becoming involved.	B-44
04/14/65	Frawley, J.P. [HERCULES]	In a "Note to Jacksonville Plant File Re: 2,4,5-T", Dow reports dioxin ppm levels in shipments from Hercules to Dow. Dow's VK Rowe "felt that these analyses indicated a trend in our own production to an increasing amount of acnegen."	B-45
06/24/65	Rowe, V. K.  Mulholland, Ross [DOW] - cc'd: Silverstein, L. Otis, C. Holdeman, Grady Amstutz, F. Goergen, G. Hoyle, H. Falsey, W. Rowe, V. K. (2) T17.4-12-20 Correspondence	Rowe writes to Ross Mulholland (Dow Chemical of Canada) responding to a request for information to use in discussing "your problem" with Naugatuck and the Co-op. Rowe warns that TCDD is "exceptionally toxic. It has a tremendous potential for producing chloracne and systemic injury." He emphasizes the need to avoid occurrence of chloracne in customers, which would bring down regulatory restrictions or even bans. "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." Rowe concludes: "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." "Under no circumstances may this letter be reproduced, shown, or sent to anyone outside of Dow."	Exhibit 23 - Plaintiff's Remand Brief

7/9/65	WA Goodloe [DIAMOND]	Diamond analysis shows dioxin of up to 40 ppm in its process stream.	Exhibit 21 - Plaintiffs' Remand Brief
7/19/65	John P. Frawley	A confidential file memorandum from Hercules' chief toxicologist J.P.Frawley summarized a conversation that he had with Dow's Earl Farnham in which Mr. Farnham confirmed Dow's desire to keep the hazards of dioxin from going public	Exhibit 24 - Plaintiffs' Remand Brief
04/06/66	Kelly, J.C. [DIAMOND ALKALI]	Dow informs Diamond Alkali that after testing Diamond Alkali's technical 2,4,5,T that it "will not be in the market for [its] material," because it could create a chloracne problem at Midland.	B-46
06/03/66	Silverstein, L.G., [DOW]	Despite Dow's stated concerns for more than a year about cleaning up the contamination of Building 199 at Midland, wipe samples for chloracne contamination in 199 Building continued to reveal contamination in many areas, indicating the need for continued intensive clean-up and continuation of strict personal hygiene and housekeeping efforts "to avoid further chloracne problems."	B-47
08/26/65	Ford, J.J. [HERCULES]  - Taves, Dr., M.A.	Memo transmitting results of 2,3,7,8-TCDD analysis of Hercules 2,4,5-T up to 3.6 ppm.	B-48
11/03/66	Ford, John J. [HERCULES]  - Wilder, H.E.	Bio-test report to Hercules from Industrial Bio-Test Laboratories Acute Oral Toxicity Studies on Three materials: a) typical current production 2,4, 5-T b) acid prepared from high recycle stock c) a sample of acid representative of process after changeover Attachment missing (Describes procedure for the determination of 2, 3, 7, 8-Tetrachlorodibenzo.)	B-49

11/04/66	Tinker, Bruce [DOW]	Partially illegible handwritten sheets, dosing unidentified animals with 2,3,7,8-TCDD. Notes on dead & sacrificed animals where legible indicate "extremely fatty liver".	B-50
02/15/67	Rowe, V. K. [DOW]  Dixon, William E., Bioproducts Department  cc: Corbin, W.L. Pletcher, D.L. Cowell, J.H. McCoy, W.J. Holder, B.B., M.D.	V, K, Rowe prepares a memo about discussions with Thompson Chemical about Thompson's chloracne problems arising from an accident in trichlorophenol manufacturing. Rowe told Thompson that it was caused by 2,3,7,8-tetrachlorodibenzodioxin, a material that "was not only extremely toxic systemically, but it was also an extremely potent chloracnegen." Holder from Dow told Thompson that extreme precautions were needed to clean up equipment and warns against using steam. Notably Rowe does not volunteer information about manufacturing processes or methods which would reduce TCDD production.	B-51
04/25/67	Widiger, Alex [DOW]  Coulter, K. E. - cc'd: Haberstroh, W. H. Sauers, R. C. Bender, S. L. Staehling, E. C. Silverstein, L.	In a major historical report for Dow, Alex Widiger describes how "in Midland more than half of the Dovicide employees have chloracne of varying intensity and it is impossible to say when or where these incidences occurred." From the toxicology perspective: "chloracne is a cosmetic evidence of the attack and serious liver damage is an invisible effect of the attack."  1963: Higher temperatures to boost production at 199 Building cause many "mild" and two "severe" cases chloracne.	B-23

06/29/67	John P. Frawley [HERCULES]  Oettel, H.	Letter to Oettel at BASF referring to Hercules' difficulties with dioxin bioassays, "unable to achieve desired sensitivity partially because 2,4,5-trichlorophenoxyacetic acid and the ester are significantly more toxic than tichlorophenol."	B-52
06/30/67	Eagan, J.M [HERCULES]  Wilder, H.E.  cc'd: Frawley, J.P.	Memo to H.E. Wilder regarding a report of five cases of chloracne in Columbia from use of phenoxy herbicides. Inference that some producers allowed contaminated 2,4,5-T to enter sales channels in 1963 and 1964 and warns to be alert for "abnormal operating conditions which might contribute to the presence of the chemical which is repute to be responsible for this type of chloracne."	B-53
00/00/68	[DIAMOND]	A Diamond employee, Charles Morissey worked at the Newark plant for only a few months, but his skin turned black and was forced to undergo several chemical face peels and dermabrasion treatments.	B-54
00/00/68	[MONSANTO]  Wallace Testimony 2798	The number of chloracne cases has reached the "saturation" point.	B-3
00/00/68	[DOW]; no author cited	Chronology of Dow experience with chloracne in both workers and customers describes Dow's knowledge of chemical agents (chloracnegens, or acnegens) from 1934 to 1968. Chronology also notes that chloracne "may be fatal." Report concedes that there has been a continuing problem with chloracne for three decades (100 cases between 1964 and 1968 alone).	B-55

01/23/68	Kligman, Albert M.  Rowe, V.K.  [DOW]	Dow has begun human testing of dioxin by Dr. Albert Kligman. Kligman writes to V.K. Rowe, reporting second test of TCDD on skin of human "volunteers," applying 1% solution TCDD to skin every other day for one month. Chloracne developed in 8 of 10 subjects with lesions lasting 4-7 months. Biopsies showed that these lesions were distinguishable from those caused by Dow Product 6X and Halowax.	B-56
10/16/68	[HERCULES]  Emil Christofano	Letter to Dow's V.K. Rowe regarding Hercules' unsuccessful attempt to replicate Oettel's [BASF] dioxin bioassay technique. Seeks advice whether to publish unsuccessful study which would "certainly" raise questions about the reason for the study.	B-57
12/24/68	[HERCULES]  Emil Christofano	Letter from V.K Rowe to Emil Chistofano, Hercules, replying to October 16, 1968 Christofano letter. Rowe advises against publication of study because of "possible consequences" and would be a "mistake to kick this in the public eye" until we have answers to "obvious questions.	B-58
00/00/69	[MONSANTO]	Dioxin can be reduced or eliminated by changing the raw material ratios, the feed time and the hold time.	B-59
02/04/69	Palleta, A.J [HERCULES]  - Frawley, J.P.	Letter from Bionetics Research labs to John Frawley enclosing "rough" copy of 2,4,5-T toxicology report. "These results indicate strong tetralogical activity of 2,4,5-T in these strains of rodents."	B-60

11/25/69	Rowe, V.K. [DOW]  (RE: DIAMOND ALKALI)	Bionetics report using Diamond Alkali 2,4,5-T demonstrates serious toxicity, including embryotoxicity.  Dow meeting with FDA Nov. 25, 1969 re: TCDD in Bionetics sample, Dow plans to repeat Bionetics study with Dow 2,4,5-T and analyze Bionetics 2,4,5-T sample results.	B-1
11/25/69	[HERCULES]	Notes for J.E. Johnson from G. Lynn and V.K. Rowe regarding Hercules' sale of 2,4,5-T to Dow in late 1965. Notes indicate that Hercules' 2,4,5-T contained 3 ppm of dioxin in 1965.	B-61