Monsanto

MONSANTO INDUSTRIAL CHEMICALS CO.
800 N. Lindbergh Boulevard
St. Louis, Missouri 63166
Phone: (314) 694-1000

March 18, 1975

Mr. Dan A. Albert
Staff Supervisor
Personnel Relations
Westinghouse Electric Corporation
Highway 58 West
South Boston, Virginia 24592

Dear Mr. Albert:

Attached are responses to the questions listed in your letter dated February 3, 1975.

In addition to the industrial hygiene practices described in our responses to your questions, I cannot overemphasize the need to properly control the use and handling of Inerteens to prevent their escape into the environment. Also, in discussing this information with your employees, I strongly recommend that the perspective gained from over 40 years of experience in which no human harm has resulted, be emphasized. In summary, the proper handling of Inerteens should pose no environmental or human health problems, permitting society's continued use of a very valuable material.

I hope the above information is useful to you. If I can be of further service please let me know.

Sincerely,

W. B. Papageorge

W. B. Papageorge
Manager, Product Acceptability
Specialty & Process Chemicals

WBP:pd

PLAINTIFF'S EXHIBIT 56 5-21-98
PENGAD-Bayonne, N.J.

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1. Question: Does Inerteen have permanent effects on the human body? If so, what type of permanent damage and how long a period of time does it take for this to develop? If not, explain why, if possible.

The polychlorinated biphenyls in Inerteen can have permanent effects on the human body.

The length of time or period of exposure necessary to develop symptoms depends on the degree or amount of exposure. In general, a single exposure for a few minutes to atmospheric concentrations that cause irritation to the eyes and/or respiratory tract would not be expected to cause either the skin eruptions or demonstrable liver injury. The problem arises from repeated and prolonged exposure to atmospheric concentrations in excess of the accepted Threshold Limit Levels or repeated and prolonged skin contact.

The polychlorinated biphenyls have not been recognized as skin "irritants" in the same sense that caustic materials or many organic chemicals are irritants. Because of their "solvent" action in removing the natural fats and oils from the skin, leaching, drying and chapping, repeated and prolonged skin contact should be avoided.

When the polychlorinated biphenyls are mixed with other chlorinated hydrocarbons, the mixture may be classified as a skin irritant.

The potential toxic effects in humans from excessive exposure to polychlorinated biphenyls include injury to the liver and chloracne. In animals, the liver effect is demonstrated by increased liver weights and injury to cellular tissue. Although chloracne is difficult to evaluate in animals, in humans, this take the form of comedones (large blackheads with typical acute pustules) and may be an external symptom of over exposure preceding serious liver injury.

Animal data and human experience indicate that the toxic effects are similar whether exposure results from ingestion, inhalation of vapors, or absorption of the liquid material through the unbroken skin.

(See AIHA Hygienic Guide Series - "Chlorodiphenyls" attached.)

2. Question: Several hourly employees have mentioned recently that many chemicals such as Inerteen cause sterilization after prolonged use. Is this true?

There is no evidence that polychlorinated biphenyls cause "sterilization" in humans.

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3. Question: Since Inerteen effects birds and other animals, if there is no real effects to human beings, how do you explain it to employees in such a way that they will understand why it can kill a bird and not a human?

There is a potential real effect to humans - including death - as discussed in the answer to Question 1.

Due to differences in metabolism of food (and food contaminants) in birds and humans (and particularly the difference in the reproduction process in birds and mammals - including humans), birds are particualrly sensitive to many chlorinated hydrocarbons including polychlorinated biphenyls.

4. Question: If an employee spills Inerteen on his clothing and later takes the clothing home to be wa ed with other clothes, will this have any effect on he or his family and should be carry his clothes home to be washed?

There should not be any effect on an employee or his family from home laundering of work clothing. If washed with other clothing, there may be residual odor of the chlorinated hydrocarbons in the clothing.

5. Question: Employees carry Inerteen home on the soles of their shoes and complain quite a bit about the effect Inerteen has on wearing out their shoes. Is this a serious problem? Will Inerteen in the soles and leather of shoes, over a long period of time, have an effect on the feet and skin since the shoe is the only protective equipment we wear on our feet and the Inerteen penetrates through the leather.

There should not be polychlorinated biphenyl on the floor for workmen to contaminate their shoes to carry home. The plasticizer or solvent action will destroy or shorten the life of the shoes. More importantly, the wearing of contaminated shoes could lead to absorption of the liquid through the soles of the feet as through any other unbroken skin surface.

6. Question: There is one employee in our plant who had no problem whatsoever with Inerteen years ago. After six years of using, now when he works in Inerteen (which is a part of his job) he develops a swelling on the inner bicep of his left arm, only in one location. Could this be from Inerteen or not? It goes away as soon as he gets out of the Inerteen. It is similar to the swelling after taking an injection.

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We do not believe there can be any association between "a swelling on the inner bicep" of the arm and exposure to polychlorinated biphenyls.

7. Question: Are there hand cleaning solvent materials that we should be using when working in Inerteen to coat our skin before working in it and to wash it off after we finish working in it? Please give your recommendation. Our employees working in Inerteen are not able to use gloves since it is an assembly area. Even if they could, the Inerteen would destroy the protective glove.

We assume the question refers to the use of "Barrier Creams" rather than a "hand cleaning solvent".

There are a number of barrier creams available to protect workers against water <u>insoluble</u> solvents. Probably the most effective include silicone "to provide an impenetrable shield". A problem with such creams is that they may offer a false sense of security.

Proper use includes a discipline which requires liberal application at the beginning of a work shift and after each washing of the hands during the work day.

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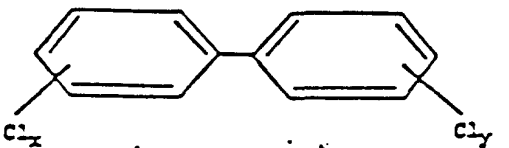
HYGIENIC GUIDE SERIES

Chlorodiphenyls

(Containing 42% and 54% Chlorine)



(x + y = 3 or 5)

Significant Physical Properties[1]

The chlorodiphenyls are light straw-colored mobile (42% chlorinated) and viscous (54% chlorinated) liquids with typical chlorinated aromatic odors. These compounds are chlorinated to specific weights of chlorine. Chlorodiphenyl (42%) contains 42.0 ± 0.5 chlorine, an amount corresponding to three chlorine atoms in unassigned positions. Chlorodiphenyl (54%) contains 54.3% chlorine corresponding to five chlorine atoms in unassigned positions. Both compounds are insoluble in water, but soluble in benzene, kerosene, acetone, amyl alcohol, ether and chloroform.

	Chlorodiphenyl (42%)	*Chlorodiphenyl (54%)*
Molecular weight:	247.53	326.45
Flash point (Cleveland O. C.):	176°-180°C (349°-356°F)	None
Distillation range:	325°-366°C	365°-390°C
Specific gravity:	1.381-1.392 (25°/15.5°C)	1.495-1.505 (65°/15.5°C)
Vapor pressure:		
0°C	0.001 mm	0.00006 mm
25°C	0.006 mm (est)	0.00054 mm (est)
150°C	4.3 mm	1.4 mm
200°C	29.0 mm	9.0 mm
At 25°C and 760 mm Hg:		
Saturated air contains	0.080 mg/liter	0.009 mg/liter
1 mg/liter =	98.8 ppm	74.9 ppm
1 ppm =	0.010 mg/liter	0.013 mg/liter

1. Hygienic Standards

A. Recommended maximal atmospheric concentrations (8 hours): One milligram chlorodiphenyl (42%) per cubic meter of air and 0.5 milligram chlorodiphenyl (54%) per cubic meter of air.[2] This is based on the results of chronic animal inhalation studies.[3]

B. Short exposure tolerance: Ten mg of a diphenyl of unspecified chlorine content per cubic meter of air has been reported as unbearably irritating.[4]

C. Atmospheric concentration immediately hazardous to life: Not known for man. Irritation of the eyes, nose and throat at levels which have not caused acute illness preclude the likelihood of voluntary exposure to immediately hazardous concentrations.

The Committee wishes to acknowledge the preparation of the [illegible] of the Guide by the Industrial Hygiene and Clinical Toxicology Committee of I. M. A., and to acknowledge also the assistance of Lester P. Whitmer and Jack T. Garrett in the writing of the Guide.

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II. Toxic Properties

A. Inhalation: Experiments with chlorodiphenyl (42% chlorine) were run at concentrations of 8.6 μg/liter and at 6.83 μg/liter of air. Cats, mice, rabbits and rats were unaffected by the higher level while guinea pigs showed poor growth after seventeen 7-hour/day exposures over 24 days. Eighty-four 7-hour/day exposures at the lower concentration had essentially no effect on similar species of animals.[3]

In the case of chlorodiphenyl (54% chlorine) eighty-three 7-hour/day exposures over 121 days to a concentration of 5.4 μg/liter resulted in injury to liver cells and increased liver weights in rats. At a concentration of 1.5 μg/liter for one hundred and fifty 7-hour/day exposures over 213 days, the rats showed distinct microscopic changes in the liver.[3]

The literature contains many references to the potential toxic effects of chlorinated diphenyls in man and animals. The early work included investigations of chlorinated naphthalenes, chlorinated diphenyls, chlorinated diphenyl oxide and various mixtures of these. An early report indicated serious toxic effects from chlorodiphenyl chlorinated to the extent of 65%.[4] A later report by the principal author properly identified the earlier sample as a mixture of chlorinated diphenyl and chlorinated diphenyl benzene.[4] However, only a few authors of subsequent papers, bulletins or textbooks have noted this correction and the original data are cited repeatedly as relating to chlorinated diphenyl alone.

B. Skin contact: Both compounds are readily absorbed through the clipped, intact skin of rabbits. The minimum lethal dose when the undiluted materials were applied to the covered clipped, intact skin of rabbits for 24 hours was approximately 1.0 cm/kg for the 42% chlorinated and 1.5 gm/kg for the 54% chlorinated.[3]

Local action on the skin is similar to that of common organic solvents where contact leads to removal of natural fats and oils with subsequent drying and cracking of the skin.

Human cases of chloracne have not been reported from the use of these two specific chlorodiphenyls. The potential undoubtedly exists because of cases which were reported from the use of chlorodiphenyls with a higher chlorine content and from mixtures with other chlorinated aromatic compounds.[1,2,5]

C. Eye contact: The liquid products and their vapors are moderately irritating to eye tissues.

D. Ingestion: The acute oral toxicities of the undiluted compounds are not great as evidenced by oral LD_{50}'s in rats of approximately 8.65 gm (7.61 to 9.78 gm) per kilogram for the 42% chlorinated and 11.9 gm (10.48 to 13.45 gm) per kilogram for the 54% chlorinated.[3] Central atrophy of the liver appears to be the chief toxic effect.

III. Industrial Hygiene Practice

A. Industrial uses: The chlorodiphenyls are used as dielectrics for condensers, capacitors and transformers, plasticizers in synthetic resins, in emulsion adhesives, as nonflammable hydraulic fluids and as transfer media.

B. Evaluation of exposures:

1. *Air sampling and analysis:*
   a. Direct field methods: None
   b. Laboratory methods:
      (1) Collect in secondary butyl alcohol in fritted bubbler or two large impingers in series; concentrate sample and complete analysis by one of various methods for chlorinated hydrocarbons.[6]
      (2) Sample air through combustion furnace, collect chloride ion from decomposed chlorodiphenyl in suitable alkaline solution and determine chloride ion concentration.[6]

C. Hazards and their recommended control:

1. *Inhalation:* Absorption is chiefly by inhalation. Concentrations in the workroom atmosphere should be maintained below the recommended levels. Where the chlorinated diphenyls are used at room tempera-

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tures, the hazard of inhalation is considered slight or absent. When these materials are subjected to elevated temperatures, the process either should be completely enclosed or other adequate mechanical exhaust ventilation must be provided to reduce concentrations to safe levels. In heat transfer media applications, the system must be designed and constructed so that it is leakproof. Special gasket materials and pump seals are available to prevent leakage. The reservoir tank should be airtight except for a vent to the outdoors. In the event of spills or leaks of hot fluids, use chemical cartridge respirators or gas masks approved by the U. S. Bureau of Mines for protection against organic vapors. These will provide good protection up to the concentrations shown on the approval labels and the odor will give ample warning if it comes through the device.

2. *Skin contact:* Operations and handling procedures should be such as to avoid the possibility of prolonged or repeated skin contact. Contaminated clothing must be laundered before reuse.
3. *Eye contact:* Eye protection should be used where there is a possibility of liquid splashes.
4. *Ingestion:* Ingestion of these materials is not a problem in industry.
5. *Fire and explosion:* The chlorodiphenyls are fire-resistant or essentially nonflammable liquids. When exposed to flame or hot surfaces they may decompose to form CO, CO_2, HCl, phenolics and aldehydes depending on the temperature, availability of oxygen, area of the heated surface, rate of application of the liquid to the surface and other variables.

IV. Medical Information

A. Emergency treatment: Skin surfaces exposed to chlorodiphenyls should be thoroughly washed with soap and water at once. If clothing has been contaminated it should be removed promptly.

If exposure to a high vapor concentration occurs, as in the case of spills at elevated temperatures, the patient should be moved from exposure and kept at rest until seen by a physician. Oxygen should be administered if breathing is difficult.

Eyes contaminated with chlorodiphenyl should be irrigated with water for at least 15 minutes and the patient should be seen by a physician. Depending on the amount of inflammation and pain present, drugs like Cortimorin® ointment and topical Pontocaine® may be indicated.

B. Special procedures: Persons who are regularly or repeatedly exposed to chlorodiphenyls should be examined periodically to detect early evidence of skin irritation and/or liver damage. Persons with known liver disease should not be exposed to repeated contact with the chlorodiphenyls.

V. References

1. Monsanto Company, Organic Chemicals Division: *Tech. Bulletin #PL-305, Aroclor Plasticizers* (Dec. 1960).
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4. Elkins, H. B.: *The Chemistry of Industrial Toxicology.* John Wiley and Sons, Inc., New York (1959).
5. Drinker, C. K., M. F. Warren, and G. A. Bennett: The Problem of Possible Systemic Effects from Certain Chlorinated Hydrocarbons. *J. Ind. Hyg. Toxicol. 19:* 283 (1937).
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7. Wheeler, E. P.: Personal Communication, Monsanto Company, St. Louis, Missouri 63166.
8. Greenburg, L., M. R. Mayers, and A. R. Smith: The Systemic Effects Resulting from Exposure to Certain Chlorinated Hydrocarbons. *J. Ind. Hyg Toxicol. 21:* 29 (1939).

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