AN 4626

November 7, 1989

Peter Lloyd
CL-OTM-3

SUBJECT: LINDANE - WIRE & CABLE JACKETING

This is in response to our conversation and your note to Bob Hinderer regarding the use of Lindane in wire and cable jacketing.

If the use is only to protect the jacketing or coating itself against termites, the end product would not be considered a pesticide. If, however, any claims are made that the end product has pesticidal uses, then it would be subject to the Federal Insecticide, Fungicides and Rodenticide Act and all of the ramifications thereof. Consequently, one must be very careful about the claims made for such a product (see enclosed copy of 40CFR 162.4).

I talked to EPA about registered termite control products. Lindane is not being used because its registration for use against termites was cancelled by default. That is, apparently the producers were not willing to develop and submit data that EPA required for this use. The product most used now is chlorpyorifos and synthetic pyrethins. I am enclosing a copy of the documentation for the TLV-TWA's for these three substances. Please note, Lindane and chlorpyrifos have a skin notation indicating that they can be absorbed through the skin.

Other than complying with the exposure level limitations and OSHA Hazardous Substance Communication Regulations, I know of no other regulatory requirements.

I am sorry I have no expert's names to supply you, otherwise, you may wish to consult with suppliers of the above pesticides for their recommendations.

W. C. Bachtel

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91107-2/jp

Attachments

cc: R. Hinderer (w/o attachments)

BGH19033

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(mm) The term "teratogenic" means the property of a substance or mixture of substances to produce or induce functional deviations or developmental anomalies, not heritable, in or on an animal embryo or fetus.

(nn) The term "toxicity" means the property of a substance or mixture of substances to cause any adverse effects.

(1) The term "acute toxicity" means the property of a substance or mixture of substances to cause adverse effects in an organism through a single short-term exposure.

(2) The term "subacute toxicity" means the property of a substance or mixture of substances to cause adverse effects in an organism upon repeated or continuous exposure within less than ½ the lifetime of that organism.

(3) The term "chronic toxicity" means the property of a substance or mixture of substances to cause adverse effects in an organism upon repeated or continuous exposure over a period of at least ½ the lifetime of that organism.

(oo) The term "use" means any act of handling or release of a pesticide, or exposure of man or the environment to a pesticide through acts, including but not limited to:

(1) Application of a pesticide, including mixing and loading and any required supervisory action in or near the area of application;

(2) Storage actions for pesticides and pesticide containers; and

(3) Disposal actions for pesticides and pesticide containers.

[Use as defined here incorporates application. However, the certification requirement for certain restricted use pesticides only applies with respect to applications of such pesticides. Many aspects of use do not include application (e.g. storage, transportation), and hence are outside the requirement for certification.]

(pp) The term "use-dilution" means a dilution specified on the label or labeling which produces the concentration of the pesticide for a particular purpose or effect.

(qq) The term "use pattern" means the manner in which a pesticide is applied and includes the following parameters of pesticide application:

(1) Target pest;

(2) Crop or animals treated;

(3) Application site; and

(4) Application technique, rate and frequency.

(rr) The term "volatility" means the property of a substance or substances to convert into vapor or gas without chemical change.

§ 162.4 Status of products as pesticides.

(a) *Determination of intent of use.* A substance or mixture of substances is a pesticide under the Act if it is intended for preventing, destroying, repelling or mitigating any pest. (See section 2(u) of the Act and § 162.3(ff).) Such intent may be either expressed or implied. If a product is represented in any manner that results in its being used as a pesticide, it shall be deemed to be a pesticide for the purposes of the Act and these regulations.

(b) *Products considered to be pesticides.* A product will be considered to be a pesticide if:

(1) Claims or recommendations for use as a pesticide are made on the label or labeling of the product including, but not limited to, collateral advertising, such as publications, advertising literature which does not accompany the product, or advertisements by radio or television;

(2) Claims or recommendations for use as a pesticide are made verbally or in writing by representatives of the manufacturer, shipper, or distributor of the product;

(3) The product is intended for use as a pesticide after reformulation or repackaging; or

(4) The product is intended for use both as a pesticide and for other purposes.

(c) *Products not considered pesticides.* The following are examples of the types of products which are not considered pesticides:

(1) Deodorizers, bleaching agents, and cleaning agents for which no pesticidal claims are made in connection with manufacture, sale, or distribution;

(2) Paints and other formulated coatings which are treated with fungicides to protect the coating itself and for which no pesticidal claims are made in the manufacture, sale, or distribution of the product as to protection of other surfaces or objects;

(3) Building material products *per se*, such as lumber, fiber boards, adhesives, and caulking material, which have been treated to protect the material itself against any pest and for which no pesticidal claims are made as to protection of other surfaces or objects in the manufacture, sale, or distribution of the product;

(4) Fabric products *per se* which have been treated to protect the fabric product itself from insects, fungi, or any other pest and for which no pesticidal claims are made as to protection of other surfaces or objects in the manufacture, sale, or distribution of the product;

(5) Fertilizers and other plant nutrients *per se;* and

(6) Intermediate substances intended for the production of a pesticide product by chemical reaction with other substances.

§ 162.5 Pesticides required to be registered.

(a) *Registration Requirement.* No person in any state may distribute, sell, offer for sale, hold for sale, ship, deliver for shipment, or receive and (having so received) deliver or offer to deliver to any person any pesticide which is not registered with the Administrator, except as provided by paragraph (b) of this section.

(b) *Exemption from Registration Requirement.* The following pesticides are exempt from the registration requirements of the Act and this part:

(1) *Pesticides transferred between establishments.* A pesticide which is transferred from one registered establishment to another registered establishment, operated by the same producer, solely for packaging at the second establishment or for use as a constituent part of another pesticide produced at the second establishment. However, pesticides transferred in accordance with this subsection shall be subject to the following misbranding provisions under section 2(q) of the Act: 2(q)(1) (A), (B), (D), (E), (G), (F) in accordance with § 162.10(i)(1)(iii)(C), 2(q)(2)(A), (C) (i) and (iii)), (D);

tribution of the product as to protection of other surfaces or objects;

(3) Building material products *per se*, such as lumber, fiber boards, adhesives, and caulking material, which have been treated to protect the material itself against any pest and for which no pesticidal claims are made as to protection of other surfaces or objects in the manufacture, sale, or distribution of the product;

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(2) *Pesticides transferred under experimental use permits.* A pesticide being transferred for use pursuant to and in accordance with the requirements of an experimental use permit as provided by sections 5 and 12(b)(5) of the Act and Part 172 of these regulations;

(3) *Pesticides transferred for purposes of disposal.* A pesticide shipped solely for purposes of disposal, in accordance with section 19, Part 165 of these regulations, or applicable Administrator's Orders. However, pesticides transferred in accordance with this subsection shall be subject to the following misbranding provisions under section 2(q) of the Act: 2(q)(1)(A), (B), (D), (E), (F), (G) in that all containers must be clearly marked that the product is for disposal only; 2(q)(2)(A), (C) (i) and (iii); (D);

(4) *Pesticides intended for export.* A pesticide intended solely for export to any foreign country, when prepared or packed according to the specifications or directions of the foreign purchaser;

(5) *Pesticides granted an emergency exemption.* A pesticide being transferred for use by a Federal or State agency under the provisions of an emergency exemption, as provided by section 18 of the Act and Part 166 of these regulations; and

(6) A pesticide product that is offered solely for human use and is also (i) a new drug within the meaning of section 201(p) of the Federal Food, Drug, and Cosmetic Act, or (ii) an article that has been determined by the Secretary of Health, Education, and Welfare not to be a new drug by a regulation establishing conditions of use for the article, is exempt from the requirements of the FIFRA. Such products are subject solely to regulation by the Food and Drug Administration in accordance with the Federal Food, Drug, and Cosmetic Act and implementing regulations set forth in Title 21 of the Code of Federal Regulations.

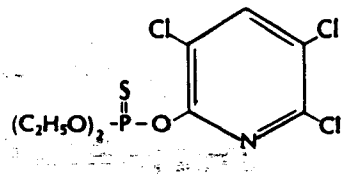
(7) *Other exemptions.* The Administrator may by regulation exempt from the requirements of the Act any pesticide which he determines either (i) to be adequately regulated by another Federal agency, or (ii) to be of a character which is unnecessary to be sub-

CHLORPYRIFOS

CAS: 2921-88-2

0,0-Diethyl 0-(3,5,6-trichloro-2-pyridinyl)phosphorothioate; Dursban®

$C_9H_{11}Cl_3NO_3PS$



Skin

TLV-TWA, 0.2 mg/m³*

Pure chlorpyrifos is a white crystalline solid. Its physiochemical properties include:

Molecular weight: 350.57
Melting point: 42.5° to 43°C
Vapor pressure:[1] *1.87 × 10^{-5} torr at 25°C*

It is soluble in most organic solvents.[1-3]

Chlorpyrifos is an organophosphorus insecticide which was introduced for use in agriculture in 1965.[4]

The acute oral LD_{50} in adult female and male rats is reported at 135 and 163 mg/kg, respectively.[1,4] Gaines reported the acute oral LD_{50} as 82 mg/kg.[5] The acute dermal LD_{50} in solvent solutions for rabbits is about 2000 mg/kg.[1,4] Short-term inhalation studies have been carried out by the manufacturer and others.

Chlorpyrifos is an active inhibitor of plasma cholinesterase. However, it has only moderate capacity to reduce red blood cell cholinesterase or cause cholinergic symptoms and little capacity to cause systemic injury. Chlorpyrifos is absorbed through the skin of laboratory rabbits and human volunteer subjects.

The cholinesterase levels of the humans appeared to be much less affected by the same exposure than rabbits. In limited studies, four repeated doses of 10 mg/kg each, applied to the skin of humans for 12 hours each did not cause depression; but four doses of 25 mg/kg for 12 hours each produced depressed plasma cholinesterase levels. Red blood cell cholinesterase levels were unaffected. Chlorpyrifos does not cause demyelination.

Chlorpyrifos does not have enough vapor pressure to present a vapor hazard, but inhalation of particles has been shown to depress plasma cholinesterase. Dogs and sheep were exposed for a four-hour period to a thermal fog or liquid aerosol at a concentration of 4 or 8 mg/ft³ (140-280 mg/m³). The only effect observed was a mild depression of plasma cholinesterase in the dogs exposed at the higher concentration. In another study in which rabbits and humans were exposed simultaneously to an ultra low volume spray, in order to create an exaggerated exposure, rabbits showed a slight depression in plasma cholinesterase, but there was no effect on plasma cholinesterase of human subjects.[6]

Dogs and rats fed chlorpyrifos for two years showed no effects due to cholinesterase depression of signs of any systemic toxicity at daily dosages of 3.0 mg/kg per day.[7] At daily dosages of 0.3 mg/kg per day and 0.1 mg/kg per day, there was no significant depression of cholinesterase activity in the plasma of dogs and rats, respectively.

Human test subjects ingesting 0.03 mg chlorpyrifos/kg per day for three weeks did not show statistically significant plasma cholinesterase depression. Nine doses of 0.1 mg/kg per day caused reduction in plasma cholinesterase depression, but no other effect.[8] These results were confirmed in a subsequent study of human volunteers ingesting daily for four weeks levels of 0.014, 0.03, and 0.1 mg/kg; significant inhibition of plasma cholinesterase occurred only at the 0.1 mg/kg level.[9]

Spray workers exposed at 0.5% chlorpyrifos emulsion in field trials for malaria control on premises showed a measurable decrease in plasma and red cell cholinesterase levels.[10] In this study, 5 of 7 sprayers showed more than 50 percent reduction in cholinesterase within two weeks after the spraying program began. In another study,[6] human volunteers were exposed to thermal aerosols containing chlorpyrifos insecticide for one period. Exposures of 3 to 8 minutes at concentrations of about 0.8 μm/m³ in air produced no significant alteration of cholinesterase levels. This concentration resulted from the recommended application rate in thermal fogging.

Available studies indicate that chlorpyrifos is rapidly metabolized in the animal body.[8]

There was no evidence of teratologic or reproductive effects in male and female rats fed 1.0 mg/kg per day during a three-generation reproduction and fertility study.[11]

A time-weighted average TLV for chlorpyrifos of 0.2 mg/m³ is recommended to prevent any measurable decrease in plasma cholinesterase activities and provides a very wide margin of safety in preventing cholinergic symptoms or organic injury. The Committee also recommends the deletion of the STEL until additional toxicological data and industrial hygiene experience become available to provide better base for quantifying on a toxicological basis what the STEL should be. The reader is encouraged to review the section on *Excursion Limits* in the Introduction to Chemical Substances of the current TLV booklet for guidance and control of excursions above the TLV-TWA, even when the 8-hour TWA is within the recommended limits.

References

1. *The Merck Index*, 10th ed., p. 309-310. Merck & Co., Inc., Rahway, New Jersey (1983).
2. **Martin, H.:** *Pesticides Manual*, 2nd ed. British Crop Protection Council (1971).
3. **Spencer, E.Y.:** *Guide to the Chemicals Used in Crop Protection*. Canada Dept. of Agriculture (1968).
4. **Gray, H.E.:** *Down to Earth 21*:26 (1965). A Dow Chemical Co. Publication.
5. **Gaines, T.B.:** *Tox. Appl. Pharm. 14*:515 (1969).
6. **Ludwig, P.O., D.J. Kilian, H.J. Dishburger and H.N. Edwards:** *Mosquito News 30*:346 (1970).
7. **FAO/WHO:** *Pesticide Residue Report, No. FAD/RES/72.6a* (November 1972).
8. **The Dow Chemical Company:** Personal communication to TLV Committee, Midland, MI (1973).
9. **Griffin, T.B. et al:** *Soc. Tox. Abstract No. 32*. Atlanta, GA (March 1976).
10. **Eliason, D.A., M.F. Cranmer, D.C. von Windeguth et al:** *Mosquito News 29*:591 (1969).
11. **The Dow Chemical Company:** Communication to the TLV Committee of unpublished data (1972).

* In 1985 the STEL appeared on the Notice of Intended Changes as a deletion with the TWA value retained.

LINDANE

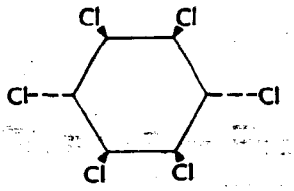
CAS: 58-89-9

Hexachlorocyclohexane, gamma isomer

$C_6H_6Cl_6$

Skin

TLV-TWA, 0.5 mg/m³*



Lindane is a white crystalline substance with a slight musty odor. Its physiochemical properties include:

Molecular weight: 290.85
Melting point: 112.5°C
Vapor pressure:[1] 9.4 × 10⁻⁵ torr at 20°C

Insoluble in water, it is soluble in chloroform, alcohol, acetone, ether, and benzene.

Lindane is an insecticide.

The acute oral LD_{50} for male rats is 88-125 mg/kg and the acute dermal LD_{50} for male rats is 500 mg/kg.[2] Male dd mice given lindane in the diet for 24 weeks at levels of 250, 305 and 500 ppm developed liver hepatomas.[3,4]

Comprehensive work on the vapor toxicity of lindane has presented a basis on which to establish the threshold limit for this compound in air. Treon and co-workers[5] found minimal pathology in several species of laboratory animals exposed seven hours a day, five days weekly for about a year at an average of 0.7 mg/m³ lindane. Spear[6] exposed rats to 0.19 mg/m³ for 24 hours daily, continuously for 655 days and found no pathology. It would appear from this work that the initial effect level lies somewhere between these two values.

Fitzhugh and Nelson[7] and Lehman[8] found that a dietary level of 50 ppm (equivalent to 170 mg/man/day) for two years produced no effect in rats, whereas 100 ppm produced tissue damage. Changes of questionable significance may occasionally occur even at 50 ppm.[7] No change was found in rats fed 0.15 ppm,[9] 10 ppm,[10] or 30 ppm.[11]

Kosa[12] found that patients tolerated highly purified gamma-isomer (lindane) at the rate of 40 mg/man/day for 14 days, although the same dosage of technical BHC produced diarrhea, vertigo and headache. Lindane was well endured even at 100 mg/man;[13] however, Graeve and Hermring[12] found that, while most patients tolerated lindane at a rate of 45 mg three times a day for three days, one patient showed full epileptic convulsions.

Neurological studies on 37 workers exposed to lindane over a period of 2 years revealed three with serious EEG disturbances and with minor symptoms and signs seen in 14 of the workers. Blood lindane levels varied from 0.002 to 0.340 ppm. No changes were observed in the EEG patterns of 21 of the exposed individuals. The frequency of clinical symptoms and EEG changes was higher among individuals whose blood contained 0.02 ppm or more lindane.[14]

Some authorities believe that man is more sensitive to lindane than animals. A time-weighted average TLV of 0.5 mg/m³ is believed to be sufficiently low to prevent central nervous system effects. At this time, the Committee recommends the deletion of the STEL until additional toxicological data and industrial hygiene experience become available to provide a better base for quantifying on a toxicological basis what the STEL should be. The reader is encouraged to review the section on *Excursion Limits* in the Introduction to Chemical Substances of excursions above the TLV-TWA, even when the 8-hour TWA is within the recommended limits.

* In 1984 the STEL was placed on the Notice of Intended Changes as a deletion with the TWA value retained.

References

1. *The Merck Index*, 10th ed., p. 789. Merck & Co., Inc., Rahway, New Jersey (1983).
2. *World Rev. of Pest Control* 9:119 (1970).
3. **Treon, J.F. et al:** Rept. from Kettering Laboratory. Univ. of Cincinnati (July 1951).
4. **Nagasaki, H., S. Tomii, T. Tsumashita et al:** *Nippon Gangakkai Kiji (Proc. Jap. Cancer Assoc.) 31*:33 (1972).
5. **Spear, P.J.:** Thesis. Univ. Mass. Lib., Amherst, MA (1952).
6. **Fitzhugh, O.G., A.A. Nelson and J.P. Frawley:** *J. Pharm. Exptl. Ther. 100*:59 (1950).
7. **Lehman, A.J.:** *Q. Bull. Assoc. Food Drug Off. U.S. 16*:47 (1952).
8. **Ortega, P., W.J. Hayes, Jr. and W.F. Durham:** *Arch. Path.* 64:614 (1957).
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10. **Melis, R.:** *Nuovi Ann. ig. Microbiol.* 6:90 (1955).
11. **Taylor, H. and J. Frodsham:** *Nature 158*:558 (1956).
12. **Klosa, J.:** *Die Phamazie* 5:615 (1950).
13. **Graeve, K. and G. Hermring:** *Klin. Wochschr. 28*:622 (1950).
14. **Czegledi-Janko, G. and P. Avar:** *Brit. J. Ind. Med. 27*:283 (1970).

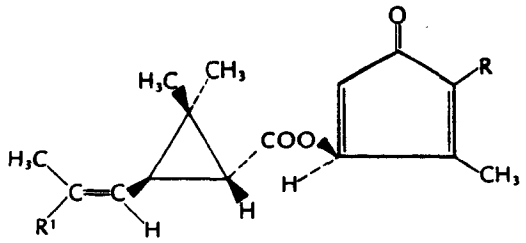
PYRETHRUM

CAS: 8003-34-7

1) Pyrethrin I or II; 2) Cinerin I or II; 3) Jasmolin I or II

1) $C_{21}H_{28}O_3$ or $C_{22}H_{28}O_5$; 2) $C_{20}H_{28}O_3$ or $C_{21}H_{28}O_5$; 3) $C_{21}H_{30}O_3$ or $C_{22}H_{30}O_5$

TLV-TWA, 5 mg/m³*



		R	R¹
1)	I	$-CH_2-CH=CH-CH=CH_2$	$-CH_3$
	II	$-CH_2-CH=CH-CH=CH_2$	$-COOCH_3$
2)	I	$-CH_2-CH=CH-CH_3$	$-CH_3$
	II	$-CH_2-CH=CH-CH_3$	$-COOCH_3$
3)	I	$-CH_2-CH=CH-CH_2-CH_3$	$-CH_3$
	II	$-CH_2-CH=CH-CH_2-CH_3$	$-COOCH_3$

A viscous brown resin or solid, pyrethrum's active principles are pyrethrins I and II, cinerins I and II, and jasmolin I and II, which are collectively known as the pyrethrins. The arrangement of these active components indicates these to be esters as depicted by the structure above. Their physiochemical properties include:

Molecular weights: 316 to 374
Vapor pressure: ≈ 0 torr at 20°C
Open cup flash points: 180° to 190°F (82° to 88°C)

Pyrethrum is insoluble in water, but soluble in alcohol, acetone, kerosene, carbon tetrachloride, nitromethane, and ethylene dichloride. Alkalies and acids speed up hydrolysis of the pyrethrins.

Pyrethrum is a botanical insecticide and the pyrethrins may be extracted in kerosene, alcohol, acetone or ethylene dichloride for formulation in dust, sprays, etc. They are stable for long periods of time in water based aerosols, but are oxidized on exposure to air and may loose 20% of their activity in a year.[1]

Pyrethrum has a low order of toxicity to warm blooded animals. The acute oral LD_{50} for the rat is 1500 mg/kg, while the acute dermal LD_{50} is greater than 1800 mg/kg.[1] Carpenter and co-workers[2] found the oral LD_{50} to be 820 mg/kg for rats. No gross effects were observable in animals fed diets containing less than 500 ppm pyrethrins. The same authors exposed rats at 6000 mg/m³ of pyrethrum in peanut oil for thirty minutes.[2] Moderate lung congestion resulted. Rats and dogs inhaled a concentration of 16 mg/m³ for 30-minute periods during 31 days with only slight lung irritation. Lehman[3] estimated that the fatal human dose might be 100 grams (1430 mg/kg) for a 70-kg man.

Ambrose and Robbins[4] reported no effect in rats fed pyrethrins at a dietary level of 1000 ppm for two years, but tissue damage and gross signs appeared in some rats given 5000 ppm. Lehman[5] confirmed these results. The no-effect level corresponds to a rate of 3600 mg/man/day.

Mitchell *et al* have described a case of allergic dermatitis to pyrethrum which was confirmed by patch test.[6] No exposure estimates were made. Baer *et al* have reported that 3.1% of 200 patients selected for contact dermatitis or other skin disease responded to pyrethrum.[7]

The TLV of 5 mg/m³, as a time-weighted average, is believed to be low enough to prevent systemic effects. At this time, the Committee recommends the elimination of the STEL until additional toxicological data and industrial hygiene experience become available to provide a better base for quantifying on a toxicological basis what the STEL should be. The reader is encouraged to review the section on *Excursion Limits* in the Introduction to the Chemical Substances of the current TLV booklet for guidance and control of excursions above the TLV-TWA, even when the 8-hour TWA is within the recommended limits.

References

1. *Farm Chemicals Handbook.* Meister Publishing Co., Willoughby, OH (1979).
2. **Carpenter, C.P., C.S. Weil, U.V. Pozzani and H.F. Smyth, Jr.:** *Arch Ind. Hyg. Occup. Med.* 2:420 (1950).
3. **Lehman, A.J.:** *Q. Bull. Assoc. Food Drug Off. U.S.* 13:65 (1949).
4. **Ambrose, A.M. and D. Robbins:** *Fed. Proc.* 10:276 (1951).
5. **Lehman, A.J.:** *Q. Bull. Assoc. Food Drug Off. U.S.* 16:47 (1949).
6. **Mitchell, J.C., G. Dupuis and G.H.N. Towers:** *Brit. J. Dermatol.* 86(6):568 (1972).
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* In 1985 the STEL was placed on the Notice of Intended Changes as a deletion with the TWA value retained.