

Lindane has been used for the control of disease vectors including mosquitoes, lice, and fleas, but resistance has developed. It has also been used as an agricultural and a horticultural insecticide, but its use is prohibited or restricted in many countries.

References

- WHO. Lindane. *Environmental Health Criteria* 124. Geneva: WHO, 1991. Available at: <http://www.inchem.org/documents/ehc/ehc/ehc124.htm> (accessed 26/04/04)
- WHO. Lindane health and safety guide. *IPCS Health and Safety Guide* 54. Geneva: WHO, 1991. Available at: <http://www.inchem.org/documents/hsg/hsg/hsg054.htm> (accessed 26/04/04)

Preparations

USP 31: Lindane Cream; Lindane Lotion; Lindane Shampoo.

Proprietary Preparations (details are given in Part 3)

Arg.: Gamma-Scab; Hexa-Defital; **Austria:** Jacutin; **Braz.:** Escabron; Pediletan; Pilsnar; **Canad.:** Hexit; **Chile:** Plomuro; Scabexy; **Cz.:** Jacutin; Skabid; **Fr.:** Scabedid; **Ger.:** Delitex N; InfectoPedicul; Jacutin; **Hung.:** Jacutin; **India:** Scabiol; Gab; Nit-N-Mitte; Scaboma; **Indon.:** Obat Kutu Rambut Cap Dua Jempol; **Irl.:** Quellada; **Israel:** Bicid; **Malaysia:** Jacutin; **Mex.:** Herklin; **NZ:** Benhex; **Pol.:** Jacutin; **Port.:** Musside; Sarcoderma; **S.Afr.:** Gambex; Quellada; **Singapore:** Jacutin; **Switz.:** Jacutin; **Thai:** Jacutin; **Venez.:** Demarj; Somergan.

Multi-ingredient: **Arg.:** Gamma-Scab; Hexa-Defital; Lyndan; **Fr.:** Elenol; **India:** Emscab; Nit-N-Mite; Scabine; Scaboma; Scarab; **Indon.:** Scabidic; Topicide; **Mex.:** Herklin; **Spain:** Yacutin.

Lufenuron (BAN, rINN)

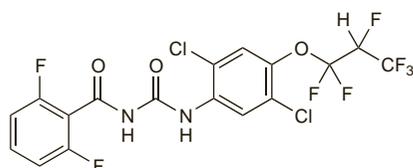
CGA-184699; Lufenurón; Lufénurone; Lufenuronum. 1-[2,5-Dichloro-4-(1,1,2,3,3,3-hexafluoropropoxy)phenyl]-3-(2,6-difluorobenzoyl)urea; (RS)-N-[2,5-Dichloro-4-(1,1,2,3,3,3-hexafluoropropoxy)phenyl]carbonyl]-2,6-difluorobenzamide.

Лүфенурон

$C_{17}H_{12}Cl_2F_8N_2O_3 = 511.2$.

CAS — 103055-07-8.

ATC Vet — QP53BC01.



Profile

Lufenuron is used as a systemic ectoparasiticide in veterinary practice; it is given by mouth or injection to the host animal.

Malathion (BAN)

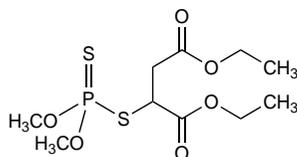
Carbofos; Compound 4047; Malathionum; Malatión; Malation; Malationa; Malationi; OMS-1. Diethyl 2-(dimethoxyphosphinothioylthio)succinate.

$C_{10}H_{19}O_6PS_2 = 330.4$.

CAS — 121-75-5.

ATC — P03AX03.

ATC Vet — QP53AF12.



Pharmacopoeias. In *Eur.* (see p.vii) and *US*.

Ph. Eur. 6.2 (Malathion). A clear, colourless or slightly yellowish liquid. It freezes at about 3°. Slightly soluble in water; miscible with alcohol, with acetone, with cyclohexane, and with vegetable oils. Store in airtight containers. Protect from light.

USP 31 (Malathion). A clear, colourless, or slightly yellowish liquid with a characteristic odour. Congeals at about 2.9°. Slightly soluble in water; miscible with alcohols, with ethers, with esters, with ketones, with aromatic and alkylated aromatic hydrocarbons, and with vegetable oils. Store in airtight containers. Protect from light.

Stability. The manufacturers have reported that malathion is sensitive to heat and is degraded at temperatures above 30°.

Adverse Effects and Treatment

As for Organophosphorus Insecticides, p.2047.

Malathion is one of the safer organophosphorus insecticides but its toxicity may be increased by the presence of impurities.

Acute renal insufficiency has been described in a patient associated with excessive exposure to a malathion spray.¹ The condition resolved without specific treatment. Renal toxicity had not

previously been associated with organophosphorus pesticides. In a second case of acute poisoning,² due to ingestion of malathion, mild transient renal insufficiency and proteinuria with several other late complications including cardiac arrhythmias, pulmonary oedema, diffuse interstitial fibrosis, and muscle weakness due to peripheral neuropathy, were seen subsequent to recovery from the initial cholinergic toxicity.

1. Albright RK, et al. Malathion exposure associated with acute renal failure. *JAMA* 1983; **250**: 2469.

2. Dive A, et al. Unusual manifestations after malathion poisoning. *Hum Exp Toxicol* 1994; **13**: 271-4.

Uses and Administration

Malathion is an organophosphorus insecticide (p.2047). It is used in the treatment of head and pubic pediculosis (p.2034) and in scabies (p.2035); lotions of 0.5% and shampoos of 1% are commonly available. Lotions are generally preferred to shampoos as the contact time is longer. Aqueous lotions are preferred to treat pubic lice and scabies because alcoholic lotions are irritant to excoriated skin and the genitalia; aqueous lotions may also be preferable in asthmatic subjects or children to avoid alcoholic fumes. Skin or hair treated with an alcohol-based preparation should be allowed to dry naturally.

Malathion is also used in veterinary practice, agriculture, and horticulture. It is widely used for adult and larval mosquito control although resistance occurs.

Preparations

USP 31: Malathion Lotion.

Proprietary Preparations (details are given in Part 3)

Austral.: Lice Rid; **Belg.:** Prioderm; Radikal; **Denm.:** Prioderm; **Fin.:** Prioderm; **Fr.:** Prioderm; **Gr.:** Sicar; Spethifhir; **Irl.:** Derbac-M; Prioderm; Quellada M; **Israel:** Prioderm; **Ital.:** Aftir Gel; **Neth.:** Noury Hooftolton; Prioderm; **Norw.:** Prioderm; **NZ:** A-Lices; Derbac-M; Prioderm; **Port.:** Olicide; **Rus.:** Pedilin (Педелин); **Singapore:** A-Lices; Lice Care; **Swed.:** Prioderm; **Switz.:** Lusarp; Prioderm; **UK:** Derbac-M; Prioderm; Quellada M; Suleo-M; **USA:** Ovide.

Multi-ingredient: **Arg.:** Aero Hellyp Forte; Para Plus; **Belg.:** Para Plus; **Fr.:** Para Plus; **Gr.:** Para-plus; **Israel:** Para Plus; **NZ:** Para Plus; **Rus.:** Para Plus (Пара Плюс).

Metaldehyde

Metaldehído.

$(C_2H_4O)_x$.

CAS — 9002-91-9.

Description. Metaldehyde is a cyclic polymer of acetaldehyde.

Adverse Effects and Treatment

Symptoms of poisoning by metaldehyde, which may be delayed, include vomiting and diarrhoea, fever, drowsiness, convulsions, and coma. Death from respiratory failure may occur within 48 hours. Kidney and liver damage may occur.

Treatment is symptomatic, although activated charcoal may be considered if more than 50 mg/kg has been ingested within the preceding hour.

References

- Longstreth WT, Pierson DJ. Metaldehyde poisoning from slug bait ingestion. *West J Med* 1982; **137**: 134-7.
- Proudfoot A, ed. *Pesticide poisoning: notes for the guidance of medical practitioners*. 2nd ed. London: DoH, The Stationery Office, 1996.
- Bleakley C, et al. Self-poisoning with metaldehyde. *Emerg Med J* 2008; **25**: 381-2.

Uses

Metaldehyde is a molluscicide used in pellets against slugs and snails. It is an ingredient of some firelighters.

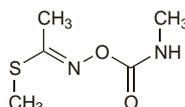
'Meta' is compressed metaldehyde which has been used as a solid fuel burning with a non-luminous carbon-free flame.

Methomyl

Metomilo. S-Methyl N-(methylcarbamoyloxy)thioacetimidate.

$C_5H_{10}N_2O_2S = 162.2$.

CAS — 16752-77-5.



Profile

Methomyl is a carbamate insecticide (p.2037) that has been used in agriculture.

References

- WHO. Methomyl health and safety guide. *IPCS Health and Safety Guide* 97. Geneva: WHO, 1995. Available at: <http://www.inchem.org/documents/hsg/hsg/hsg097.htm> (accessed 26/04/04)
- WHO. Methomyl. *Environmental Health Criteria* 178. Geneva: WHO, 1996. Available at: <http://www.inchem.org/documents/ehc/ehc178.htm> (accessed 26/04/04)

Reports of poisoning with methomyl and its management.

- Martinez-Chuecos J, et al. Management of methomyl poisoning. *Hum Exp Toxicol* 1990; **9**: 251-4.
- Buchholz U, et al. An outbreak of food-borne illness associated with methomyl-contaminated salt. *JAMA* 2002; **288**: 604-10.

Methoprene (rINN)

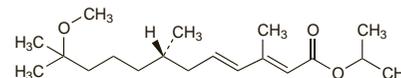
Méthoprène; Methoprenum; Metopreno; ZR-515. Isopropyl 11-methoxy-3,7,11-trimethyl-dodeca-2(E),4(E)-dienoate.

Метопрен

$C_{19}H_{34}O_3 = 310.5$.

CAS — 40596-69-8.

ATC Vet — QP53BD01.



Profile

Methoprene is an insect growth regulator which mimics the action of insect juvenile hormones and, if it is applied at the appropriate period of sensitivity, it causes death by preventing the transformation of larva to pupa. It is used against a variety of insects including fleas and mosquitoes. It is used in veterinary practice for the control of ectoparasites in the environment, rather than being applied to the animals themselves. It is also used in agriculture.

Preparations

Proprietary Preparations (details are given in Part 3)

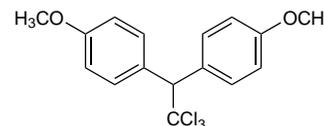
Multi-ingredient: **Fr.:** Aspipur.

Methoxychlor

Methoxy-DDT; Metoksychlor; Metoxiclora. 1,1,1-Trichloro-2,2-bis(p-methoxyphenyl)-ethane.

$C_{16}H_{15}Cl_3O_2 = 345.6$.

CAS — 72-43-5.



Profile

Methoxychlor is a chlorinated insecticide (p.2037) used in agriculture, horticulture, and veterinary practice.

Methyl Bromide

Metilo, bromuro de. Bromomethane; Monobromomethane.

$CH_3Br = 94.94$.

CAS — 74-83-9.



Adverse Effects, Treatment, and Precautions

Methyl bromide is a vesicant. Toxic effects after inhalation or percutaneous absorption are mainly due to neurotoxicity and include dizziness, headache, vomiting, blurred vision, weakness, ataxia, confusion, mania, hallucinations, mental depression, convulsions, pulmonary oedema, and coma. Renal and hepatic toxicity may also occur and death may be due to circulatory collapse or respiratory failure. Onset of symptoms may be preceded by a latent period. Concentrations of 1% or more are irritant to the eyes. Treatment is symptomatic although dimercaprol or acetylcysteine therapy has been tried.

Rubber absorbs and retains methyl bromide and should not therefore be used in protective clothing.

References to toxicity of methyl bromide including reports of poisoning.

- Chavez CT, et al. Methyl bromide optic atrophy. *Am J Ophthalmol* 1985; **99**: 715-19.
- Langard S, et al. Fatal accident resulting from methyl bromide poisoning after fumigation of a neighbouring house: leakage through sewage pipes. *J Appl Toxicol* 1996; **16**: 445-8.
- De Haro L, et al. Central and peripheral neurotoxic effects of chronic methyl bromide intoxication. *J Toxicol Clin Toxicol* 1997; **35**: 29-34.
- Michalodimitrakis MN, et al. Death following intentional methyl bromide poisoning: toxicological data and literature review. *Vet Hum Toxicol* 1997; **39**: 30-4.
- Horowitz BZ, et al. An unusual exposure to methyl bromide leading to fatality. *J Toxicol Clin Toxicol* 1998; **36**: 353-7.