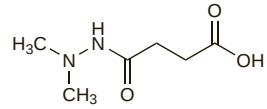
Daminozide

Daminozida. *N*-Dimethylaminosuccinamic acid.

$C_6H_{12}N_2O_3$ = 160.2.

CAS — 1596-84-5.



Profile

Daminozide is a plant growth regulator that has been used in pesticides to improve fruit crops. There have been concerns about residues of the chemical in the fruit.

Deltamethrin *(BAN)*

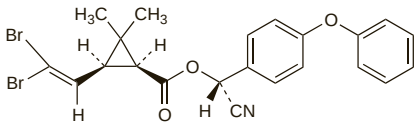
Decamethrin; Deltamethrinum; Deltametriini; Deltametrin; Deltametrina; Deltametryna; NRDC-161. (*S*)-α-Cyano-3-phenoxybenzyl (1*R*,3*R*)-3-(2,2-dibromovinyl)-2,2-dimethylcyclopropanecarboxylate.

$C_{22}H_{19}Br_2NO_3$ = 505.2.

CAS — 52918-63-5.

ATC — P03BA03.

ATC Vet — QP53AC11.



Pharmacopoeias. In *BP(Vet)*.

BP(Vet) 2008 (Deltamethrin). A white to buff-coloured crystalline powder. Insoluble in water; soluble in alcohol and in acetone.

Profile

Deltamethrin is a pyrethroid insecticide (see Pyrethrum Flower, p.2049) used in the vector control of malaria (p.594). It is also used as a topical ectoparasiticide in veterinary practice and as an agricultural and household insecticide.

◊ References.

1. WHO. Deltamethrin health and safety guide. *IPCS Health and Safety Guide 30*. Geneva: WHO, 1989. Available at: http://www.inchem.org/documents/hsg/hsg/hsg030.htm (accessed 26/04/04)
2. WHO. Deltamethrin. *Environmental Health Criteria 97*. Geneva: WHO, 1990. Available at: http://www.inchem.org/documents/ehc/ehc/ehc97.htm (accessed 26/04/04)

Preparations

Proprietary Preparations (details are given in Part 3)

Braz.: Del-Lend†; Deltacid; Deltalab; Deltamitren†; Deltapio†; Deltasay†; Deotrin; Hexafen†; Neolend†; Pediderm; Sifdel†; ***Fr.:*** Cinq sur Cinq; Pharmavoyage Moustiquaires; ***Mex.:*** Difexon†; ***Venez.:*** Nopucid.

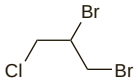
Multi-ingredient: ***Arg.:*** Capitis†; Deca-Scab†; Hexa-Defital NF; Nopucid Compuesto; ***Braz.:*** Deltacid Plus; ***Chile:*** Launol.

Dibromochloropropane

Dibromocloropropano. 1,2-Dibromo-3-chloropropane.

$C_3H_5Br_2Cl$ = 236.3.

CAS — 96-12-8.



Profile

Dibromochloropropane has been used as a pesticide. Low sperm counts and evidence of testicular damage have occurred in workers exposed to dibromochloropropane.

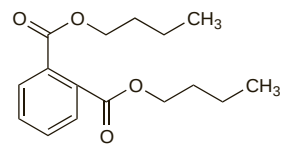
Dibutyl Phthalate

Butyl Phthalate; DBP; Dibutil-ftalát; Dibutilo ftalatas; Dibutilo, ftalato de; Dibutyle, phtalate de; Dibutylftalat; Dibutyl-ftalát; Dibutylis phthalas; Dibutylu ftalan; Dibutyyliftalaatti. Dibutyl benzene-1,2-dicarboxylate.

$C_{16}H_{22}O_4$ = 278.3.

CAS — 84-74-2.

ATC — P03BX03.



Pharmacopoeias. In *Eur.* (see p.vii). Also in *USNF*.

Ph. Eur. 6.2 (Dibutyl Phthalate). A clear, oily, colourless or very slightly yellow liquid. Practically insoluble in water; miscible with alcohol. Store in airtight containers.

USNF 26 (Dibutyl Phthalate). A clear, oily, colourless or very slightly yellow liquid. Practically insoluble in water; miscible with alcohol and with ether. Store in airtight containers.

Adverse Effects and Precautions

Dibutyl phthalate has occasionally caused hypersensitivity reactions. As with other phthalates contact with plastics should be avoided.

Uses and Administration

Dibutyl phthalate has been used as an insect repellent although it is slightly less effective than dimethyl phthalate (p.2041). It is less volatile and less easily removed by washing than dimethyl phthalate, and its chief use therefore has been for the impregnation of clothing.

Dibutyl phthalate has also been used as a plasticiser.

◊ References.

1. WHO. Di-*n*-butyl phthalate. *Environmental Health Criteria 189*. Geneva: WHO, 1997. Available at: http://www.inchem.org/documents/ehc/ehc/ehc189.htm (accessed 26/04/04)

Preparations

Proprietary Preparations (details are given in Part 3)

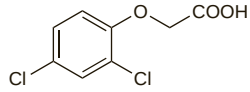
Multi-ingredient: ***S.Afr.:*** Mylol†.

Dichlorophenoxyacetic Acid

2,4-D; Diclorofenoxiacético, ácido. 2,4-Dichlorophenoxyacetic acid.

$C_8H_6Cl_2O_3$ = 221.0.

CAS — 94-75-7.



Adverse Effects, Treatment, and Precautions

Most cases of poisoning with dichlorophenoxyacetic acid have involved its ingestion with other herbicides; the solvent may also play a part in any toxicity. There is little pattern to the range of adverse effects that may occur after ingestion, inhalation, or topical exposure.

Adverse effects have involved the CNS and peripheral nervous system, muscles, and the cardiovascular system. Gastrointestinal effects are common with poisoning. Hepatotoxicity, nephrotoxicity, and pulmonary disorders have occurred but it is not clear that dichlorophenoxyacetic acid contributed to the toxicity. The role of phenoxyacetic acids in cancer is discussed under trichlorophenoxyacetic acid (p.2051).

Activated charcoal or possibly gastric lavage should be considered after ingestion of substantial amounts if the patient presents within 1 hour. Contaminated clothing should be removed and the skin washed with soap and water. Forced alkaline diuresis or haemodialysis have been reported to be effective in removing dichlorophenoxyacetic acid; the latter is considered more effective. Further treatment is symptomatic.

◊ References.

1. WHO. 2,4-Dichlorophenoxyacetic acid (2,4-D). *Environmental Health Criteria 29*. Geneva: WHO, 1984. Available at: http://www.inchem.org/documents/ehc/ehc/ehc29.htm (accessed 26/04/04)
2. WHO. 2,4-Dichlorophenoxyacetic (2,4-D) health and safety guide. *IPCS Health and Safety Guide 5*. Geneva: WHO, 1987. Available at: http://www.inchem.org/documents/hsg/hsg/hsg005.htm (accessed 26/04/04)
3. WHO. 2,4-Dichlorophenoxyacetic acid (2,4-D)—environmental aspects. *Environmental Health Criteria 84*. Geneva: WHO, 1989. Available at: http://www.inchem.org/documents/ehc/ehc/ehc84.htm (accessed 26/04/04)
4. Bradberry SM, *et al*. Mechanisms of toxicology, clinical features, and management of acute chlorophenoxy herbicide poisoning: a review. *J Toxicol Clin Toxicol* 2000; **38:** 111–22.

Uses

Dichlorophenoxyacetic acid is a herbicide widely used for weed control in cereals and other crops. It is usually used as its salts or esters with other herbicides.

Dichlorvos *(BAN, USAN, rINN)*

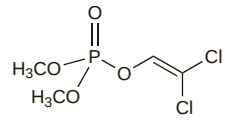
DDVP; Dichlorfos; Dichlorvosum; Diclorvós; NSC-6738; OMS-14; SD-1750. 2,2-Dichlorovinyl dimethyl phosphate.

Дихлорвос

$C_4H_7Cl_2O_4P$ = 221.0.

CAS — 62-73-7.

ATC Vet — QP52AB03; QP53AF04.



Pharmacopoeias. In *Fr.* for veterinary use.

Profile

Dichlorvos is an organophosphorus insecticide (p.2047) of short persistence, effective against a wide range of insects. It is sometimes used as a fumigant. It has been used for the extermination of insects in aircraft (disinsection). It is also used as a topical ectoparasiticide and as an anthelmintic in veterinary practice. Concern has been expressed over its possible carcinogenicity.

◊ References.

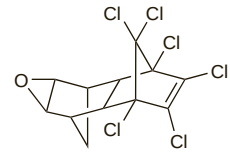
1. WHO. Dichlorvos health and safety guide. *IPCS Health and Safety Guide 18*. Geneva: WHO, 1988. Available at: http://www.inchem.org/documents/hsg/hsg/hsg018.htm (accessed 26/04/04)
2. WHO. Dichlorvos. *Environmental Health Criteria 7*9. Geneva: WHO, 1989. Available at: http://www.inchem.org/documents/ehc/ehc/ehc79.htm (accessed 26/04/04)
3. Van Maele-Fabry G, *et al*. Dichlorvos and carcinogenicity: a systematic approach to a regulatory decision. *Regul Toxicol Pharmacol* 2000; **31:** 13–21.
4. Ishmael J, *et al*. Dichlorvos—a comprehensive review of 11 rodent carcinogenicity studies. *Regul Toxicol Pharmacol* 2006; **44:** 238–48.
5. Booth ED, *et al*. Review of the in vitro and in vivo genotoxicity of dichlorvos. *Regul Toxicol Pharmacol* 2007; **49:** 316–26.

Dieldrin *(BAN, pINN)*

Dieldrina; Dieldrine; Dieldrinum; Dieldryna.

Диэлдрин

CAS — 60-57-1 (HEOD).



(HEOD)

Description. Dieldrin contains about 85% of (1*R*,4*S*,5*S*,8*R*)-1,2,3,4,10,10-hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-1,4:5,8-dimethanonaphthalene (HEOD), $C_{12}H_8Cl_6O$ = 380.9. The remaining 15% is mainly chlorinated organic compounds related to HEOD.

Adverse Effects and Treatment

As for Chlorinated Insecticides, p.2037.

Dieldrin is more toxic than clofenotane (p.2038) and is readily absorbed through the skin.

◊ References.

1. WHO. Aldrin and dieldrin. *Environmental Health Criteria 91*. Geneva: WHO, 1989. Available at: http://www.inchem.org/documents/ehc/ehc/ehc91.htm (accessed 26/04/04)
2. WHO. Aldrin and dieldrin health and safety guide. *IPCS Health and Safety Guide 21*. Geneva: WHO, 1989. Available at: http://www.inchem.org/documents/hsg/hsg/hsg021.htm (accessed 26/04/04)
3. Høyer AP, *et al*. Organochlorine exposure and risk of breast cancer. *Lancet* 1998; **352:** 1816–20.
4. Jorgenson JL. Aldrin and dieldrin: a review of research on their production, environmental deposition and fate, bioaccumulation, toxicology, and epidemiology in the United States. *Environ Health Perspect* 2001; **109** (suppl 1): 113–39.

Uses

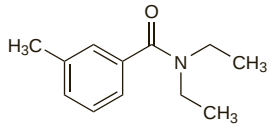
Dieldrin is a chlorinated insecticide (p.2037) formerly used as a sheepdip. Its use is now limited to a few specified purposes such as termite control.

Diethyltoluamide *(BAN, rINN)*

DEET; *N,N*-Diethyl-3-methylbenzamide; Diéthyltoluamide; Diethyltoluamidum; Dietiltoluamida; Dietiltoluamida. *NN*-Diethyl-*m*-toluamide.

Диэтилтолуамид

$C_{12}H_{17}NO$ = 191.3.
CAS — 134-62-3.
ATC — P03BX01.
ATC Vet — QP53GX01.



Pharmacopoeias. In *Int.* and *US*.
USP 31 (Diethyltoluamide). A colourless liquid with a faint pleasant odour. Practically insoluble in water and in glycerol; miscible with alcohol, with carbon disulfide, with chloroform, with ether, and with isopropyl alcohol. Store in airtight containers.

Adverse Effects and Precautions

Occasional hypersensitivity to diethyltoluamide has been reported. Diethyltoluamide should not be applied near the eyes, to mucous membranes, to broken skin, or to areas of skin flexion, as irritation or blistering may occur. Systemic toxicity has been reported after application of large topical doses, particularly in children.

◊ Hypersensitivity and anaphylaxis has been described in a patient after exposure to diethyltoluamide.[1] Toxic encephalopathy has been noted in children given liberal applications of this compound;[2] seizures have also been reported,[3] and there have been cases of manic psychosis[4] and cardiovascular toxicity (sinus bradycardia and orthostatic hypotension)[5] associated with topical application. An assessment[6] of both published and unpublished data concluded that there had been remarkably few problems considering the widespread use of diethyltoluamide and that the encephalopathy in children had not been substantiated by detailed surveillance; however, another case analysis[7] did find an association with encephalopathy in children.

Toxic reactions, including death, have been reported after the ingestion of large amounts of diethyltoluamide-containing insect repellents.[8]

1. Miller JD. Anaphylaxis associated with insect repellent. *N Engl J Med* 1982; **307:** 1341–2.
2. Roland EH, *et al*. Toxic encephalopathy in a child after brief exposure to insect repellents. *Can Med Assoc J* 1985; **132:** 155–6.
3. Anonymous. Seizures temporally associated with use of DEET insect repellent—New York and Connecticut. *Arch Dermatol* 1989; **125:** 1619–20.
4. Snyder JW, *et al*. Acute manic psychosis following the dermal application of N,N-diethyl-m-toluamide (DEET) in an adult. *J Toxicol Clin Toxicol* 1986; **24:** 429–39.
5. Clem JR, *et al*. Insect repellent (N,N-diethyl-m-toluamide) cardiovascular toxicity in an adult. *Ann Pharmacother* 1993; **27:** 289–93.
6. Goodyer L, Behrens RH. Short report: the safety and toxicity of insect repellents. *Am J Trop Med Hyg* 1998; **59:** 323–4.
7. Briassoulis G, *et al*. Toxic encephalopathy associated with use of DEET insect repellents: a case analysis of its toxicity in children. *Hum Exp Toxicol* 2001; **20:** 8–14.
8. Tenenbein M. Severe toxic reactions and death following the ingestion of diethyltoluamide-containing insect repellents. *JAMA* 1987; **258:** 1509–11.

Uses

Diethyltoluamide is an insect repellent that is effective against mosquitoes as well as blackflies, harvest-bugs or chiggers, midges, ticks, and fleas. It is considered to be of value for personal protection against malaria (p.594). It has also been used as a repellent against leeches. It may be applied to skin and clothing.

Preparations

USP 31: Diethyltoluamide Topical Solution.

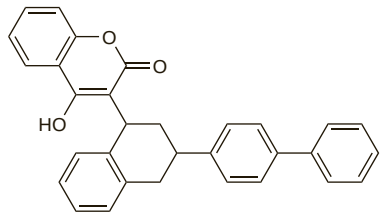
Proprietary Preparations (details are given in Part 3)
Austral.: Apex Repel Super; ***Belg.:*** Mouskito Tropical; ***Canad.:*** Bens†; Bug zzz Away†; Cutter†; Deep Woods OFF†; Konk†; Muskol†; Off; Off Skintastic; Ungava; ***Fr.:*** Insect Ecran; Item Antipoux; ***NZ:*** Apex Repel Super; ***S.Afr.:*** Mylol†; ***UK:*** Bens; Jungle Formula Insect Repellent; Mijex.

Multi-ingredient: ***Arg.:*** Standard XXI; ***Austral.:*** Apex Repel Super; Apex Repel Ultra; ***Belg.:*** Mouskito Sun; Mouskito Travel Milk; Mouskito Travel Stick; ***Canad.:*** Coppertone Bug & Sunblock†; Muskol with Sunblock†; Off Skintastic with Sunscreen†; ***Fr.:*** Mousticologne; Moustidose Adult et Enfant; Tiq'Aouta; ***Hong Kong:*** Pellit†; ***Israel:*** Yatushan Plus†; ***Ital.:*** Esoklin; Sinezan; ***Jpn:*** Una Repellent; ***NZ:*** Apex Repel Super; Apex Repel Ultra; ***S.Afr.:*** Mylol†; No-Bite†; ***Thai.:*** Pellit†.

Difenacoum

Difenacum. 3-(3-Biphenyl-4-yl-1,2,3,4-tetrahydro-1-naphthyl)-4-hydroxycoumarin.

$C_{31}H_{24}O_3$ = 444.5.
CAS — 56073-07-5.



Profile

Difenacoum is an anticoagulant rodenticide.

◊ References.

1. WHO. Anticoagulant rodenticides. *Environmental Health Criteria 175*. Geneva: WHO, 1995. Available at: http://www.inchem.org/documents/ehc/ehc/ehc175.htm (accessed 26/04/04)
2. WHO. Difenacoum health and safety guide. *IPCS Health and Safety Guide 95*. Geneva: WHO, 1995. Available at: http://www.inchem.org/documents/hsg/hsg/hsg095.htm (accessed 26/04/04)

Toxicity. Difenacoum, a second-generation anticoagulant rodenticide inhibits prothrombin synthesis to cause bleeding that may be occult.[1] It is absorbed from the gastrointestinal tract; dermal absorption is possible. Poisons containing 100 mg in each kg of bait are not hazardous to man; more concentrated forms are particularly hazardous and their availability should be restricted. Baits, which should be prepared only by trained personnel, should contain a suitable marker-dye.

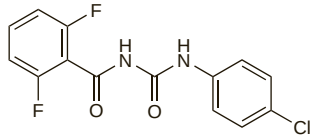
There have been reports of poisoning with difenacoum.[2-4]

1. WHO. Safe use of pesticides: ninth report of the WHO expert committee on vector biology and control. *WHO Tech Rep Ser 720* 1985. Available at: http://libdoc.who.int/trs/WHO_TRS_720.pdf (accessed 21/07/08)
2. Barlow AM, *et al*. Difenacoum (Neosorexa) poisoning. *BMJ* 1982; **285:** 541.
3. Butcher GP, *et al*. Difenacoum poisoning as a cause of haematuria. *Hum Exp Toxicol* 1992; **11:** 553–4.
4. McCarthy PT, *et al*. Covert poisoning with difenacoum: clinical and toxicological observations. *Hum Exp Toxicol* 1997; **16:** 166–70.

Diflubenzuron

1-(4-Chlorophenyl)-3-(2,6-difluorobenzoyl)urea.

$C_{14}H_9ClF_2N_2O_2$ = 310.7.
CAS — 35367-38-5.
ATC Vet — QP53BC02.



Profile

Diflubenzuron is an insecticide and larvicide that acts as a growth regulator by interfering with the formation of cuticle. It is used in agriculture and for the control of disease vectors.

Diflubenzuron possesses residual activity against mosquito larvae.

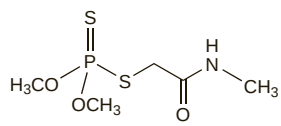
◊ References.

1. WHO. Diflubenzuron. health and safety guide. *IPCS Health and Safety Guide 99*. Geneva: WHO, 1995. Available at: http://www.inchem.org/documents/hsg/hsg/hsg099.htm (accessed 26/04/04)
2. WHO. Diflubenzuron. *Environmental Health Criteria 184*. Geneva: WHO, 1996. Available at: http://www.inchem.org/documents/ehc/ehc/ehc184.htm (accessed 26/04/04)

Dimethoate

Dimetoato; Fosfamid. *O,O*-Dimethyl *S*-methylcarbamoylmethyl phosphorodithioate.

$C_5H_{12}NO_3PS_2$ = 229.3.
CAS — 60-51-5.



Profile

Dimethoate is an organophosphorus insecticide (p.2047) used in agriculture.

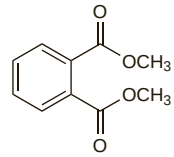
◊ References.

1. WHO. Dimethoate health and safety guide. *IPCS Health and Safety Guide 20*. Geneva: WHO, 1988. Available at: http://www.inchem.org/documents/hsg/hsg/hsg020.htm (accessed 28/05/04)
2. WHO. Dimethoate. *Environmental Health Criteria 90*. Geneva: WHO, 1989. Available at: http://www.inchem.org/documents/ehc/ehc/ehc90.htm (accessed 28/05/04)
3. Jovanović D, *et al*. A case of unusual suicidal poisoning by the organophosphorus insecticide dimethoate. *Hum Exp Toxicol* 1990; **9:** 49–51.
4. Hoffmann U, Papendorf T. Organophosphate poisonings with parathion and dimethoate. *Intensive Care Med* 2006; **32:** 464–8.

Dimethyl Phthalate

Dimetilo, ftalato de; DMP; Methyl Phthalate. Dimethyl benzene-1,2-dicarboxylate.

$C_{10}H_{10}O_4$ = 194.2.
CAS — 131-11-3.
ATC — P03BX02.
ATC Vet — QP53GX02.



Pharmacopoeias. In *Br.* and *Fr.*
BP 2008 (Dimethyl Phthalate). A colourless or faintly coloured liquid, odourless or almost odourless. Slightly soluble in water; miscible with alcohol, with ether, and with most organic solvents.

Adverse Effects and Precautions

Dimethyl phthalate may cause temporary smarting and should not be applied near the eyes or to mucous membranes. As with other phthalates contact with plastics should be avoided.

Uses

Dimethyl phthalate is an insect repellent.

Preparations

Proprietary Preparations (details are given in Part 3)

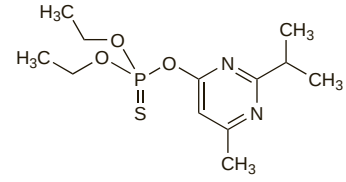
Multi-ingredient: ***Fr.:*** SVR Creme Antimoustique†; Tiq'Aouta; ***Hong Kong:*** Pellit†; ***Hung.:*** Novascabin; ***Israel:*** Yatushan Plus†; ***S.Afr.:*** Mylol†; ***Thai.:*** Pellit†.

Dimpylate *(BAN, rINN)*

Diazinon; Diazynon; Dimpilato; Dimpylaatti; Dimpylat; Dimpylatum. *O,O*-Diethyl *O*-(2-isopropyl-6-methylpyrimidin-4-yl) phosphorothioate.

Димпилат

$C_{12}H_{21}N_2O_3PS$ = 304.3.
CAS — 333-41-5.
ATC Vet — QP53AF03.



Pharmacopoeias. In *BP(Vet)*.
BP(Vet) 2008 (Dimpylate). A clear, yellowish-brown, slightly viscous liquid. Practically insoluble in water; miscible with alcohol, with ether, and with most organic solvents.

Profile

Dimpylate is an organophosphorus insecticide (p.2047) used as a systemic ectoparasiticide in veterinary practice; it is applied topically to the host animal. It is also used as an insecticide in agriculture and horticulture.

◊ References.

1. Wagner SL, Orwick DL. Chronic organophosphate exposure associated with transient hypertonia in an infant. *Pediatrics* 1994; **94:** 94–7.