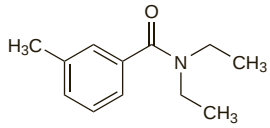
Diethyltoluamide *(BAN, rINN)*

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 An assessment[6] of both published and unpublished data concluded that there had been remarkably few problems considering the widespread use of diethyltoluamide and that the encephalopathy in children had not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.

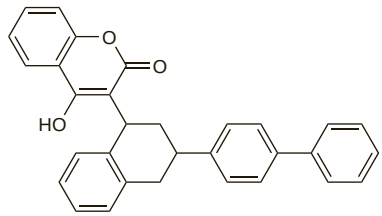
Proprietary Preparations (details are given in Part 3)
Austral.: Apex Repel Super; ***Belg.:*** Mouskito Tropical; ***Canad.:*** Bens†; Bug zzz Away†; Cutter†; Deep Woods OFF†; Konk†; Muskol†; Off; Off Skintastic; Ungava; ***Fr.:*** Insect Ecran; Item Antipoux; ***NZ:*** Apex Repel Super; ***S.Afr.:***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

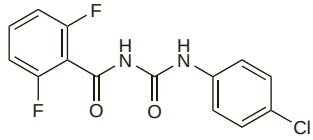
There have been reports of poisoning with difenacoum.[2-4]

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.

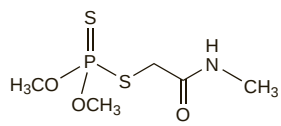
◊ References.

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.

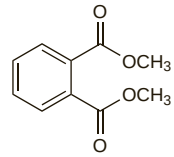
◊ References.

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)

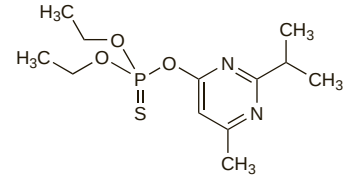
Multi-ingredient: ***Fr.:*** SVR Creme Antimoustique†; Tiq'Aouta; ***Hong Kong:*** Pellit†; ***Hung.:*** Novascabin; ***Israel:*** Yatushan Plus†; ***S.Afr.:*** Mylol†; ***Thai.:*** Pellit†.

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.

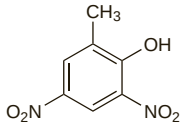
1. Wagner SL, Orwick DL. Chronic organophosphate exposure associated with transient hypertonia in an infant. *Pediatrics* 1994; **94:** 94–7.

Dinitro-*o*-cresol

DNOC. 4,6-Dinitro-*o*-cresol.

$C_7H_6N_2O_5$ = 198.1.

CAS — 534-52-1.



Profile

Dinitro-*o*-cresol is a dinitrophenol formerly used as an insecticide and herbicide. It increases metabolism by uncoupling oxidative phosphorylation and was also formerly used in obesity. Fatal poisoning has occurred.

◊ References.

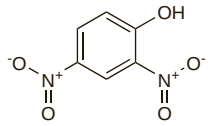
1. WHO. Dinitro-ortho-cresol. *Environmental Health Criteria 220*. Geneva: WHO, 2000. Available at: http://www.inchem.org/documents/ehc/ehc/ehc220.htm (accessed 26/04/04)

Dinitrophenol

Dinitrofenol. 2,4-Dinitrophenol.

$C_6H_4N_2O_5$ = 184.1.

CAS — 51-28-5.



Profile

Dinitrophenol has been used as a herbicide. Since dinitrophenol increases metabolism by uncoupling oxidative phosphorylation it was formerly used in the treatment of obesity. Fatal poisoning has occurred.

Dioctyl Adipate

DEHA; Di-(2-ethylhexyl)adipate; Dioctilo, adipato de.

$C_{22}H_{42}O_4$ = 370.6.

Profile

Dioctyl adipate is used as an insect repellent. It is also used as a plasticiser by the plastics industry; concern about the migration of this and other plasticisers into foodstuffs from polythene films used to wrap them ('cling film') have led to its use at lower concentrations.

Preparations

Proprietary Preparations (details are given in Part 3)
UK: Protec.

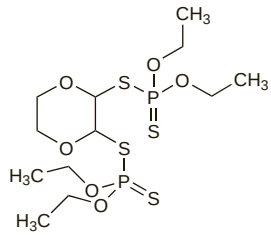
Dioxation *(BAN, rINN)*

Dioxathion; Dioxatión; Dioxationum. It consists mainly of *cis* and *trans* isomers of *S,S'*-1,4-dioxan-2,3-diyl bis(*O,O*-diethyl phosphorodithioate).

Диоксатион

$C_{12}H_{26}O_6P_2S_4$ = 456.5.

CAS — 78-34-2.



Profile

Dioxation is an organophosphorus insecticide (p.2047) that has been used in agriculture and as a topical ectoparasiticide in veterinary practice.

Diphenadione *(BAN, pINN)*

Difenadiona; Diphacinone; Diphénadione; Diphenadionum. 2-(Diphenylacetyl)indan-1,3-dione.

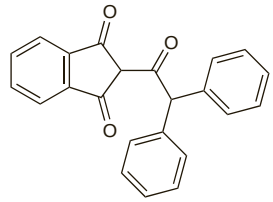
Дифенадион

$C_{23}H_{16}O_3$ = 340.4.

CAS — 82-66-6.

ATC — B01AA10.

ATC Vet — QB01AA10.



Profile

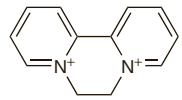
Diphenadione is used as an anticoagulant rodenticide.

Diquat Dibromide

Diquat, dibromuro de. 9,10-Dihydro-8a,10a-diazoniaphenanthrene dibromide; 1,1'-Ethylene-2,2'-bipyridyldiylium dibromide.

$C_{12}H_{12}Br_2N_2$ = 344.0.

CAS — 2764-72-9 (diquat); 85-00-7 (diquat dibromide).



(diquat)

Profile

Diquat dibromide is a contact herbicide used in agriculture and horticulture. It has similar adverse effects to those of paraquat (p.2047).

◊ References.

1. WHO. Paraquat and diquat. *Environmental Health Criteria 39*. Geneva: WHO, 1984. Available at: http://www.inchem.org/documents/ehc/ehc/ehc39.htm (accessed 26/04/04)
2. WHO. Diquat health and safety guide. *IPCS Health and Safety Guide 52*. Geneva: WHO, 1991. Available at: http://www.inchem.org/documents/hsg/hsg/hsg052.htm (accessed 26/04/04)
3. Proudfoot A, ed. Pesticide poisoning: notes for the guidance of medical practitioners. 2nd ed. London: DoH, The Stationery Office, 1996.
4. Jones GM, Vale JA. Mechanisms of toxicity, clinical features, and management of diquat poisoning: a review. *J Toxicol Clin Toxicol* 2000; **38:** 123–8.

Emamectin

Emamectina. A mixture of (4″-*R*)-5-*O*-Demethyl-4″-deoxy-4″-(methylamino)avermectin A_{1a} and (4″-*R*)-5-*O*-Demethyl-25-de(1-methylpropyl)-4″-deoxy-4″-(methylamino)-25-(1-methylethyl)avermectin A_{1a} in the ratio of 9:1.

CAS — 121124-29-6 (major component); 121424-52-0 (minor component); 137335-79-6.

ATC Vet — QP54AA06.

Profile

Emamectin is an avermectin insecticide used for the control of sea-lice infestation in salmon.

Endod

Profile

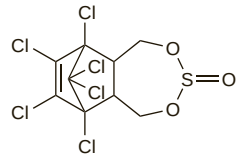
Endod is obtained from the dried fruits of *Phytolacca dodecandra* (Phytolaccaceae) and has molluscicidal properties. It has been investigated for the control of the snail vector of schistosomiasis.

Endosulfan

Endosulfán. 1,4,5,6,7,7-Hexachloro-8,9,10-trinorborn-5-en-2,3-ylenebismethylene sulphite.

$C_9H_6Cl_6O_3S$ = 406.9.

CAS — 115-29-7.



Profile

Endosulfan is a chlorinated insecticide (p.2037) used in agriculture.

◊ References.

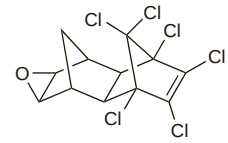
1. WHO. Endosulfan. *Environmental Health Criteria 40*. Geneva: WHO, 1984. Available at: http://www.inchem.org/documents/ehc/ehc/ehc40.htm (accessed 26/04/04)
2. WHO. Endosulfan health and safety guide. *IPCS Health and Safety Guide 17*. Geneva: WHO, 1988. Available at: http://www.inchem.org/documents/hsg/hsg/hsg017.htm (accessed 26/04/04)
3. Blanco-Coronado JL, *et al.* Acute intoxication by endosulfan. *J Toxicol Clin Toxicol* 1992; **30:** 575–83.
4. Boereboom FT, *et al.* Nonaccidental endosulfan intoxication: a case report with toxicokinetic calculations and tissue concentrations. *J Toxicol Clin Toxicol* 1998; **36:** 345–52.
5. Chugh SN, *et al.* Endosulfan poisoning in Northern India: a report of 18 cases. *Int J Clin Pharmacol Ther* 1998; **36:** 474–7.
6. Venkateswarlu K, *et al.* Endosulfan poisoning—a clinical profile. *J Assoc Physicians India* 2000; **48:** 323–5.
7. Karatas AD, *et al.* Characteristics of endosulfan poisoning: a study of 23 cases. *Singapore Med J* 2006; **47:** 1030–2.
8. Bektas M, *et al.* Management of acute endosulfan poisoning in an organophosphate poisoning clinic. *Clin Toxicol* 2007; **45:** 563–4.

Endrin

Endrín; Endryna. (1*R*,4*S*,4a*S*,5*S*,6*S*,7*R*,8*R*,8a*R*)-1,2,3,4,10,10-Hexachloro-1,4,4a,5,6,7,8,8a-octahydro-6,7-epoxy-1,4:5,8-dimethanonaphthalene.

$C_{12}H_8Cl_6O$ = 380.9.

CAS — 72-20-8.



Profile

Endrin is a chlorinated insecticide (p.2037), but its use was prohibited, at least in some countries, because of toxicity and persistence in the environment.

◊ General references to endrin,[1-4] including reports of poisoning.[2,3]

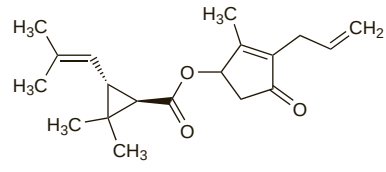
1. Anonymous. Acute convulsions associated with endrin poisoning—Pakistan. *JAMA* 1985; **253:** 334–5.
2. Runhaar EA, *et al.* A case of fatal endrin poisoning. *Hum Toxicol* 1985; **4:** 241–7.
3. WHO. Endrin health and safety guide. *IPCS Health and Safety Guide 60*. Geneva: WHO, 1991. Available at: http://www.inchem.org/documents/hsg/hsg/hsg060.htm (accessed 26/04/04)
4. WHO. Endrin. *Environmental Health Criteria 130*. Geneva: WHO, 1992. Available at: http://www.inchem.org/documents/ehc/ehc/ehc130.htm (accessed 26/04/04)

Esdepallethrine

Esdepaletrina. (*S*)-3-Allyl-2-methyl-4-oxocyclopent-2-enyl (1*R*,3*R*)-2,2-dimethyl-3-(2-methylprop-1-enyl)-cyclopropanecarboxylate.

$C_{19}H_{26}O_3$ = 302.4.

CAS — 28434-00-6.



Profile

Esdepallethrine is a pyrethroid insecticide (see Pyrethrum Flower, p.2049). It is used as an acaricide with piperonyl butoxide (p.2049) in the topical treatment of scabies (p.2035).

Esdepallethrine is also used in devices and sprays to control insects, including mosquitoes.