

and bentonite (as a 7% suspension) are alternative oral adsorbents and are given in similar doses to those of charcoal. When none of these adsorbents is available, a suspension of clay or of uncontaminated soil should be considered if medical attention is likely to be delayed. An osmotic laxative may be used with the first dose of the adsorbent in order to hasten bowel evacuation and prevent obstruction due to the adsorbent. Patients may require intensive supportive therapy, but oxygen should not be given initially as it appears to enhance the pulmonary toxicity of paraquat; however, it may be needed in later stages as part of palliative care.

Methods aimed at hastening elimination such as forced diuresis, peritoneal dialysis, haemodialysis, and haemoperfusion have been tried but the first three appear to be ineffective and results with the last method have varied; no method is of proven value.

◇ For some general references concerning the treatment of paraquat toxicity, see under Adverse Effects, above.

Once paraquat has been absorbed, moderate to severe poisoning may result in acute renal failure, hepatitis, and pulmonary fibrosis; death may occur after 2 to 3 weeks. Pulse therapy with cyclophosphamide and methylprednisolone might be of benefit in such patients but not in those with fulminant poisoning.^{1,2}

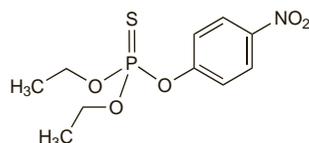
- Lin J-L, et al. Pulse therapy with cyclophosphamide and methylprednisolone in patients with moderate to severe paraquat poisoning: a preliminary report. *Thorax* 1996; **51**: 661-3.
- Lin J-L, et al. A prospective clinical trial of pulse therapy with glucocorticoid and cyclophosphamide in moderate to severe paraquat poisoned patients. *Am J Respir Crit Care Med* 1999; **159**: 357-60. Correction to the dose of cyclophosphamide. *ibid.* 2001; **163**: 292.

Uses

Paraquat is a contact herbicide widely used as the dichloride in agriculture and horticulture. Liquid concentrates are supplied in the UK only to approved users.

Parathion

Parathion. *O,O*-Diethyl *O*-4-nitrophenyl phosphorothioate. $C_{10}H_{14}NO_5PS = 291.3$. CAS — 56-38-2.



Profile

Parathion is an organophosphorus insecticide (p.2047) that has been used in agriculture and horticulture. Its metabolite diethyl nitrophenyl phosphate (paraoxon, p.1883) contributes to its toxicity.

◇ References.

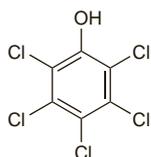
- WHO. Parathion health and safety guide. *IPCS Health and Safety Guide 74*. Geneva: WHO, 1992. Available at: <http://www.inchem.org/documents/hsg/hsg/hsg74.htm> (accessed 26/04/04)

◇ Reports of poisoning with parathion.

- Anastasiades CJ, Ioannides M. Organophosphate poisoning and arterial fibrillation. *BMJ* 1984; **289**: 290.
- Golsousidis H, Kokkas V. Use of 19 590 mg of atropine during 24 days of treatment, after a case of unusually severe parathion poisoning. *Hum Toxicol* 1985; **4**: 339-40.
- Clifford NJ, Nies AS. Organophosphate poisoning from wearing a laundered uniform previously contaminated with parathion. *JAMA* 1989; **262**: 3035-6.
- Wang M-H, et al. Q-T interval prolongation and pleomorphic ventricular tachyarrhythmia ("Torsade de pointes") in organophosphate poisoning: report of a case. *Hum Exp Toxicol* 1998; **17**: 587-90.
- Eyer F, et al. Human parathion poisoning: a toxicokinetic analysis. *Toxicol Rev* 2003; **22**: 143-63.
- Lund CM, Iversen G. Bladanforgiftning forekommer endnu. *Ugeskr Laeger* 2005; **167**: 3195-6.
- Hoffmann U, Papendorf T. Organophosphate poisonings with parathion and dimethoate. *Intensive Care Med* 2006; **32**: 464-8.

Pentachlorophenol

PCP; Penta; Pentaclorofenol. $C_6HCl_5O = 266.3$. CAS — 87-86-5.



NOTE. The name PCP has also been used as a synonym for phenacycline hydrochloride.

Adverse Effects, Treatment, and Precautions

Pentachlorophenol may be absorbed in toxic amounts through the skin or by inhalation, as well as by ingestion. Pentachlorophenol and its aqueous solutions are irritant to the eyes, mucous membranes, and to the skin, and may produce caustic burns. The systemic effects are due to uncoupling of oxidative phosphorylation with consequent stimulation of cellular metabolism. Acute poisoning with pentachlorophenol increases metabolic rate, leading to raised temperature with copious sweating and thirst, restlessness, fatigue, increased rate and depth of respiration, and tachycardia. There may be abdominal pain and nausea, and death has occurred from respiratory failure. Symptoms of subacute or chronic poisoning include hyperpyrexia and CNS, haematological, renal, reproductive, respiratory, and skin disorders.

Treatment is symptomatic. Raised body temperature should be treated by physical means; the use of antipyretics is not recommended since they can increase toxicity.

◇ Reviews of the toxicity of pentachlorophenol.

- Health and Safety Executive. Pentachlorophenol. *Toxicity Review 5*. London: HMSO, 1982.
- WHO. Pentachlorophenol. *Environmental Health Criteria 71*. Geneva: WHO, 1987. Available at: <http://www.inchem.org/documents/ehc/ehc/ehc71.htm> (accessed 26/04/04)
- Pentachlorophenol health and safety guide. *Health and Safety Guide 19*. Geneva: WHO, 1989. Available at: <http://www.inchem.org/documents/hsg/hsg/hsg019.htm> (accessed 26/04/04)
- Jorens PG, Schepens PJ. Human pentachlorophenol poisoning. *Hum Exp Toxicol* 1993; **12**: 479-95.
- Proudfoot AT. Pentachlorophenol poisoning. *Toxicol Rev* 2003; **22**: 3-11.

◇ There have been reports of malignant neoplasms,^{1,2} aplastic anaemia,³ pancreatitis,⁴ intravascular haemolysis,⁵ and urticaria⁶ associated with exposure to pentachlorophenol.

- Greene MH, et al. Familial and sporadic Hodgkin's disease associated with occupational wood exposure. *Lancet* 1978; **ii**: 626-7.
- Hardell L. Malignant lymphoma of histiocytic type and exposure to phenoxycetic acids or chlorophenols. *Lancet* 1979; **i**: 55-6.
- Roberts HJ. Aplastic anaemia due to pentachlorophenol. *N Engl J Med* 1981; **305**: 1650-1.
- Cooper RG, Macaulay MB. Pentachlorophenol pancreatitis. *Lancet* 1982; **i**: 517.
- Hassan AB, et al. Intravascular haemolysis induced by pentachlorophenol. *BMJ* 1985; **291**: 21-2.
- Kentor PM. Urticaria from contact with pentachlorophenol. *JAMA* 1986; **256**: 3350.

Pharmacokinetics

Pentachlorophenol may be absorbed after ingestion or inhalation or through the skin. After ingestion, the majority of a dose is eliminated in the urine as unchanged pentachlorophenol and its glucuronide, with small amounts appearing in the faeces.

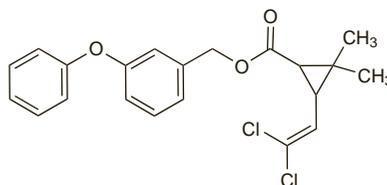
Uses

Pentachlorophenol has been used mainly as the sodium salt ($C_6Cl_5NaO = 288.3$), as a preservative for a wide range of industrial and agricultural products, including wood and other building materials, textiles, glues, and starch. It has also been used for the control of slime and algae, and as a molluscicide, fungicide, and herbicide.

Permethrin (BAN, USAN, rINN)

Permethrine; Permethrinum; Permetriini; Permetrin; Permetrina; Permetryna. 3-Phenoxybenzyl (1*RS*,3*RS*)-(1*RS*,3*SR*)-3-(2,2-dichlorovinyl)-2,2-dimethylcyclopropanecarboxylate.

Перметрин
 $C_{21}H_{20}Cl_2O_3 = 391.3$.
CAS — 52645-53-1.
ATC — P03AC04.
ATC Vet — QP53AC04.



Profile

Permethrin is a pyrethroid insecticide (see Pyrethrum Flower, p.2049). It is used in the treatment of head pediculosis (p.2034) as a 1% application; there have been signs of resistance. It is also used as a 5% cream for pubic pediculosis and as an acaricide in the treatment of scabies (p.2035).

Permethrin is also used as a topical ectoparasiticide in veterinary practice and as an agricultural, horticultural, and household insecticide.

Permethrin is active against mosquitoes and is widely used for the impregnation of bednets and curtains in the control of malaria

(p.594). It is also active against blackflies in the adult and larval stages and is used for the larvicidal treatment of rivers in the control of onchocerciasis (p.137). It is also active against tsetse flies.

Permethrin is suitable for aircraft disinsection.

◇ References.

- WHO. Permethrin health and safety guide. *IPCS Health and Safety Guide 33*. Geneva: WHO, 1989. Available at: <http://www.inchem.org/documents/hsg/hsg/hsg033.htm> (accessed 26/04/04)
- WHO. Permethrin. *Environmental Health Criteria 94*. Geneva: WHO, 1990. Available at: <http://www.inchem.org/documents/ehc/ehc/ehc94.htm> (accessed 26/04/04)

Preparations

Proprietary Preparations (details are given in Part 3)

Arg.: Assy Crema de Enjuague; Assy Espuma; B-Jen; Blum; Capitis; Dermopier; Duncankilij; Fripi; Haircintj; Helpp; Kinerdant; Kwell; Lumatj; Nopucid; Pelo Libre; Permapyj; Quitoso NF; Sapucarij; Witty; **Austral:** Lyclear; Pyrafoam; Quellada; **Belg:** Mouskito Textile; Nix; Zalvor; **Braz:** Clean Hair; Keltrina; Kwell; Lendrexj; Nedax; Nedax Plus; Permetelj; Permetrixj; Piodrex; Pioletal; Pliohol Plusj; Postopj; Plurintj; Toppycj; Wellcidi; **Canad:** Kwellada-P; Nix; **Chile:** Assy Espuma; Kintj; **Cz:** Infectoscab; **Denm:** Nix; **Fin:** Nix; **Fr:** Insect Ecran; Modul'Aidj; Mousticologne; Moustidose; Nix; Pharmavoyage; Moustiquaires; **Ger:** InfectoPedicul; Infectoscab; **Gr:** Nix; **Hong Kong:** Quellada; **India:** Perlice; Permite; **Indon:** Scabimite; **Irl:** Lyclear; **Israel:** Lyclear; Mite-X; New-Nok; Nokj; Zehu-Ze; **Ital:** Nix Pre Clean Morn; **Mex:** Novo-Herklin 2000; Scabisan; Scabisan Plus; **Neth:** Loxazol; **Norw:** Nix; **NZ:** Lyderm; Pyrafoam; **Philipp:** Kwell Reformulated; Pyrafoam; **Port:** Desintan Ptj; Nix; Quitoso; **Rus:** (Никс); **S.Afr:** Lyclear; **Spain:** Sarcop; **Swed:** Nix; **Switz:** Loxazol; **Turk:** Kwellada; Niksen; Zalvor; **UK:** Lyclear; Residex P55; **USA:** Acticin; Elimite; Nix; **Venez:** Piokl Plus.

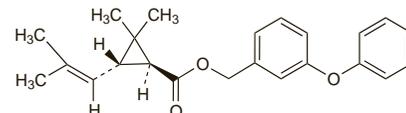
Multi-ingredient Arg.: Aero Helpp Forte; Arnecrem; Bencil Scab; Detebencl; Detebencl Nit; Hexa-Defital Plus; Hexabencil; Para Plus; Peditrem; Perbel; Permedcl; Sapucarij; **Belg:** Para Plus; Shampoo; **Braz:** Plioholj; **Cz:** Charlieu Anti-Poux; **Fr:** Anti-Ac; Aspipur; Charlieu Anti-Poux; Para Plus; Pyreflor; Sanytolj; **Gr:** Para-plus; **Israel:** Para Plus; **Ital:** Antiscabbia CM; **NZ:** Para Plus; **Rus:** Para Plus (Тара Плюс); **S.Afr:** Nitagon.

Phenothrin (BAN, rINN)

Fenotrin; Fenotrina; Phenothrine; Phenothrinum; S-2539. 3-Phenoxybenzyl (1*RS*,3*RS*)-(1*RS*,3*SR*)-2,2-dimethyl-3-(2-methylprop-1-enyl)cyclopropanecarboxylate.

Фенотрин

$C_{23}H_{26}O_3 = 350.5$.
CAS — 26002-80-2.
ATC — P03AC03.
ATC Vet — QP53AC03.



Profile

Phenothrin is a pyrethroid insecticide (see Pyrethrum Flower, p.2049). It is used for the treatment of head and pubic pediculosis (p.2034) as a 0.2% alcoholic or 0.5% aqueous lotion, or as a 0.5% alcoholic foam; as with permethrin there have been signs of resistance.

Phenothrin is also used in veterinary practice as a topical ectoparasiticide, as a household insecticide, and for the disinsection of public areas and aircraft.

◇ References.

- WHO. d-Phenothrin health and safety guide. *IPCS Health and Safety Guide 32*. Geneva: WHO, 1989. Available at: <http://www.inchem.org/documents/hsg/hsg/hsg032.htm> (accessed 26/04/04)
- WHO. d-Phenothrin. *Environmental Health Criteria 96*. Geneva: WHO, 1990. Available at: <http://www.inchem.org/documents/ehc/ehc/ehc96.htm> (accessed 26/04/04)

Aircraft disinsection. References.

- Russell RC, Paton R. In-flight disinsection as an efficacious procedure for preventing international transport of insects of public health importance. *Bull WHO* 1989; **67**: 543-7.

Preparations

Proprietary Preparations (details are given in Part 3)

Arg.: Nopucid MC; Sumo; **Cz:** Parasidose; **Fr:** Itax Antipoux; Item Antipoux; Parasidose; **Gr:** Ivaliten; Pubex; Stiem; **Irl:** Headmaster; **Israel:** Sof-Soft; **Ital:** Cruzzio Shampoo Potenziato alla Sumitrina; Mediker; Morn Gel; Morn Shampoo Schiuma; Neo Morn; Ottocid; **Mex:** Herklin NF; **NZ:** Full Marks; Parasidose; **Rus:** Anti-Bit (Анти-Бит); Itax (Итак); **Turk:** Anti-Bit; **UK:** Full Marks; **USA:** Pronto.

Multi-ingredient Fr: Sanytol; **Gr:** Cif Candioli; **Ital:** Morn Shampoo Antiparassitario; Neo Morn; **Mex:** Herklin NF; **Neth:** Zinkan.