Potassium Permanganate

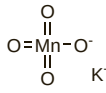
Kalii permanganas; Kalio permanganatas; Kalium Hypermanganicum; Kalium Permanganicum; Kaliumpermanganaatti; Kaliumpermanganat; Kálium-permanganát; Manganistan draselný; Permanganato potásico; Pot. Permang.; Potassium, permanganate de; Potasu nadmanganian; Potasyum Permanganat.

$KMnO_4$ = 158.0.

CAS — 7722-64-7.

ATC — D08AX06; V03AB18.

ATC Vet — QD08AX06; QV03AB18.



Pharmacopoeias. In *Chin.*, *Eur.* (see p.vii), *Jpn*, *US*, and *Viet.*

Ph. Eur. 6.2 (Potassium Permanganate). Dark purple or almost black crystals or a dark purple or brownish-black granular powder, usually with a metallic lustre. It decomposes in contact with certain organic substances. Soluble in cold water and freely soluble in boiling water.

USP 31 (Potassium Permanganate). Dark purple crystals, almost opaque by transmitted light and with a blue metallic lustre by reflected light; its colour is sometimes modified by a dark bronze-like appearance. Soluble 1 in 15 of water and 1 in 3.5 of boiling water.

Incompatibility. Potassium permanganate is incompatible with iodides, reducing agents, and most organic substances.

Adverse Effects, Treatment, and Precautions

The dry crystals or concentrated solutions of potassium permanganate are highly corrosive to tissue, while dilute solutions are mildly irritant. Contact with the skin causes irritation, redness, pain and burns, and even dilute solutions cause hardening of the outer layer of the skin and leave a brown stain on the skin. Exposure of the eye to dry crystals (including crystal dust) or concentrated solutions causes irritation, blurred vision, redness, brown staining of the conjunctiva, swelling of the eyelids, and corneal and conjunctival burns. For the effects of ingestion, see below.

The insertion into the vagina of potassium permanganate for its supposed abortifacient action causes corrosive burns, severe vaginal haemorrhage, and perforation of the vaginal wall, leading to peritonitis. Vascular collapse may occur.

Handling and storage. Potassium permanganate may be explosive if it is brought into contact with organic or other readily oxidisable substances. It has been used for the illicit preparation of fireworks; care is required with its supply.

Poisoning. Ingestion of dilute solutions of potassium permanganate may result in the mouth and throat being stained brown, sore throat, dysphagia, abdominal pain, diarrhoea, and vomiting. Ingestion of dry crystals and concentrated solutions causes oedema and necrosis of the mouth, larynx, gastrointestinal tract, and upper respiratory tract. In severe cases, acute respiratory distress syndrome, coagulopathy, hypotension, methaemoglobinaemia, hepatic necrosis, pancreatitis, and acute renal failure may develop. Oesophageal strictures and pyloric stenosis are possible long-term consequences. The fatal dose is probably about 10 g and death is usually as a result of pharyngeal oedema and cardiovascular collapse, although multiple organ failure may occur. Inhalation of potassium permanganate causes sore throat, coughing, and shortness of breath. Chronic ingestion or inhalation of potassium permanganate has resulted in CNS symptoms such as sluggishness, sleepiness, weakness of the legs, tremor, spastic gait, and falling.

Symptoms of poisoning after ingestion of potassium permanganate should be treated symptomatically. Gut neutralisation and emesis are contra-indicated. Dilution with large quantities of water or milk is cautiously recommended, while the role of activated charcoal is unclear as it is not known whether it binds potassium permanganate. Similarly, the role of corticosteroids is controversial and the efficacy of *N*-acetylcysteine for potassium permanganate hepatotoxicity is unproven. Eyes and skin contaminated with potassium permanganate should be thoroughly washed.

Uses and Administration

Potassium permanganate possesses oxidising properties which in turn confer disinfectant and deodorising properties. It is also astringent. Though bactericidal *in vitro* its clinical value as a bactericide is minimised by its rapid reduction in the presence of body fluids.

Solutions are used as cleansing applications to wounds, ulcers, or abscesses and as wet dressings and in baths in eczematous conditions and acute dermatoses especially where there is secondary infection. It is often prepared as a concentrated 0.1% solution in water to be diluted 1 in 10 before use to provide a 0.01% (1 in 10 000) solution. Solutions have also been used in bromhidrosis, in mycotic infections such as athlete's foot, and in poison ivy dermatitis.

Potassium permanganate is added to formaldehyde solution to produce formaldehyde vapour for the disinfection of rooms and cabinets (see p.1645).

Preparations

Proprietary Preparations (details are given in Part 3)
Braz.: Permaton†; ***Turk.:*** Permasol; ***UK:*** Permitabs.

Povidone-Iodine *(BAN)*

Iodinated Povidone; Jodowany powidon; Polyvidone-Iodine; Polyvinylpyrrolidone-Iodine Complex; Povidon, joderad; Povidon jodovaný; Povidona yodada; Povidonas, joduotas; Povidone iodée; Povidoni, jodattu; Povidon-Iyot; Povidon-jód; Povidonum iodinatum; Propyléneglycol, monostéarate de; PVP-Iodine; PVP-Iodine.

Повидон-йод

CAS — 25655-41-8.

ATC — D08AG02; D09AA09; D11AC06; G01AX11; R02AA15; S01AX18.

ATC Vet — QD08AG02; QD09AA09; QD11AC06; QG01AX11; QG51AD01; QR02AA15; QS01AX18.

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

Ph. Eur. 6.2 (Povidone, Iodinated). A complex of iodine with povidone containing 9 to 12% of available iodine calculated with reference to the dried substance. Yellowish-brown or reddish-brown amorphous powder. It loses not more than 8% of its weight on drying. Soluble in water and in alcohol; practically insoluble in acetone. A 10% solution in water has a pH of 1.5 to 5.0. Protect from light.

USP 31 (Povidone-Iodine). A complex of iodine with povidone containing 9 to 12% of available iodine calculated on the dried basis. A yellowish-brown to reddish-brown amorphous powder with a slight characteristic odour. It loses not more than 8% of its weight on drying. Soluble in water and in alcohol; practically insoluble in acetone, in carbon tetrachloride, in chloroform, in ether, and in petroleum spirit. Its solutions are acid to litmus. Store in airtight containers.

Incompatibility. Antimicrobial activity may be reduced at high pH.

Dermatological reactions, described as second- and third-degree burns, were observed in 4 patients in whom wounds were covered with a povidone-iodine soaked bandage secured to the skin by compound benzoin tincture. It was suggested that an interaction had occurred resulting in a more acidic pH.[1]

A mixture of povidone-iodine solution and hydrogen peroxide [brown bubbly] has caused explosions.[2]

1. Schillaci LJ, *et al.* Reduced pH associated with mixture of povidone-iodine and compound tincture of benzoin. *Am J Hosp Pharm* 1983; **40:** 1694–5.
2. Dannenberg E, Peebles J. Betadine-hydrogen peroxide irrigation solution incompatibility. *Am J Hosp Pharm* 1978; **35:** 525.

Adverse Effects and Precautions

Povidone-iodine can cause hypersensitivity reactions and irritation of the skin and mucous membranes, although severe reactions are rare and povidone-iodine is considered to be less irritant than iodine.

The application of povidone-iodine to severe burns or to large areas otherwise denuded of skin may produce the systemic adverse effects associated with iodine (p.2169) and metabolic acidosis, hypernatraemia, and renal impairment. Hyperthyroidism or hypothyroidism may occur after ingestion or absorption of large quantities. Hypothyroidism has occurred in neonates both as a result of absorption of iodine from povidone-iodine applied to the neonate and also to the mother during pregnancy or breast feeding. Povidone-iodine application is contra-indicated in premature neonates or those weighing less than 1.5 kg.

Regular or prolonged use should be avoided in patients with thyroid disorders or those receiving lithium therapy.

Acidosis. There have been reports of acidosis in patients whose burns were treated topically with povidone-iodine.[1,2] Fatal metabolic acidosis[3] and seizures[4] have been reported after mediastinal irrigation with povidone-iodine.

1. Pietsch J, Meakins JL. Complications of povidone-iodine absorption in topically treated burn patients. *Lancet* 1976; **i:** 280–2.
2. Scoggin C, *et al.* Hypernatraemia and acidosis in association with topical treatment of burns. *Lancet* 1977; **i:** 959.
3. Glick PL, *et al.* Iodine toxicity in a patient treated by continuous povidone-iodine mediastinal irrigation. *Ann Thorac Surg* 1985; **39:** 478–80.
4. Zec N, *et al.* Seizures in a patient treated with continuous povidone-iodine mediastinal irrigation. *N Engl J Med* 1992; **326:** 1784.

Breast feeding. Use of povidone-iodine in a vaginal gel by a breast-feeding woman resulted in elevated iodine concentrations in the breast milk and an odour of iodine on the infant's skin.[1]

The American Academy of Pediatrics considers however that the use of povidone-iodine is usually compatible with breast feeding.[2]

For more on precautions in breast feeding when treated with iodine compounds see p.2170.

1. Pastellon DC, Aranow R. Iodine in mother's milk. *JAMA* 1982; **247:** 463.
2. American Academy of Pediatrics. The transfer of drugs and other chemicals into human milk. *Pediatrics* 2001; **108:** 776–89. Correction. *ibid.*; 1029. Also available at: http://aappolicy.aappublications.org/cgi/content/full/pediatrics%3b108/3/776 (accessed 15/03/06)

Hypersensitivity. Immediate type I hypersensitivity reactions have been reported after topical disinfection with povidone-iodine; anaphylaxis has been reported after vaginal application[1,2] and after wound disinfection during surgery.[3] In some cases[2,3] skin tests showed that the reactions were caused by the povidone component.

Contact dermatitis has been reported[4] in a 36-year-old man who received a compress with 10% povidone-iodine aqueous solution under an occlusive bandage. The patient experienced mild itching, erythema, exudation, and a bullous reaction, limited to the area of the compress, 48 hours after application. He responded to topical corticosteroids within 5 to 6 days, but an area of sharply demarcated brown hyperpigmentation persisted for a month. While this was considered to be suggestive of an irritant effect, a positive patch test supported an allergic mechanism. A study to evaluate the incidence of contact dermatitis associated with povidone-iodine[5] found that 14 of 500 patients (2.8%) had a positive patch test with 10% povidone-iodine aqueous solution. On retesting with the same solution using a repeated open application test only 2 of the 14 (0.4%) were found to have true contact dermatitis to povidone-iodine.

1. Waran KD, Munsick RA. Anaphylaxis from povidone-iodine. *Lancet* 1995; **345:** 1506.
2. Adachi A, *et al.* Anaphylaxis to polyvinylpyrrolidone after vaginal application of povidone-iodine. *Contact Dermatitis* 2003; **48:** 133–6.
3. Le Pabic F, *et al.* First case of anaphylaxis to iodinated povidone. *Allergy* 2003; **58:** 826–7.
4. Borja JM, *et al.* Contact dermatitis due to povidone-iodine: allergic or irritant? *J Investig Allergol Clin Immunol* 2003; **13:** 131–2.
5. Lachapelle JM. Allergic contact dermatitis from povidone-iodine: a re-evaluation study. *Contact Dermatitis* 2005; **52:** 9–10.

Neonates. Hypothyroidism has been reported in premature and very low birth-weight infants after the use of povidone-iodine for routine antisepsis,[1,2] and hyperthyroidism in a full-term infant following mediastinal lavage.[3]

Perinatal vaginal use of povidone-iodine may also cause neonatal thyroid dysfunction.[4]

1. Parravicini E, *et al.* Iodine, thyroid function, and very low birth weight infants. *Pediatrics* 1996; **98:** 730–4.
2. Linder N, *et al.* Topical iodine-containing antiseptics and subclinical hypothyroidism in preterm infants. *J Pediatr* 1997; **131:** 434–9.
3. Bryant WP, Zimmerman D. Iodine-induced hyperthyroidism in a newborn. *Pediatrics* 1995; **95:** 434–6. Correction. *ibid.*; **96:** 779.
4. l'Allemand D, *et al.* Iodine-induced alterations of thyroid function in newborn infants after prenatal and perinatal exposure to povidone iodine. *J Pediatr* 1983; **102:** 935–8.

Uses and Administration

Povidone-iodine is an iodophore that is used as a disinfectant and antiseptic mainly for the treatment of contaminated wounds and pre-operative preparation of the skin and mucous membranes as well as for the disinfection of equipment.

Iodophores are loose complexes of iodine and carrier polymers. Solutions of povidone-iodine gradually release iodine to exert an effect against bacteria, fungi, viruses, protozoa, cysts, and spores; povidone-iodine is thus less potent than preparations containing free iodine but it is less toxic.

A wide variety of topical formulations is available, the majority containing about 4 to 10% of povidone-iodine; a 1% mouthwash has been used for oral infections including candidiasis and topical powders containing up to 2.5% povidone-iodine have been tried in the treatment and prevention of wound infection. For vaginal application povidone-iodine has also been used as pessaries containing 200 mg or as a 10% gel or solution.

Preparations

BP 2008: Povidone-Iodine Mouthwash; Povidone-Iodine Solution; ***USP 31:*** Povidone-Iodine Cleansing Solution; Povidone-Iodine Ointment; Povidone-Iodine Topical Aerosol; Povidone-Iodine Topical Solution.

Proprietary Preparations (details are given in Part 3)
Arg.: Antiseptico; Clivasol†; DG-6 Iodopovidona†; Dovidox†; Extraleci; Iodep; Iodoasept†; Iodomax; Iodomine†; Iopox; IPV†; Nu-Gel Hidrogel en Placa; Pervinox; Povi Complex; Povibac; Povicler; Povitiol; Salguer†; Tycoytycoy; ***Austral.:*** Betadine; Isodine†; Logicin Sore Throat†; Microshield PVP; Microshield PVP-S; Minidine†; Nyal Medithroat Gargle†; PI Antiseptic Ointment†; Savlon Antiseptic; Viodine†; ***Austria:*** Betadona; Betaisodona; Betas-

an; Betaseptic; Braunol; Braunovidon; Wundesin; ***Belg.:*** Braunol; Iodex; Iso-Betadine; ***Braz.:*** Asteriodine†; Laboriodine; Marcodine; PVPI†; Sabofen†; ***Canad.:*** Betadine; Proviodine; ***Chile:*** Difexon; Neoyod†; ***Cz.:*** Betadine; Braunol; Braunovidon; Jodisol; Jodobac†; ***Fin.:*** Betadine; ***Fr.:*** Betadine; Polidone; ***Ger.:*** Betaisodona; Braunol; Braunovidon; Freka-cid; Inadine†; Jodobac†; Mercuchrom-Jod; Polydona; Polysept; Sepso J; Traumasept; ***Gr.:*** Betadine; Drapix; Eva Povi†; Lombocid†; Oxisept; Tinsole; ***Hong Kong:*** Betadine; Freka-cid; Proviodine; Videne; ***Hung.:*** Betadine; Colpo-Cleaner; Gyneiod†; ***India:*** Alphadine†; Betadine; Betadine-AD; Cipladine; Povidine; Wokadine; ***Indon.:*** Abodine; Asepta; Betadine; Corsasep; Duvodine; Forinfec; Isodine; Molexdine; Mugisept; Neo Iodine; Scansepta; Septadine; Vidisep; ***Irl.:*** Betadine; Inadine; Savlon Dry; ***Israel:*** Idovit; Iodiflor; Iodispray; Iodo-Vit; Massengill Medicated†; Polydine; Polysept; Yodon; ***Ital.:*** Asepsan; Betadine; Betaseptic; Braunol; Citro Jod; Destrobac; Eso-Jod; Esoform Jod 35 and 75; Gammadin; Golasept; Inadine; Iodosteril; Iodoten; Jodocur†; Jodogard; Oftasteril; Paniodal†; Paniodine†; Poviderm; ***Jpn:*** Finish; ***Malaysia:*** Betadine; Freka-cid; Poviderm; Septi-Aid; Summers Eve Medicated; ***Mex.:*** Isodine; Solvin†; Yodacua; Yodine; ***Neth.:*** Betadine; Braunol; ***NZ:*** Betadine; Biocil; Riodine; Viodine†; ***Philipp.:*** Bacticide; Betadine; Povidine; Zigmadone; ***Pol.:*** Betadine; Braunovidon; Jodi; Polodina-R; Polseptol; PV Jod; ***Port.:*** Betadine; Braunol; Dinasepte†; Ginoseptil; Iodolab; Isodine; Septil; ***Rus.:*** Betadine (Бетадин); Iodoxyd (Йодоксид); Wokadine (Вокадин); ***S.Afr.:*** Betadine; Dermadine; Drygel; Podine; Septadine; Septisooth; Steridine; Zedchem PVP-I; ***Singapore:*** Betadine; ***Spain:*** Acydona; Betadine; Betatul; Curadona; Iodina; Orto Dermo P; Sanoyodo; Topionic; ***Switz.:*** Betadine; Braunol; Braunosan; Braunosan H Plus; Braunovidon; Destrobac; Intersept; Jodoplex; ***Thai.:*** Annadine; Bactedene; Bemadine†; Betadine; Cavodine†; Eprodine†; Freka-cid; Isodine; Movidone; P-Vidine†; Povadine; Sepfadine†; Septidine; Upodine; Videne; X-Tardine; ***Turk.:*** Batticon; Betakon; Biokadin; Isosol; Polyod; Poviseptin; ***UK:*** Betadine; Inadine; Savlon Dry; Videne; ***USA:*** ACU-dyne; Betadine; Biodine; Efodine; Iodex; Massengill Medicated; Minidyne; Operand; Polydine; Summers Eve Medicated; ***Venez.:*** Betadine; Etiyodix†; Intradine; Intradyn; Iopovidona†; Jabodine†; Norlidine; Podival†; Povidine†; Yodasept†.

Multi-ingredient: ***Arg.:*** Merthiolate Iodopovidona; Pervinox D; ***Austria:*** Braunoderm; ***Belg.:*** Braunoderm; ***Braz.:*** Iodocaine†; ***Cz.:*** Jox; ***Ger.:*** Betaseptic; Braunoderm; Repithel; ***Hung.:*** Eczil†; Jox†; ***India:*** Eczo-Wokadine; ***Indon.:*** Kalpanax; Kopamex; ***Ital.:*** Braunoderm; Jodieci; ***Jpn:*** U-Pasta; ***Mex.:*** Bano Coloide; Riban; ***Port.:*** Braunoderm; ***Rus.:*** Jox (Мокс); ***Switz.:*** Betaseptic; Braunoderm; ***Turk.:*** Batiodin; ***USA:*** Anbesol; Orasol; ProTech.

Propamidine Isetionate *(BANM, rINNM)*

Isetionato de propamidina; M&B-782; Propamidine Isethionate; Propamidine, Isétionate de; Propamidini Isetionas. 4,4′-Trimethylenedioxydibenzamidine bis(2-hydroxyethanesulphonate).

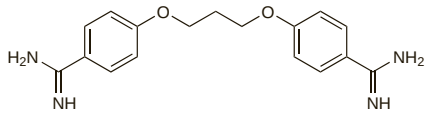
Пропамидина Изетионат

$C_{17}H_{20}N_4O_2.2C_2H_6O_4S$ = 564.6.

CAS — 104-32-5 (propamidine); 140-63-6 (propamidine isetionate).

ATC — D08AC03; S01AX15.

ATC Vet — QD08AC03; QS01AX15.



Profile

Propamidine isetionate is an aromatic diamidine antiseptic that is active against Gram-positive bacteria, but less active against Gram-negative bacteria and spore-forming organisms. It also has antifungal properties and is active against *Acanthamoeba*. Ophthalmic solutions containing 0.1% of propamidine isetionate are used for the treatment of conjunctivitis and blepharitis.

Acanthamoeba keratitis. The optimal regimen for the treatment of *Acanthamoeba* keratitis (p.822) has yet to be determined. Propamidine isetionate applied topically was the first drug used with some success.[1,2] It was used with an aminoglycoside such as neomycin or a neomycin-polymyxin-gramicidin preparation and a cure was achieved in about 50% of cases. Due to surface toxicity and poor *in-vitro* sensitivity of neomycin, propamidine was later used with chlorhexidine or polihexanide. However, poor cysticidal activity, chronic conjunctival infection, and resistance of some strains of *Acanthamoeba* to propamidine has prompted the suggestion that it should be replaced by another diamidine such as hexamidine.[3]

1. Murdoch D, *et al.* Acanthamoeba keratitis in New Zealand, including two cases with in vivo resistance to polyhexamethylene biguanide. *Aust N Z J Ophthalmol* 1998; **26:** 231–6.
2. Seal DV. Acanthamoeba keratitis update—incidence, molecular epidemiology and new drugs for treatment. *Eye* 2003; **17:** 893–905.
3. Perrine D, *et al.* Amoebicidal efficiencies of various diamidines against two strains of Acanthamoeba polyphaga. *Antimicrob Agents Chemother* 1995; **39:** 339–42.

Preparations

Proprietary Preparations (details are given in Part 3)
Austral.: Brolene; ***Irl.:*** Brolene; ***NZ:*** Brolene; ***S.Afr.:*** Brolene; ***UK:*** Brolene; Golden Eye Drops.

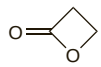
Propiolactone *(BAN, USAN, rINN)*

BPL; NSC-21626; 2-Oxetanone; Propanolide; Propiolactona; β-Propiolactone; Propiolactonum. Propiono-3-lactone.

Пропиолактон

$C_3H_4O_2$ = 72.06.

CAS — 57-57-8.



Profile

Propiolactone vapour is an irritant, mutagenic, possibly carcinogenic, disinfectant which is very active against most microorganisms including viruses. It is rather less effective against bacterial spores.

Propiolactone vapour has been used for the gaseous sterilisation of pharmaceutical and surgical materials and for disinfecting large enclosed areas. It has low penetrating power. Propiolactone liquid has also been used.

Propyl Alcohol

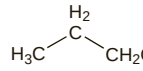
Alcohol propílico; Normal Propyl Alcohol; Primary Propyl Alcohol; Propanol; Propanoli; Propanolis; Propanolum. Propan-1-ol.

$CH_3.CH_2.CH_2OH$ = 60.10.

CAS — 71-23-8.

ATC — D08AX03.

ATC Vet — QD08AX03.



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

Ph. Eur. 6.2 (Propanol). A clear colourless liquid. Miscible with water and with dehydrated alcohol. Protect from light.

Adverse Effects and Treatment

As for Alcohol, p.1625; propyl alcohol is considered more toxic.

◊ References.

1. WHO. 1-Propanol. *Environmental Health Criteria 102.* Geneva: WHO, 1990. Available at: http://www.inchem.org/documents/ehc/ehc/ehc102.htm (accessed 15/03/06)

Uses and Administration

Propyl alcohol, an antiseptic with properties similar to those of alcohol (p.1627), is used in preparations for disinfection of the hands, skin, surfaces, and instruments.

Isopropyl alcohol (p.1651) is also used as an antiseptic.

Preparations

Proprietary Preparations (details are given in Part 3)
Ger.: Skinman Asept.

Multi-ingredient: ***Austria:*** Dodesept; Kodan; Marcocid; Octeniderm; ***Fr.:*** Anios DD; Sterillium†; ***Ger.:*** Aerodesin; Bacillol; Bacillol AF; Bacillol plus; Desmanol†; Freka-Steril; Hospisept; Incidin; Incidur Spray†; Kodan Tinktur Forte†; Meliseptol; Meliseptol Rapid; Neo Kodan†; Primasept Med†; Sagrosept†; Softa Man; St-Tissues; Sterillium; ***Gr.:*** Chiro Des; Octeniderm; Sterillium; ***Ital.:*** Softa Man; ***Neth.:*** Softa-Man; Sterillium; ***Singapore:*** Listerine Cool Mint; Listerine Fresh Burst; Listerine Tartar Control; ***Switz.:*** Kodan Teinture forte; Octeniderm; Softa-Man; Sterillium†.

Ritiometan *(rINN)*

Ritiométan; Ritiometán; Ritiometanum. (Methylidynetrithio)-triacetic acid.

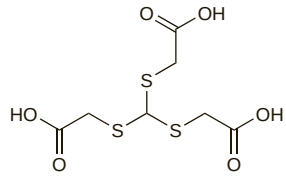
Ритиометан

$C_7H_{10}O_6S_3$ = 286.3.

CAS — 34914-39-1.

ATC — R01AX05.

ATC Vet — QR01AX05.



Profile

Ritiometan is used as the magnesium salt in an aerosol preparation for the treatment of infections of the nose and throat.

Preparations

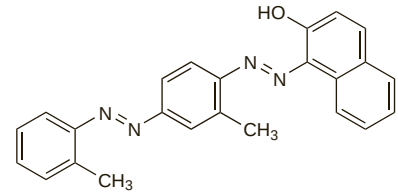
Proprietary Preparations (details are given in Part 3)
Fr.: Necyrane.

Scarlet Red

Biebrich Scarlet R Medicinal; CI Solvent Red 24; Colour Index No. 26105; Fat Ponceau R; Rojo escarlata; Rubrum Scarlatinum; Scharlachrot; Sudan IV. 1-[4-(o-Tolylazo)-o-tolylazo]naphth-2-ol.

$C_{24}H_{20}N_4O$ = 380.4.

CAS — 85-83-6.



Profile

Scarlet red is an antiseptic dye that has been used topically. It can be irritant. Scarlet red is not permitted as a food colour in the EU, as it is thought to be a genotoxic carcinogen.

Sodium Azide

Azida sódica; Sodu azydek.

N_3Na = 65.01.

CAS — 26628-22-8.

Adverse Effects and Precautions

Sodium azide is a potent vasodilator and the most common adverse effect, regardless of the route of exposure, is hypotension. Hypotension developing more than an hour after exposure is associated with more severe toxicity and fatality. Other severe symptoms include seizure, coma, arrhythmia, tachypnoea, pulmonary oedema, metabolic acidosis, and cardiorespiratory arrest. Milder symptoms include nausea, vomiting, diarrhoea, headache, dizziness, temporary loss of vision, palpitations, dyspnoea, temporary loss of consciousness, or decreased mental status. There is no specific antidote for sodium azide intoxication.

Solutions containing sodium azide must not be disposed of into drain pipelines containing copper, lead, or brass since highly explosive heavy metal azides may be produced.

◊ References to acute poisoning with sodium azide.

1. Edmonds OP, Bourne MS. Sodium azide poisoning in five laboratory technicians. *Br J Ind Med* 1982; **39:** 308–9.
2. Klein-Schwartz W, *et al.* Three fatal sodium azide poisonings. *Med Toxicol Adverse Drug Exp* 1989; **4:** 219–27.
3. Anonymous. Sodium azide contamination of hemodialysis water supplies. *JAMA* 1989; **261:** 2603.
4. Chang S, Lamm SH. Human health effects of sodium azide exposure: a literature review and analysis. *Int J Toxicol* 2003; **22:** 175–86.

Airbag deployment. Chemical and thermal burns have occurred after accidental perforation of airbags in motor vehicles and the release of sodium azide and other byproducts. Irritant contact dermatitis usually affecting the upper chest, arms, and face, and blunt trauma have also been reported.[1,2]

1. Corazza M, *et al.* Effects of airbag deployment: lesions, epidemiology, and management. *Am J Clin Dermatol* 2004; **5:** 295–300.
2. Suhr M, Kreusch T. Burn injuries resulting from (accidental) airbag inflation. *J Craniomaxillofac Surg* 2004; **32:** 35–7.

Effects on the nervous system. A study[1] to evaluate occupational neurotoxicity to sodium azide over a period of 3 years found that the only significant chronic symptom was trembling of the hands, occurring in 15 of 41 exposed workers compared with none of 42 controls. There was no difference between the 2 groups for other psychological or neuropsychological tests. Acute adverse effects most commonly reported by the exposed workers were heart palpitations, fatigue, nausea, vertigo, and irritated or red eyes.

1. Miljours S, Braun CMJ. A neuropsychotoxicological assessment of workers in a sodium azide production plant. *Int Arch Occup Environ Health* 2003; **76:** 225–32.

Haemodialysis. Of 10 investigations by the CDC[1] into outbreaks of disease caused by chemicals in haemodialysis facilities between 1979 and 1999, one was due to sodium azide. Inadequate rinsing of water filters resulted in the exposure of 9 patients to sodium azide in a dialysis centre. Patients experienced sudden hypotension, blurred vision, headache, nausea, vomiting, syncope, and 1 patient experienced cramps.

1. Arduino MJ. CDC investigations of noninfectious outbreaks of adverse events in hemodialysis facilities, 1979-1999. *Semin Dial* 2000; **13:** 86–91.

Uses

Sodium azide has been used as an antimicrobial preservative in laboratory reagents, serum samples, and dialysis equipment. It is also used in car airbags; sudden impact triggers an electrical charge causing the sodium azide to explode and nitrogen gas is released.