

Preparations

Proprietary Preparations (details are given in Part 3)

Multi-ingredient: USA: Vi Rid-Ready.

Orthophenylphenol

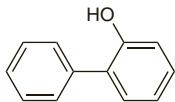
2-Biphenyol; E231; E232 (sodium-o-phenylphenol); 2-Hydroxybiphenyl; o-Hydroxydiphenyl; Ortifenilfenol. (I,I'-Biphenyl)-2-ol.

$C_{12}H_{10}O = 170.2$.

CAS — 90-43-7.

ATC — D08AE06.

ATC Vet — QD08AE06.



Profile

Orthophenylphenol is a phenolic disinfectant with antimicrobial properties similar to those of chloroxylenol (p.1640). It is used for disinfection of skin, hands, instruments, and hard surfaces. It also has many industrial and agricultural uses as a preservative for a wide range of materials, particularly against moulds and rots. Sodium-o-phenylphenol has been used similarly.

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Ger.: Amocid; **Ital.:** Citromedics Disinfettante; Citrosteril Aspiratori; Crescom; Esofenol 60; Germozero Clean; Helix; Higesan; Neo Esoformolo; Vcanalare; **Switz.:** Manusept†.

Multi-ingredient: Austria: Dodesept; Dodesept Gefarbtl; Kodan; **Ger.:** Bomix; Desderman Nf; Freka-Derm; Freka-Sept 80; Helipur; Incidin Extra†; Kodan Tinktur Forte†; Primasept Med†; **Ital.:** Bergont; Dianil†; Esofenol; Fermi; Germozero Dermo; Germozero Plus; Helipur; Hygienist†; Norica; Sangen Casa; Sterosan; **Switz.:** Frekaderm†; Kodan Teinture forte; **USA:** BTK-Plus.

Oxychlorosene (USAN)

Monoxychlorosene; Oxicloroseno.

$C_{20}H_{34}O_3S.HOCl = 407.0$.

CAS — 8031-14-9.

Oxychlorosene Sodium (USAN)

Oxicloroseno sódico; Sodium Oxychlorosene.

CAS — 52906-84-0.

Profile

Oxychlorosene is the hypochlorous acid complex of a mixture of the phenyl sulfonate derivatives of aliphatic hydrocarbons. It is a chlorine-releasing antiseptic with the general properties of chlorine, p.1638.

A 0.4% solution of oxychlorosene sodium has been used for cleansing wounds (although chlorine-releasing antiseptics are generally regarded as too irritant for this purpose—see Disinfection, Wounds, under Uses and Administration of Sodium Hypochlorite, p.1662) and for pre-operative skin preparation; a 0.1 or 0.2% solution has been used in urological and ophthalmological disinfection.

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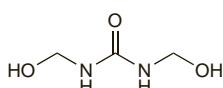
USA: Cloractin WCS-90.

Oxymethurea

Carbamol; N,N'-di(hydroksimetyl)karbamidi; N,N'-di(hydroximethyl)-karbamid; Dihydroxymethyl Carbamide; N,N'-di(hydroxymethyl)carbamidum; Oximeturea. N,N'-Bis(hydroxymethyl)urea.

$C_3H_8N_2O_3 = 120.1$.

CAS — 140-95-4.



Profile

Oxymethurea is an antiseptic included in multi-ingredient preparations intended for the topical treatment of ear infections.

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Multi-ingredient: Austria: Ciloprin cum Anaesthetico†; **Fin.:** Ciloprin cum Anaesthetico†; **India:** Otogesic; **Switz.:** Ciloprin cat†.

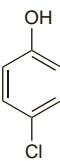
The symbol † denotes a preparation no longer actively marketed

Parachlorophenol

Paraclorofenol. 4-Chlorophenol.

$C_6H_5ClO = 128.6$.

CAS — 106-48-9.



Pharmacopoeias. In US.

US also includes camphorated parachlorophenol.

USP 31 (Parachlorophenol). It consists of white or pink crystals with a characteristic phenolic odour. M.p. about 42°; congealing temperature between 42° and 44°. Sparingly soluble in water and in liquid paraffin; very soluble in alcohol, in chloroform, in ether, in glycerol, and in fixed and volatile oils; soluble in soft paraffin. A 1% solution in water is acid to litmus. Store in airtight containers. Protect from light.

USP 31 (Camphorated Parachlorophenol). It contains not less than 33% and not more than 37% of parachlorophenol and not less than 63% and not more than 67% of camphor, with the sum of the percentages of parachlorophenol and camphor not less than 97% and not more than 103%. Store in airtight containers. Protect from light.

Profile

Parachlorophenol is a chlorinated phenolic disinfectant and antiseptic with similar properties to phenol (p.1656). Camphorated parachlorophenol has been used in dentistry in the treatment of infected root canals.

Preparations

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Multi-ingredient: **Ital.:** Esofenol Ferri; Pasta Iodoformica Radiopaca; **Spain:** Cresophene; **Switz.:** Frekaderm†; Kodan Teinture forte; **USA:** BTK-Plus.

Paraformaldehyde

Paraform; Paraformaldehido; Paraformic Aldehyde; Polymerised Formaldehyde; Polyoxymethylene; Trioxyméthylène.

$(CH_2O)_n$.

CAS — 30525-89-4.

Pharmacopoeias. In Jpn.

Adverse Effects, Treatment, and Precautions

As for Formaldehyde Solution, p.1644. There have been reports of allergic reactions and nerve damage associated with the dental use of paraformaldehyde as a root canal sealant; it should not extrude beyond the apex.

Uses and Administration

Paraformaldehyde is a disinfectant and antiseptic with the properties and uses of formaldehyde (p.1645) and is used as a source of formaldehyde. To disinfect rooms it has been vapourised by heating. Tablets prepared for this purpose should be coloured by the addition of a suitable blue dye.

Paraformaldehyde has been used in lozenges for the treatment of minor throat infections. In dentistry, it has been used as an obtundent for sensitive dentine and as an antiseptic in mummifying pastes and for root canals. Paraformaldehyde may also be used for the decontamination of equipment thought to be contaminated with the spores of *Bacillus anthracis*.

Preparations

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Israel: Formalin.

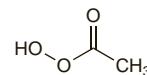
Multi-ingredient: **Ital.:** Eso 70; Esoform 7 mc; Esoform 70 mc; Pasta Devitalizzante; **Switz.:** Asphaltine†; Caustiner forte†.

Peracetic Acid

Acetyl Hydroperoxide; Acidum Peraceticum; Kyselina peroctová; Peracético, ácido; Peroxyacetic Acid.

$C_2H_4O_3 = 76.05$.

CAS — 79-21-0.



Adverse Effects and Precautions

Concentrated peracetic acid is corrosive to the skin. Inhalation may produce respiratory symptoms, including pulmonary oedema, although commercial solutions are claimed to have low vapour activity.

Occupational exposure. Although corrosive and highly irritating to skin, eyes, mucous membranes and respiratory tract, solutions of peracetic acid (with hydrogen peroxide) were thought unlikely to cause sensitisation leading to hypersensitivity reactions in healthcare workers who were occupationally exposed. In contrast, o-phthalodialdehyde, although its sensitising potential was much lower than that of glutaral, might cause respiratory and dermal sensitisation.¹

- Rideout K, et al. Considering risks to healthcare workers from glutaraldehyde alternatives in high-level disinfection. *J Hosp Infect* 2005; **59**: 4-11.

Uses

Peracetic acid is a strong oxidising disinfectant. It is active against many micro-organisms including bacteria, spores, fungi, and viruses. It is used for disinfecting medical equipment including dialysers and endoscopes. It is used in the food industry and for disinfecting sewage sludge, and has been used as a spray for sterilisation of laboratories.

◊ Reviews.

- Kitis M. Disinfection of wastewater with peracetic acid: a review. *Environ Int* 2004; **30**: 47-55.

Disinfection of dialysis equipment. For use of peracetic acid with hydrogen peroxide in the disinfection of dialysis equipment, see under Hydrogen Peroxide, p.1648.

Disinfection of endoscopes. Peracetic acid has been used to disinfect endoscopes;^{1,2} it is a possible alternative to glutaral (see p.1623).

- Bradley CR, et al. Evaluation of the Steris system 1 peracetic acid endoscope processor. *J Hosp Infect* 1995; **29**: 143-51.
- Middleton AM, et al. Disinfection of bronchoscopes, contaminated in vitro with Mycobacterium tuberculosis, Mycobacterium avium-intracellulare and Mycobacterium chelonae in sputum, using stabilized, buffered peracetic acid solution ('Nu-Cidex'). *J Hosp Infect* 1997; **37**: 137-43.

Preparations

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Fr.: Dynacide; Nu-Cidex†; **Ger.:** Sekusept; **Ital.:** Esodrox; Ferrister; Renaxid; SaniDrox; Sekusept; Spordox Plus; **Singapore:** Perasafe.

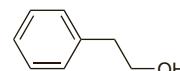
Multi-ingredient: **Fr.:** Anioxyde; **Ger.:** Peralst†; **Ital.:** Adaspor; Esocetic Plus; Esocetic†; Peresa; **Singapore:** Virkon.

Phenethyl Alcohol (BAN)

Alcohol feniletílico; Alcohol Phenylethylicus; Alkohol fenyloetylowy; Benzyl Carbinol; Phenethanolum; Phenylethyl alcohol. 2-Phenylethanol.

$C_6H_5CH_2CH_2OH = 122.2$.

CAS — 60-12-8.



Pharmacopoeias. In Pol. and US.

USP 31 (Phenethyl Alcohol). A colourless liquid with a rose-like odour. Soluble 1 in 60 of water, 1 in less than 1 of alcohol, of chloroform, of ether of benzyl benzoate, and of diethyl phthalate, and 1 in 2 of alcohol 50%; very soluble in glycerol, in propylene glycol, and in fixed oils; slightly soluble in liquid paraffin. Store in airtight containers in a cool, dry place. Protect from light.

Incompatibility. Phenethyl alcohol is incompatible with oxidising agents and proteins. Activity may be reduced by nonionic surfactants or by adsorption onto low density polyethylene containers.

Profile

Phenethyl alcohol is more active against Gram-negative than Gram-positive bacteria. It is used as a preservative in ophthalmic, nasal, and otic solutions at a concentration of 0.25 to 0.5%, with another bactericide, and up to 1% in topical preparations. It is also used as an antiseptic in topical products in concentrations of up to 7.5%. It is also used as a component of flavouring essences and perfumes.

Phenethyl alcohol may cause eye irritation.

Antimicrobial action. Antimicrobial activity may be enhanced by the addition of phenethyl alcohol to solutions preserved with benzalkonium chloride, chlorhexidine acetate, phenylmercuric nitrate, chlorocresol, or chlorobutanol.¹

- Richards RME, McBride RJ. The preservation of ophthalmic solutions with antibacterial combinations. *J Pharm Pharmacol* 1972; **24**: 145-8.

Preparations

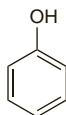
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Multi-ingredient: **Austral.:** Resolve Tinea; Sebirinse; **Canada.:** Sclerodex; **Ger.:** Imazol; **Irl.:** Canealf†; **NZ:** Sebirinse; **UK:** Caneel.

The symbol † denotes a preparation no longer actively marketed

Phenol

Carbolic Acid; Fenol; Fenoli; Fenolis; Phenic Acid; Phénol; Phenolum; Phenyl Hydrate; Phenylc Acid. Hydroxybenzene.
Оксибензол; Фенол
 $C_6H_5OH = 94.11$.
CAS — 108-95-2.
ATC — C05BB05; D08AE03; N01BX03; R02AA19.
ATC Vet — QC05BB05; QD08AE03; QN01BX03;
QR02AA19.



Pharmacopoeias. In Chin., Eur. (see p.vii), Jpn., US, and Viet. Br., Swiss, and US also include a monograph for Liquefied Phenol.

Ph. Eur. 6.2 (Phenol). Colourless or faintly pink or faintly yellow deliquescent crystals or crystalline masses. F.p. not less than 39.5°. Soluble in water; very soluble in alcohol, in dichloromethane, and in glycerol. Store in airtight containers. Protect from light.

BP 2008 (Liquefied Phenol). An aqueous mixture containing phenol 77.0 to 81.5% w/w in purified water. A colourless to faintly coloured, caustic liquid with a characteristic and not tarry odour. Soluble in water; miscible with alcohol, with ether, and with glycerol. Protect from light. It may congeal or deposit crystals if stored at a temperature below 4°. It should be completely melted before use.

When phenol is to be mixed with collodion, fixed oils, or paraffins, melted phenol should be used, and not Liquefied Phenol.

USP 31 (Phenol). Colourless to light pink, interlaced or separate, needle-shaped crystals, or a white to light pink crystalline mass, with a characteristic odour. It gradually darkens on exposure to light and air. Soluble 1 in 15 of water; very soluble in alcohol, in chloroform, in ether, in glycerol, and in fixed and volatile oils; soluble 1 in 70 of liquid paraffin. A solution of 1 g in 15 mL water is clear and is neutral or acid to litmus. Store in airtight containers. Protect from light.

USP 31 (Liquefied Phenol). Phenol maintained in a liquid condition by the presence of about 10% of water; it contains not less than 89% by weight of phenol. It may contain a suitable stabiliser. A colourless to pink liquid which may develop a red tint upon exposure to air or light, and with a characteristic, somewhat aromatic odour. Miscible with alcohol, with ether, and with glycerol. Store in airtight glass containers. Protect from light.

When phenol is to be mixed with a fixed oil, liquid paraffin, or white soft paraffin, crystalline Phenol and not Liquefied Phenol should be used.

Incompatibility. Phenol is incompatible with alkaline salts and nonionic surfactants. The antimicrobial activity of phenol may be diminished through increasing pH or through combination with blood and other organic matter.

Use for preservation. NOTE. Phenol should not be used to preserve preparations that are to be freeze-dried.

Adverse Effects

When ingested, phenol causes extensive local corrosion, with pain, nausea, vomiting, sweating, and diarrhoea. Excitation may occur initially but it is quickly followed by unconsciousness. There is depression of the CNS, with cardiac arrhythmias, and circulatory and respiratory failure, which may lead to death. Acidosis may develop and occasionally there is haemolysis and methaemoglobinemia with cyanosis. The urine may become dark brown or green. Pulmonary oedema and myocardial damage may develop, and damage to the liver and kidneys may lead to organ failure.

Severe or fatal poisoning may occur from the absorption of phenol from unbroken skin or wounds and suitable precautions should be taken to prevent absorption. Applied to skin, phenol causes blanching and corrosion, sometimes with little pain. Aqueous solutions as dilute as 10% may be corrosive.

Toxic symptoms may also arise through absorption of phenol vapour by the skin or lungs. Phenol throat spray may cause local oedema.

Cresols and other phenolic substances have similar effects.

Effects on the heart. A 10-year-old boy developed life-threatening premature ventricular complexes during the application of a solution of phenol 40% and croton oil 0.8% in hexachlorophene soap and water for chemical peeling of a giant hairy naevus.¹

Cardiac arrhythmias have been reported after the use of phenol for chemical face peeling.² They were also seen in 3 of 16 children who received phenol 5% as a neurolytic.³

- Warner MA, Harper JV. Cardiac dysrhythmias associated with chemical peeling with phenol. *Anesthesiology* 1985; **62**: 366-7.
- Botta SA, et al. Cardiac arrhythmias in phenol face peeling: a suggested protocol for prevention. *Aesthetic Plast Surg* 1988; **12**: 115-17.
- Morrison JE, et al. Phenol motor point blocks in children: plasma concentrations and cardiac dysrhythmias. *Anesthesiology* 1991; **75**: 359-62.

Effects on the kidneys. A 41-year-old man developed acute renal failure due to cutaneous absorption of phenol after falling into a shallow vat of industrial solvent containing 40% phenol in dichloromethane. No ingestion occurred. Other symptoms included 50% body-surface burns, cold extremities, nausea, vomiting, and respiratory distress. The patient required haemodialysis for 3 weeks; some abnormalities of renal function remained one year later.¹

- Foxall PJD, et al. Acute renal failure following accidental cutaneous absorption of phenol: application of NMR urinalysis to monitor the disease process. *Hum Toxicol* 1989; **9**: 491-6.

Effects on the liver. Phenol-induced hepatotoxicity has been reported¹ in a 43-year-old man after injection sclerotherapy for haemorrhoids with 5% phenol in arachis oil. During treatment the patient experienced pain radiating to the penis, then later developed backache and haematuria, and 6 days later was admitted to hospital with jaundice. He recovered well and his liver enzymes returned to normal levels after 6 months.

- Suppli A, Perry EP. Jaundice as a presentation of phenol induced hepatotoxicity [sic] following injection sclerotherapy for haemorrhoids. *Surgeon* 2005; **3**: 43-4.

Effects on sexual function. Three patients developed urinary symptoms and impotence which lasted up to one year after each receiving phenol 5% in arachis oil sclerotherapy for haemorrhoids.¹

- Bullock N. Impotence after sclerotherapy of haemorrhoids: case reports. *BMJ* 1997; **314**: 419.

Effects on the throat. Acute life-threatening epiglottitis occurred in a 49-year-old woman after the use of a throat spray containing the equivalent of 1.4% phenol. The reaction may have been anaphylactic or due to a direct toxic effect of the spray.¹ The UK CSM² reported in 1990 that it had received 4 reports of oedema of the epiglottis and/or larynx leading to respiratory difficulties. While the condition was rare, the effects were severe; 1 patient died and 2 survived only after emergency hospital treatment.

- Ho S-L, Hollinrake K. Acute epiglottitis and Chloraseptic. *BMJ* 1989; **298**: 1584.

- Committee on Safety of Medicines. Chloraseptic throat spray and oedema of the epiglottis and larynx. *Current Problems* 1990.

Treatment of Adverse Effects

If phenol has been swallowed, activated charcoal may be useful. Some sources suggest the cautious use of gastric lavage although this is generally inappropriate after ingestion of corrosive substances.

If phenol has been spilled on the skin removal of contaminated clothing and excess phenol should be followed by washing of the skin with glycerol or, alternatively, with copious amounts of water. Macrogol 300 and vegetable oils have also been used.

Contamination of the eyes should be treated by flooding with water or sodium chloride 0.9% only for at least 10 to 15 minutes.

The patient should be kept warm and given supportive treatment. Intravenous sodium bicarbonate should be given where there is metabolic acidosis.

Precautions

Solutions containing phenol should not be applied to large areas of skin or large wounds since sufficient phenol may be absorbed to give rise to toxic symptoms. Phenol should not be used as a throat spray in patients with epiglottitis, or in children aged under 6 years.

Pharmacokinetics

Phenol is absorbed from the gastrointestinal tract and through skin and mucous membranes. It is metabolised to phenylglucuronide and phenyl sulfate, and small amounts are oxidised to catechol and quinol which are mainly conjugated. The metabolites are excreted in the urine; on oxidation to quinones they may tint the urine dark brown or green.

Uses and Administration

Phenol is an antiseptic and disinfectant effective against vegetative Gram-positive and Gram-negative

bacteria, mycobacteria, and some fungi, but only very slowly effective against spores. It is also active against certain viruses. Phenol is more active in acid solution. Aqueous solutions up to 1% are bacteriostatic while stronger solutions are bactericidal.

A 0.5 to 1% solution has been used for its local anaesthetic effect to relieve itching.

A 1.4% solution is used for pain or irritation of the mouth and throat. Weak concentrations (up to 2%) have also been used topically for disinfection. A 5% solution has been used as a disinfectant for excreta.

Oily Phenol Injection (BP 2008), up to 10 mL, has been injected into the tissues around internal haemorrhoids as an analgesic sclerosing agent, but alternative procedures may be preferred. Aqueous phenol has also been used as a sclerosant in the treatment of hydroceles.

Solutions of phenol in glycerol have been given intrathecally for the alleviation of spasticity (p.1887) or injected intrathecally or into soft-tissue structures for the treatment of chronic low back pain. Other types of severe intractable pain may be relieved by injecting aqueous phenol close to motor nerves. Aqueous phenol has been used for chemical sympathectomy in peripheral vascular disorders and for the treatment of urinary incontinence.

Liquefied phenol has been used in the treatment of ingrowing toenails.

Dystonias. Phenol appears to produce a decrease in muscle tone without profound weakness and is considered to be an effective agent in treating focal dystonias.¹ Intramuscular phenol was reported² to have produced improvement in 2 adult patients with moderately severe spasmodic torticollis (p.1892) who had not responded adequately to intramuscular injections of botulinum A toxin. Response was maintained by re-injection every 6 months. Following this case report, an open trial³ was conducted on 3 patients with spasmodic torticollis who had not responded to botulinum toxin A and other drug treatments. After 10 intramuscular injections of phenol, given weekly and then monthly, 2 of the patients showed improvement; one reached partial remission while the other had improvement that lasted for 3 months. The third patient did not respond to treatment with phenol. A study⁴ to determine the effectiveness and adverse effects of a 2% phenol block in patients with spasmodic torticollis was conducted in 16 patients, all of whom were refractory to oral drug and rehabilitation therapies. Results showed significant improvement in neck movement and position. However, 4 patients developed reversible sensory disturbance of the transverse cutaneous nerve of the neck area. A patient who developed a focal dystonic contraction of the foot responded to single intramuscular injection of 5% aqueous phenol, after initial treatment with botulinum toxin A had shown no benefit.⁵

- Zafonte RD, Munin MC. Phenol and alcohol blocks for the treatment of spasticity. *Phys Med Rehabil Clin N Am* 2001; **12**: 817-32.

- Massie JM. Treatment of spasmodic torticollis with intramuscular phenol injection. *J Neurol Neurosurg Psychiatry* 1995; **58**: 258-9.

- Garcia Ruiz PJ, Sanchez Bernardo V. Intramuscular phenol injection for severe cervical dystonia. *J Neurol* 2000; **247**: 146-7.

- Takeuchi N, et al. Phenol block for cervical dystonia: effects and side effects. *Arch Phys Med Rehabil* 2004; **85**: 1117-20.

- Kim J-S, et al. Idiopathic foot dystonia treated with intramuscular phenol injection. *Parkinsonism Relat Disord* 2003; **9**: 355-9.

Haemorrhoids. Sclerotherapy with oily phenol injection has been used¹ to treat haemorrhoids (p.1697). The technique for preventing mucosal prolapse is to inject small volumes (about 2 or 3 mL) of a 5% solution of phenol in arachis oil into the submucous space above each of the 3 principal haemorrhoids. Rather than causing the haemorrhoidal veins to thrombose, the injection works by producing submucosal fibrosis, fixing the mucosa to the underlying muscle. However, other techniques for mucosal fixation such as rubber band ligation or perhaps infra-red coagulation are more effective and associated with fewer complications.²⁻⁵

- Alexander-Williams J. The management of piles. *BMJ* 1982; **285**: 1137-9.

- Gartell PC, et al. A randomised clinical trial to compare rubber band ligation with phenol injection in the treatment of haemorrhoids. *Gut* 1984; **25**: A563.

- Ambruso NS, et al. Prospective randomised trial of injection therapy against photoocoagulation therapy in first and second degree haemorrhoids. *Gut* 1984; **25**: A563-4.

- Johanson JF, Rimini A. Optimal nonsurgical treatment of hemorrhoids: a comparative analysis of infrared coagulation, rubber band ligation, and injection sclerotherapy. *Am J Gastroenterol* 1992; **87**: 1601-6.

- MacRae HM, McLeod RS. Comparison of hemorrhoidal treatment modalities: a meta-analysis. *Dis Colon Rectum* 1995; **38**: 687-94.