

There has been considerable concern over the systemic absorption of mercury from dental amalgam, which typically contains between 40 and 70% of mercury. However, the quantity absorbed from amalgam fillings is reported to be relatively small^{9,10} and current evidence suggests that the use of dental amalgam for tooth restoration is both safe and effective.¹¹⁻¹⁴ The main risks appear to be occupational exposure of dental staff and environmental pollution. Some patients with hypersensitivity to mercury (manifest most commonly as local lichenoid reactions) may benefit from removal of amalgam fillings.¹⁵⁻¹⁷

Ethylmercury is contained in thiomersal, which is used as a preservative in some vaccines for infants and children, thus representing a potential source of mercury exposure. The safety of these vaccines has been a matter of considerable debate worldwide for many years although it is now usually accepted that there is no evidence of neurotoxicity. However, some countries have phased out vaccines containing thiomersal in favour of alternative preservatives. For further details and references, see Thiomersal p.1664.

The symptoms of *acrodyndia* have been mistaken for those of phaeochromocytoma.¹⁸⁻²¹

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Effects on the kidneys. The kidneys are one of the primary sites for the accumulation of mercury in the body. All forms of mercury (liquid mercury, inorganic mercury, and organic mercury) may be toxic to the kidney although the inorganic forms are the most nephrotoxic.¹

- Zalups RK. Molecular interactions with mercury in the kidney. *Pharmacol Rev* 2000; **52**: 113-43.

Hypersensitivity. Systemic contact dermatitis in a patient apparently sensitised by red, mercury-based tattoo pigments, developed when he ate raw swordfish and alfonso, both renowned for high mercury levels.¹

- Tsuruta D, et al. A red tattoo and a swordfish supper. *Lancet* 2004; **364**: 730.

Treatment of Adverse Effects

The treatment of acute mercury toxicity depends on the form of mercury, the route of exposure, and the dose. Supportive measures may be needed with all types of toxicity. Ingestion of elemental mercury seldom requires active treatment since it is poorly absorbed by this route, although inhalation or aspiration of elemental mercury vapour is a potentially serious problem. Poisoning due to organic mercury is difficult to treat and supportive measures are the mainstay of treatment. Acute exposure to mercury by injection requires mainly supportive therapy, although excision of the affected area has been recommended after subcu-

aneous or intramuscular injection. Mercurials on the skin should be removed by copious washing with soap and water; for contamination in the eye, irrigation with water at room-temperature for at least 15 minutes should be performed.

Acute oral poisoning due to inorganic mercury salts should be treated if appropriate by activated charcoal or gastric lavage to reduce absorption if within 1 hour of ingestion of a potentially life-threatening dose. Decontamination is not usually necessary after ingestion of small amounts such as elemental mercury from a thermometer. Some inorganic mercury compounds may be corrosive to the gastrointestinal tract when ingested, which can make gastrointestinal decontamination problematic; induction of emesis is not recommended. Gastric decontamination may be tried for organic mercury compounds, although the benefits are uncertain.

In severe cases of toxicity with all forms of mercury poisoning, chelation therapy may be required to facilitate the removal of mercury from the body. Unithiol (p.1468) is the chelating agent of choice in the UK and should be considered in symptomatic patients with a blood-mercury concentration of 100 micrograms/litre, and in asymptomatic patients with a blood-mercury concentration of 200 micrograms/litre. Other chelating agents that may be used are succimer (p.1466), dimercaprol (p.1444), and penicillamine (p.1456). The treatment of choice may vary in other countries depending on local policies and availability of the above chelating agents. Penicillamine may be associated with more adverse effects than other chelating agents and should be reserved for use when others are unavailable or not tolerated. Dimercaprol should be avoided in poisoning with metallic mercury or methylmercury because it may exacerbate neurological effects through redistribution of mercury to the brain from other sites.

Some centres start haemodialysis early in the course of treatment; others wait until renal failure develops. Giving a thiol resin complex to prevent the reabsorption of mercury from the bile has also been tried.

The management of chronic toxicity is generally symptomatic although chelation therapy has been used in some patients if the blood-mercury concentration is raised or the patient is symptomatic.

References

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Pharmacokinetics

There is little absorption of elemental mercury from globules in the gastrointestinal tract. The main hazard of elemental mercury is from absorption after inhalation of mercury vapour; this mercury is widely distributed before being oxidised to the mercuric form. Concentrations can be detected in the brain.

Soluble inorganic mercuric salts are absorbed from the gastrointestinal tract and can also be absorbed through the skin. The mercury is distributed throughout the soft tissues with high concentrations in the kidneys; it is mainly excreted in the urine and faeces with an elimination half-life of about 60 days, although it may take years to eliminate mercury from the brain; elimination from other tissues can take several months.

Organic alkyl mercury compounds are more readily absorbed from both the gastrointestinal and the respiratory tracts. They are widely distributed and can produce high concentrations in the brain. Alkyl mercury compounds are excreted in urine and in the faeces with extensive enterohepatic recycling. The biological half-life varies but is longer than that of inorganic mercury.

Organic mercury, and to some extent inorganic mercury, diffuse across the placenta and are distributed into breast milk.

Uses and Administration

The hazards associated with mercury generally outweigh any therapeutic benefit and its clinical use has largely been abandoned. The use of mercurial diuretics such as mersalyl (p.1333) has generally been superseded by other diuretics. Ointments con-

taining mercurials, such as ammoniated mercury (p.1604) have also generally been replaced by less toxic preparations. Mercurials were formerly used as spermicides.

Some ionisable inorganic mercury salts and certain organic compounds of mercury have been used as disinfectants, and some mercury salts are effective parasiticides and fungicides. Organic mercurials such as phenylmercuric acetate, borate, and nitrate are also used as preservatives (p.1657). Mercury is a component of dental amalgams.

Other mercury salts that have been used for their antibacterial activity include mercuric chloride, yellow mercuric oxide, and mercurous chloride (above).

Homeopathy. Mercury and some mercury compounds have been used in homeopathic medicines under the following names:

- Mercury: Hydrargyrum metallicum; Mercurius vivus; Merc. viv.
- Mercuric cyanide: Hydrargyrum bicianatum; Mercurius cyanatus
- Mercuric iodide: Mercurius iodatus flavus; Merc. i. f.
- Red mercuric iodide: Hydrargyrum biiodatum; Mercurius biiodatus; Mercurius iodatus ruber; Merc. i. r.
- Mercuric nitrate: Hydrargyrum nitricum oxydulatum; Mercurius nitricus oxydulatus; Mercurius nitricus; Merc. nit.
- Red mercuric sulfide: Hydrargyrum sulfuratum rubrum; Cin-nabaris; Cinbar.
- Ammoniated mercuric nitrate: Mercurius solubilis; Merc. sol.
- Potassium mercuric iodide: Mercurius et kali iodatus; Merc. ki.

See also Ammoniated Mercury (p.1604), Mercuric Chloride (above), and Mercurous Chloride (above).

Preparations

Proprietary Preparations (details are given in Part 3)

Arg.: Lagrimas de Santa Lucia†;

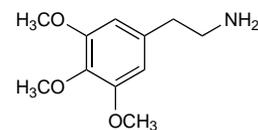
Multi-ingredient: **Austria:** Coldophthal; **Belg.:** Ocal; **Spain:** Oftalmol Ocular;

Mescaline

Mescalina; Mescalinum; Meskaliini; Meskalin. 3,4,5-Trimethoxyphenethylamine.

$C_{11}H_{17}NO_3 = 211.3$.

CAS — 54-04-6.



NOTE. The following terms have been used as 'street names' (see p.vi) or slang names for mescaline or peyote:

Bad seed; Beans; Big chief; Black button; Blue caps; Britton; Buttons; Cactus; Cactus buttons; Cactus head; Chief; Crystal; Dusty; Full moon; Green button; Half moon; Hikori; Hikula; Hikuli; Hyatari; Indians; M; Mesc; Mesca; Mescal; Mescalito; Mescap; Mescy; Mese; Mess; Mez; Moon; Musk; Nubs; P; Peyote; Peyotl; Pixie sticks; San Pedro; Seni; Shaman; Topi; Tops.

Profile

Mescaline is an alkaloid obtained from the cactus *Lophophora williamsii* (*Anhalonium williamsii*, *A. lewini*) (Cactaceae), which grows in the northern regions of Mexico. The cactus is known in those areas by the Aztec name 'peyote' or 'peyotl' and dried slices of the cactus are called 'mescal buttons'.

Mescaline produces hallucinogenic and sympathomimetic effects similar to those produced by lysergide (see p.2335), but it is less potent. Its effects last for up to 12 hours. It has no therapeutic use. Both Mexican and North American Indians have used peyote in religious ceremonies on account of its hallucinogenic activity.

Botulism. Peyote consumed during a ceremonial ritual was believed to have caused botulism in three men.¹ The sample was found to contain type B botulinum toxin when assayed.

- Hashimoto H, et al. Botulism from peyote. *N Engl J Med* 1998; **339**: 203-4.

Mesoglycan Sodium

Mesoglicano sódico.

Profile

Mesoglycan sodium is a mucopolysaccharide complex (glycosaminoglycan) extracted from calf aorta, containing mainly suleparoid (heparan sulfate) (p.1406) and dermatan sulfate (p.1256). It has been claimed to have antithrombotic, antiplatelet, and antihyperlipidaemic properties.

References

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- Arosio E, *et al.* A placebo-controlled, double-blind study of mesoglycan in the treatment of chronic venous ulcers. *Eur J Vasc Endovasc Surg* 2001; **22**: 365-72.
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Preparations

Proprietary Preparations (details are given in Part 3)

Ital.: Perclar†; Prisma. **Port.:** Prisma.

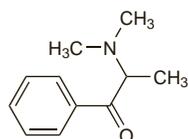
Metamfepramone Hydrochloride (rINN) ⊗

Dimepropion Hydrochloride (BANM); Hidrocloruro de metamfepramona; Métamfépramone, Chlorhydrate de; Metamfepramoni Hydrochloridum; Metamfepramone Hydrochloride. 2-Dimethylaminopropiophenone hydrochloride.

Метамфепрамона Гидрохлорид

$C_{11}H_{15}NO \cdot HCl = 213.7$.

CAS — 15351-09-4 (metamfepramone); 10105-90-5 (metamfepramone hydrochloride).



(metamfepramone)

Profile

Metamfepramone, the dimethyl analogue of diethylpropion (p.2154), is a sympathomimetic that has been used as the hydrochloride in the treatment of hypotension and in preparations for the symptomatic relief of the common cold. It was formerly used as an anorectic agent.

Preparations

Proprietary Preparations (details are given in Part 3)

Multi-ingredient: Ger.: Tempil N.

Metergoline (BAN, rINN)

Fl-6337; MCE; Metergolini; Metergolini; Metergolina; Métergoline; Metergolinum; Methergoline. Benzyl (8S,10S)-(1,6-dimethyl-8-ylmethyl)carbamate.

Метэрголин

$C_{25}H_{29}N_3O_2 = 403.5$.

CAS — 17692-51-2.

ATC — G02CB05.

ATC Vet — QG02CB05.

Profile

Metergoline, an ergot derivative, is a dopamine agonist with actions and uses similar to those of bromocriptine (p.798). It is also a serotonin antagonist. Metergoline has been used similarly to bromocriptine in disorders associated with hyperprolactinaemia in usual oral doses of 12 mg daily in divided doses; up to 24 mg daily has been given in hyperprolactinaemic men. It has also been used orally to inhibit lactation, for the treatment of gastrointestinal disorders, and for the prophylaxis of migraine and other vascular headaches.

Hyperprolactinaemia and prolactinomas. Dopamine agonists have been widely used for the treatment of hyperprolactinaemia secondary to a prolactinoma (p.2079). Metergoline has been tried in patients intolerant of bromocriptine.¹ In this report metergoline lowered plasma-prolactin concentrations, although not to normal, in 3 men and 8 women with hyperprolactinaemia. Galactorrhoea was abolished and/or a regular menstrual cycle established in 5 of the women. Prolactin concentrations and symptoms were unchanged in 3 further women with normoprolactinaemic galactorrhoea.

- Casson IF, *et al.* Intolerance of bromocriptine: is metergoline a satisfactory alternative? *BMJ* 1985; **290**: 1783-4.

Migraine. Although metergoline has been used in some countries for the prophylaxis of migraine (p.616) it is not usually considered to be the drug of choice or even one of the main alternatives.

Preparations

Proprietary Preparations (details are given in Part 3)

Ger.: Liserdol; **Hong Kong:** Liserdol†; **Ital.:** Liserdol; **Singapore:** Liserdol†; **Switz.:** Liserdol†.

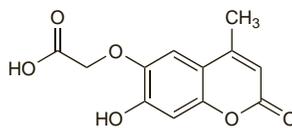
Metesculeto Sodium (rINN)

Metesculeto sódico; Métesculétol Sodique; Natrii Metesculeto-lyum. [(7-Hydroxy-4-methyl-2-oxo-2H-1-benzopyran-6-yl)-oxy]acetate sodium.

Натрий Метэскулетол

$C_{12}H_9NaO_6 = 272.2$.

CAS — 52814-39-8 (metesculeto); 53285-61-3 (metesculeto sodium).



(metesculeto)

Profile

Metesculeto is included in preparations for peripheral vascular disorders and haemorrhoids. Metescufylline is a compound of metesculeto and etamiphylline (p.1120) that has been given by mouth for its reputed vasoprotective effect.

Preparations

Proprietary Preparations (details are given in Part 3)

Multi-ingredient: Chile: Parogenyl Bi-Actif; Vitis Encias Colutorio; Vitis Encias Pasta. **Fr.:** Intraît de Marron d'Inde P; Parogenyl gencives fragilisees†; Parogenyl prevention gencives; Parogenyl sensibilite gencives; Veinotony†; **Hong Kong:** Pyodontyl; **Ital.:** Parogenyl; Parogenyl Gengive Delicate; **Mon.:** Fluon.

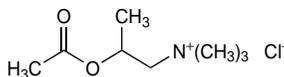
Methacholine Chloride (BAN, rINN)

Acetyl-β-methylcholine Chloride; Amezol Chloride; Cloruro de metacolina; Méthacholine, Chlorure de; Methacholini Chloridum; Methacholinium Chloratum. (2-Acetoxypropyl)trimethylammonium chloride.

МетАХОЛИНИЯ ХЛОРИД

$C_8H_{18}ClNO_2 = 195.7$.

CAS — 55-92-5 (methacholine); 62-51-1 (methacholine chloride).



Pharmacopoeias. In *Fr.*, *Swiss*, and *US*.

USP 31 (Methacholine Chloride). Colourless or white crystals, or a white crystalline powder. It is odourless or has a slight odour, and is very hygroscopic. Soluble 1 in 1.2 of water, 1 in 1.7 of alcohol, and 1 in 2.1 of chloroform. Its solutions are neutral to litmus. Store in airtight containers.

Adverse Effects and Treatment

As for Acetylcholine Chloride, p.1877. Severe adverse cholinergic effects have followed the oral and parenteral use of methacholine and these routes are no longer used.

Precautions

As for Neostigmine, p.632.

Methacholine has the potential to produce severe bronchoconstriction and it should not be used for inhalation challenge tests in patients with clinically apparent asthma, wheezing, or poor pulmonary function.

Methacholine should not be given orally or parenterally.

Interactions

As for Neostigmine, p.632. Methacholine is slowly hydrolysed by acetylcholinesterase, and its effects are markedly enhanced if used after anticholinesterases.

Uses and Administration

Methacholine is a quaternary ammonium parasympathomimetic with the muscarinic actions of acetylcholine (p.1877). It is hydrolysed by acetylcholinesterase at a considerably slower rate than acetylcholine and is more resistant to hydrolysis by non-specific cholinesterases so that its actions are more prolonged.

Inhalation of nebulised solutions of methacholine chloride are used to provoke bronchoconstriction in the diagnosis of bronchial airway hypersensitivity (but see Precautions, above).

Methacholine chloride has been used in eye drops as a miotic for diagnostic purposes.

References

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- Swartz E, Lang D. When should a methacholine challenge be ordered for a patient with suspected asthma? *Cleve Clin J Med* 2008; **75**: 37-40.

Preparations

Proprietary Preparations (details are given in Part 3)

Canad.: Provocholine; **Ger.:** Provokit; **USA:** Mechoyl; Provocholine.

Multi-ingredient: Braz.: Frixodont†.

Methiosulfonium Chloride

Methylmethionine Sulfonium Chloride; Metiosulfonio, cloruro de; Vitamin U. (3-Amino-3-carboxypropyl)dimethylsulphonium chloride.

$C_6H_{14}ClNO_2S = 199.7$.

CAS — 1115-84-0.

ATC — A02BX04.

ATC Vet — QA02BX04.

Profile

Methiosulfonium chloride has been used for its reputed protective effect on the liver and gastrointestinal mucosa.

Preparations

Proprietary Preparations (details are given in Part 3)

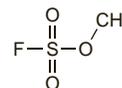
Multi-ingredient: Hong Kong: Rudd-U†; **Jpn.:** Cabagin; Cabe 2; The Guard Seichojo; **Singapore:** Weisen-U†.

Methyl Fluorosulfate

Fluorosulfato, metilo de; Magic Methyl; Methyl Fluorosulphate; Methyl Fluorosulphonate.

$CH_3FO_3S = 114.1$.

CAS — 421-20-5.



Profile

Methyl fluorosulfate has been used as a laboratory methylating agent. Pulmonary oedema has occurred after inhalation, and concern has been expressed concerning possible carcinogenicity.

Methylenedioxyacetic Acid

3,4-Methylenedioxyacetic acid.

$C_{10}H_8O_4 = 192.2$.

CAS — 2373-80-0.

Profile

Methylenedioxyacetic acid and its potassium salt have been used in preparations for the treatment of liver disorders.

Preparations

Proprietary Preparations (details are given in Part 3)

Arg.: Vacuobil.

Multi-ingredient: Arg.: Vacuobil Plus.

Methylhydroxyquinoline Metilsulfate

Methylhydroxyquinoline Methylsulphate; Metilhidroxiquinolina, metilsulfato de. 1-Methyl-8-hydroxyquinolinium methyl sulphate. $C_{10}H_{10}NO \cdot CH_3O_4S = 271.3$.

Profile

Methylhydroxyquinoline metilsulfate has been used topically to treat eye irritation.

Preparations

Proprietary Preparations (details are given in Part 3)

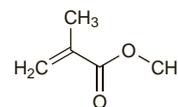
Belg.: Uvestat; **Fr.:** Uveline†.

Methylmethacrylate

Metacrilato de metilo; Méthacrylate de méthyle; Methylis methacrylas. Methyl 2-methylacrylate; Methyl 2-methylpropenoate.

$C_5H_8O_2 = 100.1$.

CAS — 80-62-6.



Adverse Effects and Precautions

Occupational exposure to methylmethacrylate monomer vapour during preparation of the bone cement may irritate the respiratory tract, eyes, and skin. Cases of occupational asthma have been reported. Contact dermatitis, dizziness, nausea and vomiting may also occur. Methylmethacrylate monomer may be harmful to the liver.