

**Menbutone** (BAN, rINN)

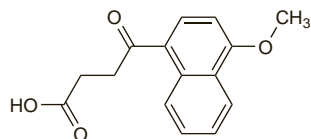
Menbuton; Menbutona; Menbutoni; Menbutonium; SC-1749 (menbutone sodium). 4-(4-Methoxy-1-naphthyl)-4-oxobutyrac acid.

Менбутон

$C_{15}H_{14}O_4 = 258.3$

CAS — 3562-99-0.

ATC Vet — QA05AX90.

**Profile**

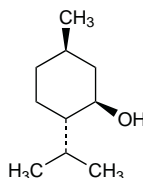
Menbutone is used as a choleric to stimulate gastrointestinal function in veterinary medicine.

**Menthol**

Hexahydrothymol; Mentholum; Mentol; Mentoli; Mentolis. *p*-Menthane-3-ol; 2-Isopropyl-5-methylcyclohexanol.

$C_{10}H_{20}O = 156.3$

CAS — 1490-04-6 (menthol); 15356-60-2 ((+)-menthol); 2216-51-5 ((-)-menthol); 89-78-1 ((±)-menthol).



**Description.** Menthol is either the laevo-isomer, levomenthol (BAN, rINN), or a racemic mixture, racementhol (BAN, rINN). The laevo-isomer may be obtained from the volatile oils of various species of *Mentha* (Labiatae) or it may be prepared synthetically.

**Pharmacopoeias.** In *Chin.*, *Eur.* (see p.vii), *Jpn*, *US*, and *Viet*. *Eur.* and *Jpn* have separate monographs for laevo-menthol (levomenthol) and racemic menthol (racementhol).

**Ph. Eur. 6.2** (Levomenthol). It occurs as colourless, acicular or prismatic shiny crystals. M.p. about 43°. Practically insoluble in water; very soluble in alcohol and in petroleum spirit; freely soluble in fatty oils and in liquid paraffin; very slightly soluble in glycerol.

**Ph. Eur. 6.2** (Menthol, Racemic; Racementhol BP 2008). It occurs as colourless, acicular or prismatic shiny crystals or as a free-flowing or agglomerated crystalline powder. M.p. about 34°. Practically insoluble in water; very soluble in alcohol and in petroleum spirit; freely soluble in fatty oils and in liquid paraffin; very slightly soluble in glycerol.

**USP 31** (Menthol). An alcohol obtained from diverse mint oils or prepared synthetically. It may be laevorotatory (*l*-menthol), from natural or synthetic sources, or racemic (*dl*-menthol). It occurs as colourless, hexagonal crystals, usually needle-like, or in fused masses, or crystalline powder. Has a pleasant, peppermint-like odour. M.p. of *l*-menthol 41° to 44°. Slightly soluble in water; very soluble in alcohol, in chloroform, in ether, and in petroleum spirit; freely soluble in glacial acetic acid, in fixed and volatile oils, and in liquid paraffin. Store in airtight containers preferably at a temperature of 15° to 30°.

**Compounding.** A liquid or soft mass is formed when menthol is triturated with camphor, cloral hydrate, phenol, and many other substances.

Methods of preparing menthol 1% w/w in aqueous cream BP and the stability of the resultant product have been discussed.<sup>1</sup>

1. Cable C. The preparation of menthol (1 per cent w/w) in aqueous cream BP. *Pharm J* 2005; **274**: 469.

**Adverse Effects, Treatment, and Precautions**

Menthol may give rise to hypersensitivity reactions including contact dermatitis. Ingestion of significant quantities of menthol is reported to cause symptoms similar to those seen after ingestion of camphor (p.2273), including severe abdominal pain, nausea, vomiting, vertigo, ataxia, drowsiness, and coma; they may be managed similarly. There have been reports (below) of apnoea and instant collapse in infants after the local application of menthol to their nostrils.

**Administration to infants.** Instillation of decongestant preparations containing menthol directly into the nostrils of infants and young children has resulted in acute respiratory distress with cyanosis<sup>1</sup> and respiratory arrest,<sup>2</sup> and must be avoided. In one

case,<sup>1</sup> nasal application was associated with concurrent chemical conjunctivitis.

1. Wyllie JP, Alexander FW. Nasal instillation of 'Olbas Oil' in an infant. *Arch Dis Child* 1994; **70**: 357-8.
2. Blake KD. Dangers of common cold treatments in children. *Lancet* 1993; **341**: 640.

**Effects on the nervous system.** Ataxia, confusion, euphoria, nystagmus, and diplopia developed in a 13-year-old boy following the inhalation of 5 mL of Olbas oil instead of the recommended few drops.<sup>1</sup> It was considered probable that the menthol in the preparation was responsible for the symptoms; the amount of menthol inhaled was approximately 200 mg.

1. O'Mullane NM, et al. Adverse CNS effects of menthol-containing Olbas oil. *Lancet* 1982; **i**: 1121.

**Pharmacokinetics**

After absorption, menthol is excreted in the urine and bile as a glucuronide.

**Absorption.** The systemic absorption of camphor, menthol, and methyl salicylate from dermal patches containing all three ingredients has been studied.<sup>1</sup> The absolute bioavailability of these compounds could not be determined from this study, but there did not appear to be any substantial systemic accumulation even after unrealistically high exposure for prolonged periods.

1. Martin D, et al. Dermal absorption of camphor, menthol, and methyl salicylate in humans. *J Clin Pharmacol*. 2004; **44**: 1151-7.

**Uses and Administration**

Menthol is chiefly used to relieve symptoms of bronchitis, sinusitis, and similar conditions. For this purpose it may be used as an inhalation, usually with benzoin or eucalyptus oil, as pastilles, or as an ointment with camphor and eucalyptus oil for application to the chest or nostrils (but see Adverse Effects above). However, as mentioned under the section on the management of cough (p.1547), the use of menthol in inhalations is unlikely to provide any additional benefit.

When applied to the skin menthol dilates the blood vessels, causing a sensation of coldness followed by an analgesic effect. It relieves itching and is used in creams, lotions, or ointments in pruritus and urticaria. It has also been applied to the forehead, presumably as a counter-irritant, for the relief of headache. In small doses by mouth menthol has a carminative action.

**Action.** It has been suggested that the apparent benefits of menthol in nasal congestion may be due to an effect on calcium channels of sensory nerves.<sup>1</sup> This mechanism has also been implicated in its muscle relaxant action on the gastrointestinal tract when used as peppermint oil (p.1761).

1. Anonymous. How does menthol work? *Pharm J* 1993; **251**: 480.

**Preparations**

**BP 2008:** Levomenthol Cream; Menthol and Benzoin Inhalation; **USP 31:** Benzocaine and Menthol Topical Aerosol; Menthol Lozenges; Tetracaine and Menthol Ointment.

**Proprietary Preparations** (details are given in Part 3)

**Arg.:** Flex-All; Rati Salil Ice; Robitussin Caramelos†; **Austral.:** Dencorub Arthritis Ice; Ice Gel; Vicks Throat Drops†; Vicks VapoDrops with Butter and Menthol; **Braz.:** Analgen†; **Canad.:** Absorbine Jr.; Absorbine Jr Roll-on Ice; Absorbine Power Gel; Antiphlogistine Rub A-535 Ice; Bengay Ice†; Bents-It†; Certified Ice; Cough Drops; Cough Lozenges; Deep Cold; Fisherman's Friend; Flex-All; Ice Gel Therapy; Ice Gel†; Meggezones†; Physiomenthol; Polar Ice; Soothing Ice Rub; Vicks Throat Drops; **Chile:** Friorub; Hielorub; Mentholatum Patch; **Ger.:** Klosterfrau Franzbranntwein Menthol; Nifint†; **Hong Kong:** Counterpain; **India:** Dolocide Plus; **Indon.:** Counterpain Cool; **Malaysia:** Menzza Ice; **Mex.:** Friocal†; **NZ:** Vicks Throat Drops; Vicks VapoDrops; **Pol.:** Deep Relief†; Migrenol; **Port.:** Vicks Vaporub; **Singapore:** Celatrac; Counterpain Cool; **Spain:** Prulit; **Switz.:** Perskindol Cool; **Thai.:** Centropain; Counterpain Cool; Painza Cool; Stopain; **UK:** Ar-jun; Deep Freeze Cold Gel; Dermacool; Happinose; Ice Cool Stress & Tension Relief; Meggezones; Quool; Vicks VapoSpray for Ticky Coughs; **USA:** Absorbine Jr.; Ben-Gay Patch; Ben-Gay Vanishing; Cepacol Sore Throat Post Nasal Drip; Extra Strength Vicks Cough Drops; Halls-Plus Maximum Strength; Icy Hot Back Pain Relief; Icy Hot Pop & Peel; Icy Hot Pro-Therapy; Kof-Eze; Mineral Freeze Gel; Nice; Nice 'n Clear; Salonpas Aqua Patch; Sportscreme Ice; Therapeutic Mineral Ice; Therapy Ice; Vicks Cough Drops; Wonder Ice; **Venez.:** Dencorub Ice; Inquifit†.

**Multi-ingredient:** numerous preparations are listed in Part 3.

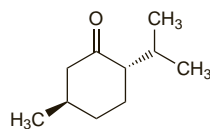
**Menthone**

(±)-menthone; (*dl*)-menthone; Menton. (2*R*,5*S*)-rel-5-Methyl-2-(1-methylethyl)cyclohexanone.

Ментон

$C_{10}H_{18}O = 154.2$

CAS — 3391-87-5 ((+)-menthone); 14073-97-3 ((-)-menthone); 89-80-5 ((±)-menthone); 1196-31-2 ((+)-isomenthone); 491-07-6 ((±)-isomenthone).



((-)-menthone)

**Profile**

Menthone is a constituent of several essential oils. Of the 4 possible stereoisomers of menthone, (-)-menthone (*l*-menthone) is

the most abundant in nature. Menthone is reported to be a cholagogue and has been used in preparations for biliary-tract and liver disorders.

**Preparations**

**Proprietary Preparations** (details are given in Part 3)

**Multi-ingredient:** **Austria:** Rowachol; **Braz.:** Quelodint†; **Cz.:** Rowachol; **Ger.:** Rowachol; Rowachol comp†; Rowachol-Digestiv; **Hong Kong:** Neo-Rowachol; Rowachol; **Hung.:** Rowachol; **Ir.:** Rowachol; **Israel:** Rowachol; **Malaysia:** Rowachol; **Mex.:** Cholex; **Philipp.:** Rowachol; **Pol.:** Rowachol; **Terpichol;** **Switz.:** Rowachol; **Thai.:** Rowachol; **UK:** Rowachol; **Venez.:** Rowachol.

**Menyanthes**

Bitterklee; Bogbean; Buckbean; Folia Trifoli Fibrini; Liść bobrka (bogbean leaf); Marsh Trefoil; Ményanthe; Menyanthis Foliolum (bogbean leaf); Menyanthis trifoliatae folium; Raatteenlehti (bogbean leaf); Trébol de agua; Trèfle d'Eau; Trifolii Fibrini Foliolum (bogbean leaf); Trilapių pupalaiškių lapai (bogbean leaf); Vach-tový list (bogbean leaf); Vattenkloverblad (bogbean leaf); Vid-rafülevel (bogbean leaf).

**NOTE.** Bog myrtle (see p.2267) has also been used as a common name for *Menyanthes trifoliata*.

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

**Ph. Eur. 6.2** (Bogbean Leaf). The dried, entire or fragmented leaf of *Menyanthes trifoliata*. It has a very bitter and persistent taste.

**Profile**

Menyanthes has been used as a bitter. It is used in herbal medicine for rheumatic, gastrointestinal, and biliary-tract disorders. It is also used in folk medicine.

**Homoeopathy.** Menyanthes has been used in homoeopathic medicines under the following names: Menyanthes trifoliata; Menyan. t.

**Preparations**

**Proprietary Preparations** (details are given in Part 3)

**Cz.:** List Vachty Trojliste†.

**Multi-ingredient:** **Austria:** Mariazeller; **Cz.:** Naturland Grosser Sweden-bitter†; **Fr.:** Tisane Hépatique de Hoerd†; **Ger.:** Gallexier; **Pol.:** Kropke Zoladkowe; **Rus.:** Original Grosser Bittner Balsam (Оригинальный Большой Бальзам Биттнера); **UK:** Modern Herbals Rheumatic Pain; Rheumatic Pain; Rheumatic Pain Relief; Rheumatic Pain Remedy; Vegetex.

**Mercaptamine** (BAN, rINN)

Cysteamine (USAN); L-1573; MEA; Mercamine; Mercaptamina; Mercaptaminum; Merkaptamiini; Merkaptamin. 2-Aminoethanethiol.

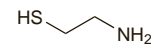
Меркаптамин

$C_3H_7NS = 77.15$

CAS — 60-23-1.

ATC — A16AA04.

ATC Vet — QA16AA04.



**NOTE.** In the UK, the CSM noted in October 2004 that confusion had arisen between mercaptopurine (p.744) and mercaptamine (formerly cysteamine) after the switch from prescribing by British Approved Name to prescribing by International Nonproprietary Name. Particular care should be taken to distinguish the two, since they are available in oral dosage forms of similar strength.

**Mercaptamine Bitartrate** (BANM, rINNM)

Bitartrato de mercaptamina; Cysteamine Bitartrate; Mercaptamine, Bitartrate de; Mercaptamini Bitartras.

Меркаптамина Битартрат

$C_3H_7NS \cdot C_4H_6O_6 = 227.2$

CAS — 27761-19-9.

ATC — A16AA04.

ATC Vet — QA16AA04.

**Mercaptamine Hydrochloride** (BANM, rINNM)

Cl-9148; Cysteamine Hydrochloride (USAN); Hidrocloruro de mercaptamina; Mercaptamine, Chlorhydrate de; Mercaptamini Hydrochloridum.

Меркаптамина Гидрохлорид

$C_3H_7NS \cdot HCl = 113.6$

CAS — 156-57-0.

ATC — A16AA04.

ATC Vet — QA16AA04.

**Adverse Effects and Precautions**

Mercaptamine can be unpalatable and may cause breath and body odour. It may cause gastrointestinal disturbances including anorexia, nausea, vomiting, diarrhoea, and abdominal pain, and occasionally, gastrointestinal ulceration. Other adverse effects may include drowsiness, lethargy, headache, rashes, fever, and encephalopathy. Mercaptamine may cause increases in liver en-