

ine, the (–)-(*S*)-isomer of dropropizine, is claimed to produce fewer CNS effects and is used similarly in an oral dose of 60 mg up to three times daily.

#### References.

1. Catena E, Daffonchio L. Efficacy and tolerability of levodropropizine in adult patients with non-productive cough: comparison with dextromethorphan. *Pulm Pharmacol Ther* 1997; **10**: 89–96.

#### Preparations

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

**Arg.:** Perlatos; **Belg.:** Catabex; Levotuss; **Braz.:** Antux; Atossion; Ecos; Eritoss; Flexotoss; Neotoss; Percuf; Tussiflex D; Vibral; Zyplo; **Chile:** Broncard; **Cz.:** Ditustat; Levopront; **Ger.:** Larylin Husten-Stiller; **Gr.:** Dropavix; Levotuss; **Hung.:** Levopront; **Indon.:** Levopront; **Ital.:** Danka; Domutussina; Levotuss; Rapitux; Ribex Tosse; Salituss; Tau-Tux; **Mex.:** Levocof; Troferit; Zyplo; **Neth.:** Levotuss; **Philipp.:** Levopront; **Pol.:** Levopront; **Port.:** Cat-abina; Levotuss; **Singapore:** Levopront; **Spain:** Levotuss; Tautoss; **Thai.:** Levopront; **Turk.:** Levopront; **Venez.:** Antux; Levopront.

**Multi-ingredient:** **Belg.:** Catabex Expectorans; **Braz.:** Notus; **Ital.:** Elisir Terpina; Guaiaacalium Complex; Ribexen con Espettorante; Tioacalmi-na; Tussamag Complex; **Port.:** Catabina Expectorante.

#### Elecampane

Ala; Alant; Aunée; Énula; Énula campana; Helenin; Ínula; Inula.

Девясил Высокий

CAS — 97676-35-2 (elecampane oil).

**Pharmacopoeias.** In *Chin.* (which also includes various other species of *Inula*) and *Fr.*

##### Profile

Elecampane is the root of *Inula helenium* (Compositae). It has been used in herbal preparations for the treatment of cough for its supposed expectorant and cough suppressant properties. It is also used as a flavouring in foods and alcoholic beverages.

Elecampane contains sesquiterpene lactones including alantolactone (alant camphor; elecampane camphor; inula camphor; helenin), which was formerly used in the treatment of worm infections, and has also been an ingredient of some cough preparations.

Elecampane oil has been used in aromatherapy.

#### Preparations

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

**Multi-ingredient:** **Austria:** Brust- und Hustentee St Severin; **Cz.:** Klosterfrau Melisana; Species Chologogae Planta; **Fr.:** Mediflor Tisane Digestive No 3; Mediflor Tisane Hépatique No 5; **Ger.:** Leber-Galle-Tropfen 83; **Pol.:** Pectosol; **Rus.:** Original Grosser Bittner Balsam (Оригинальный Большой Бальзам Биттнера); **S.Afr.:** Wonderkroonessens; **Spain:** Bronpul; Natusor Asmaten; Natusor Broncopul; **Switz.:** Hederix; Padmed Laxan; **UK:** Catarrh-eeze; Cough-eeze; Horehound and Aniseed Cough Mixture; Vegetable Cough Remover.

#### Ephedra ☒

Efedra; Ma-huang.

Хвойник; Эфедра хвощевая (*Ephedra equisetina*)

**Pharmacopoeias.** In *Chin.*, *Ger.*, and *Jpn.*

*Chin.* also includes the roots of *Ephedra sinica* or *E. intermedia*.

##### Profile

Ephedra consists of the dried young branches of *Ephedra sinica*, *E. equisetina*, and *E. gerardiana* (including *E. nebrodensis*) (Ephedraceae), containing not less than 1.25% of alkaloids, calculated as ephedrine.

The action of ephedra is due to the presence of ephedrine (below) and pseudoephedrine (p.1571). It has been used chiefly as a source of these alkaloids. The FDA states that ephedra-containing dietary supplements are unsafe and the sale of these products is banned in the USA. Other countries have also banned the sale of ephedra-containing dietary supplements.

For reference to the adverse effects of herbal products containing ephedra see Abuse under Ephedrine, below.

#### Preparations

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

**Multi-ingredient:** **Canad.:** Herbal Cold Relief; **Ger.:** Cardibisana; Cefadrin.

#### Ephedrine (BAN) ☒

Efedriini; Efedrin; Efedrina; Efedrinas; Ephedrina; Éphédrine; (–)-Ephedrine; Ephedrinum. (1*R*,2*S*)-2-Methylamino-1-phenylpropan-1-ol.

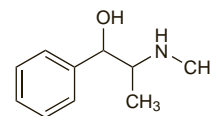
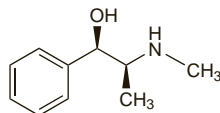
ЭФЕДРИН

C<sub>10</sub>H<sub>15</sub>NO = 165.2.

CAS — 299-42-3 (anhydrous ephedrine); 50906-05-3 (ephedrine hemihydrate).

ATC — R01AA03; R01AB05; R03CA02; S01FB02.

ATC Vet — QG04BX90; QR01AA03; QR01AB05; QR03CA02; QS01FB02.



(racedrine)

**Description.** Ephedrine is an alkaloid obtained from species of *Ephedra*, or prepared synthetically. It may exist in a hemihydrate form or as the anhydrous substance.

The following terms have been used as 'street names' (see p.vi) or slang names for various forms of ephedrine: Trucker's Speed.

**Pharmacopoeias.** In *Eur.* (see p.vii), *Int.*, and *US*, which have specifications, in either the same monograph or in separate monographs, for the anhydrous form and for the hemihydrate.

**Ph. Eur. 6.2** (Ephedrine, Anhydrous). A white or almost white, crystalline powder or colourless crystals. Soluble in water; very soluble in alcohol. It melts at about 36°. Protect from light.

**Ph. Eur. 6.2** (Ephedrine Hemihydrate; Ephedrine BP 2008). A white or almost white, crystalline powder or colourless crystals. Soluble in water; very soluble in alcohol. It melts at about 42°, determined without previous drying. Protect from light.

**USP 31** (Ephedrine). It is anhydrous or contains not more than one-half molecule of water of hydration. It is an unctuous, practically colourless solid or white crystals or granules. It gradually decomposes on exposure to light. M.p. between 33° and 40°, the variability being the result of differences in the moisture content, anhydrous ephedrine having a lower melting-point than the hemihydrate. Soluble 1 in 20 of water and 1 in 0.2 of alcohol; soluble in chloroform and in ether; moderately and slowly soluble in liquid paraffin, the solution becoming turbid if the ephedrine contains more than about 1% of water. Its solutions are alkaline to litmus. Store in airtight containers at a temperature not exceeding 8°. Protect from light.

#### Ephedrine Hydrochloride (BANM) ☒

Efedriinihidrokloridi; Efedrin Hidroklorür; Efedrin hydrochlorid; Efedrina, hidrocloruro de; Efedrin-hidroklorid; Efedrinhidroklorid; Efedrino hidrokloridas; Efedriny chlorowodorek; Ephedrinae Hydrochloridum; Éphédrine, chlorhydrate d; Ephedrine Chloride; Ephedriini hydrochloridum; Ephedrinium Chloratum; *l*-Ephedrinum Hydrochloricum.

Эфедрина Гидрохлорид

C<sub>10</sub>H<sub>15</sub>NO.HCl = 201.7.

CAS — 50-98-6.

ATC — R01AA03; R01AB05; R03CA02; S01FB02.

ATC Vet — QR01AA03; QR01AB05; QR03CA02; QS01FB02.

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

**Ph. Eur. 6.2** (Ephedrine Hydrochloride). A white or almost white, crystalline powder or colourless crystals. Freely soluble in water; soluble in alcohol. It melts at about 219°. Protect from light.

**USP 31** (Ephedrine Hydrochloride). Fine, white, odourless crystals or powder. Soluble 1 in 3 of water and 1 in 14 of alcohol; insoluble in ether. Protect from light.

#### Ephedrine Sulfate ☒

Efedrina, sulfato de; Ephedrine Sulphate (BANM).

Эфедрина Сульфат

(C<sub>10</sub>H<sub>15</sub>NO)<sub>2</sub>.H<sub>2</sub>SO<sub>4</sub> = 428.5.

CAS — 134-72-5.

ATC — R01AA03; R01AB05; R03CA02; S01FB02.

ATC Vet — QR01AA03; QR01AB05; QR03CA02; QS01FB02.

**Pharmacopoeias.** In *Int.* and *US*.

**USP 31** (Ephedrine Sulfate). Fine, white, odourless crystals or powder. It darkens on exposure to light. Soluble 1 in 1.3 of water and 1 in 90 of alcohol. Protect from light.

#### Racedrine Hydrochloride (BANM, USAN, rINN) ☒

Efedriinihidrokloridi, raseeminen; Efedrinhidroklorid, racemisk Efedrino (raceminio) hidrokloridas; Éphédrine (chlorhydrate d) racémique; *dl*-Ephedrine Hydrochloride; Ephedriini racemici hydrochloridum; *dl*-Ephedrinium Chloride; Hidrokloruro de racedrina; Racém efedrin-hidroklorid; Racemic Ephedrine Hydrochloride; Racéphédrine, Chlorhydrate de; Racedriini Hydrochloridum. (±)-2-Methylamino-1-phenylpropan-1-ol hydrochloride.

Рацифедрина Гидрохлорид

C<sub>10</sub>H<sub>15</sub>NO.HCl = 201.7.

CAS — 90-81-3 (racedrine); 134-71-4 (racedrine hydrochloride).

##### Pharmacopoeias. In *Eur.*

**Ph. Eur. 6.2** (Ephedrine Hydrochloride, Racemic; Racedrine Hydrochloride BP 2008). A white or almost white, crystalline powder or colourless crystals. Freely soluble in water; soluble in alcohol; practically insoluble in ether. It melts at about 188°. Protect from light.

##### Adverse Effects

As for Sympathomimetics, p.1407. Ephedrine has both alpha- and beta-agonist effects and its commonest adverse effects are tachycardia, anxiety, restlessness, and insomnia. Tremor, dry mouth, impaired circulation to the extremities, hypertension, and cardiac arrhythmias may also occur.

Ephedrine may be used in labour to maintain blood pressure during spinal anaesthesia but can cause fetal tachycardia.

Paranoid psychosis, delusions, and hallucinations may also follow ephedrine overdosage. Prolonged use has no cumulative effect, but tolerance with dependence has been reported.

For a discussion of the toxicity reported from the self-administration of ephedrine-containing dietary supplements or herbal stimulants, see Abuse, below.

##### Precautions

As for Sympathomimetics, p.1407. Ephedrine should be given with care to patients with hyperthyroidism, diabetes mellitus, ischaemic heart disease, hypertension, renal impairment, or angle-closure glaucoma. In patients with prostatic enlargement, ephedrine may increase difficulty with micturition.

Irritability and disturbed sleep have been reported in breast-fed infants.

**Abuse.** Although illicit use of ephedrine is primarily in the manufacture of street stimulants such as metamfetamine (p.2158), there is increasing evidence of the abuse of ephedrine preparations in some countries,<sup>1</sup> and the public health and social problems associated with its abuse appear to be significant, particularly in certain African countries. Ephedrine is also sold as a street substitute for 'Ecstasy' (Methylenedioxymetamphetamine, p.2159).

Adverse effects reported with illicit ephedrine use include cardiovascular toxicity<sup>2,3</sup> and chest pain.<sup>4</sup>

There is controversy over the abuse liability of over-the-counter (OTC) stimulants such as ephedrine:<sup>5</sup> some studies have indicated that ephedrine is, overall, a relatively weak reinforcer whereas others have suggested that the abuse potential may be high. Examination of the characteristics of 5 patients who had been taking ephedrine-containing OTC preparations in high doses for periods ranging from 8 months to 2 years, emphasised the reinforcing and, therefore, addictive potential of ephedrine; similar observations were made for 2 patients who had ingested phenylpropanolamine long term, combined with pseudoephedrine in one of these cases. The authors suggested that, for most people, OTC preparations containing weaker sympathomimetics will not be reinforcing at the recommended doses. However, these cases strengthen the research findings that high-dose use of an OTC stimulant increases its potency, and thus its effects become more like amphetamine (p.2150).

Toxicity has also been reported<sup>6-8</sup> from the self-administration of ephedrine-containing dietary supplements or herbal stimulants, usually based on ephedra (ma-huang) and marketed for a variety of purposes including weight loss and as an alternative to illegal drugs of abuse. Not all cases of ephedrine toxicity have arisen as a result of overt abuse but rather because of inadequate labelling of content and dosage instructions on some unlicensed products. A small study found that combinations of herbal caffeine and ephedra alkaloids taken in recommended amounts resulted in plasma ephedrine concentrations that exceeded the usual therapeutic range. Significant increases occurred in blood pressure and heart rate, and unfavourable effects on glucose and potassium homeostasis were noted.<sup>9</sup> The use of ephedra-containing dietary supplements is now banned in the USA and some other countries.