

Uses and Administration

Belladonna has the actions of atropine (p.1219). Belladonna herb and its preparations have been used for their antimuscarinic actions in a wide range of conditions, including the relief of gastrointestinal and urinary-tract disorders associated with smooth muscle spasm, but they are generally regarded as an outmoded form of treatment.

Belladonna liniments and plasters have been used as counter-irritants for the relief of pain but there is little evidence that they have a beneficial effect and adverse effects have occurred.

Homoeopathy. Belladonna has been used in homoeopathic medicines under the following names: Atropa bella-donna; Bell.

Preparations

Ph. Eur.: Belladonna Leaf Dry Extract, Standardised; Belladonna Leaf Tincture, Standardised;

USP 31: Belladonna Extract; Belladonna Extract Tablets; Belladonna Tincture.

Proprietary Preparations (details are given in Part 3)

Austral.: Atrobel†; **Austria:** Bellanorm; **Chile:** Felaxen†; **Ger.:** Belladonnysat Burger; Tremoforat†; **Pol.:** Bellapan; **Venez.:** Atroveran.

Multi-ingredient: **Arg.:** Antipasmot; Benitol; Cascara Sagrada Bouzen†; Cascara Sagrada Oligoplex; Dioxicolagol; Hepacur; Hepatodirectol; Opobyl; Passacanthine†; Trinox†; **Austria:** Asthma 23 D; Tampositonien mit Belladonna; **Belg.:** Colimax†; Eucalyptine Pholcodine Le Brun†; Gastrofilm†; Grains de Vals; Saintbois; **Braz.:** Acridin; Benzomel†; Bisusan†; Broncol; Bronquidex; Bronitoss; Calminex Atleta; Calminex H; Cessatosse†; Cystex; Donveran†; Ductoveran; Etaverol†; Gastrobene; Gotas Nican†; Iodeto de Potassio†; Pilulas Ross; Regulador Xavier N-1†; Regulador Xavier N-2†; Revulsan†; Salicilato de Bismuto Composto†; Solvobil; Teutoss†; Tussifen†; Tussucalmant†; Xarope de Caraguata†; Xarope Sao Joao†; **Canad.:** Beller-gal; Cafergot-PB†; Rheumalan†; **Chile:** Bellergal Retardado†; Belupan†; Broncodeina; Cafergot-PB†; Ergobelan†; Fenokomp 39; Fenoltaleina Compuesta†; Gotas Nican†; Gruben; Ramistos; **Cz.:** Bellaspon†; Capsicollie; Contraspant†; Homeovox; **Denm.:** Gynergen Comp; **Fin.:** Tannopon; **Fr.:** Gelumaline†; Humex†; Suppomaline; **Ger.:** Dalet Med Balsam†; **Hung.:** Artin†; Kefalgin; **India:** Emantid†; Migranil; Molzymet†; **Indon.:** Bellapheen; Spasmal; Spasminal; Stomadol; **Israel:** Laxative; Laxative Comp; **Ital.:** Antiemorridal; Antispasmina Colica; Lassatina†; **Jpn:** Colgen Kowa Bien Soft Mini; **Mex.:** Chofabot; Parche Negro Belladonna; Reudol; **Pol.:** Alax; Beller-got; Biospasmil; Cholitol; Hemorol; Kapsiplast; Spasticol; **Port.:** Anti-Gripe†; Antispasmina Colica; Anucet†; Balsamo Analgesico Sanitas; Migretil; Servet-inal†; Vaponi; **Rus.:** Anusol (Анузол); Bethiol (Бетхиол); Solutan (Солутан); **S.Afr.:** Bennetts Colic Mixture; Bolus Eucalypti Comp; Cafergot-PB†; **Spain:** Alofedina; Boldolaxin†; Broncovital†; Cafergot-PB†; Carminativo Ju-ventus; Crislaxo; Digestovital†; Doloke; Equidant†; Laxante Bescansa Aloico; Menabil Complex†; Sin Mareo x 4; Tanagel; **Switz.:** Bellagotin†; Bromocod N; Cafergot-PB; Demo Elixir pectoral N; Dragees S contre la toux†; Escotussin; Lysedil; Nican; Phol-Tux; Saintbois; **Thai.:** Belacid; Beller-gal†; Benera; Delta Charcoal; Neuramizone; **Turk.:** Beller-gal; **UK:** Opazimes; **USA:** B & O Supporettes No. 15A; B & O Supporettes No. 16A; Bel-Phen-Ergot S; Bellamine; Beller-gal-S; Butibek; Cafatine-PB; Folergot-DF; Phener-bel-S; **Venez.:** Atrobel; Clovenin†; Codoformo†; Ervostal; Neo-Atropan†; Traveget.

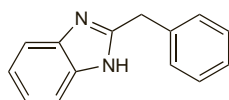
Bendazol Hydrochloride (rINN)

Bendazol, Chlorhydrate de; Bendazoli Hydrochloridum; Dibazol; Hidrocloruro de bendazol. 2-Benzylbenzimidazole hydrochloride.

Бендазола Гидрохлорид

$C_{14}H_{12}N_2 \cdot HCl = 244.7$.

CAS — 621-72-7 (bendazol); 1212-48-2 (bendazol hydrochloride).



(bendazol)

Profile

Bendazol hydrochloride is used as an antispasmodic.

Bentiromide (BAN, USAN, rINN)

Bentiromid; Bentiromida; Bentiromidi; Bentiromidum; BTPABA; BT-PABA; E-2663; PFT; Ro-11-7891. 4-(N-Benzoyl-L-tyrosylamino)benzoic acid.

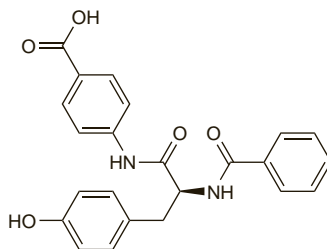
Бентиромид

$C_{23}H_{20}N_2O_5 = 404.4$.

CAS — 37106-97-1.

ATC — V04CK03.

ATC Vet — QV04CK03.

**Profile**

Bentiromide has been given orally as a noninvasive test of exocrine pancreatic function, the amount of *p*-aminobenzoic acid and its metabolites excreted in the urine being taken as a measure of the chymotrypsin-secreting activity of the pancreas. Headache and gastrointestinal disturbances have been reported in patients receiving bentiromide. The bentiromide test has given misleading results in patients with gastrointestinal, liver, or kidney disorders, or in patients receiving certain foods or drugs that are excreted as arylamines. Some of these drugs included benzocaine, chloramphenicol, lidocaine, paracetamol, procaine, procainamide, sulfonamides, and some diuretics.

◇ References.

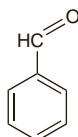
- Hoek FJ, *et al.* Improved specificity of the PABA test with *p*-aminosalicylic acid (PAS). *Gut* 1987; **28**: 468-73.
- Puntis JWL, *et al.* Simplified oral pancreatic function test. *Arch Dis Child* 1988; **63**: 780-4.

Benzaldehyde

Benzaldehído; Benzaldehyd.

$C_7H_6O = 106.1$.

CAS — 100-52-7.



Pharmacopoeias. In Br. Also in *USNF*.

BP 2008 (Benzaldehyde). A clear colourless liquid with a characteristic odour of bitter almonds. Slightly soluble in water; miscible with alcohol and with ether. Store at a temperature not exceeding 15° in well-filled containers. Protect from light.

USNF 26 (Benzaldehyde). A colourless strongly refractive liquid with an odour resembling that of bitter almond oil and a burning aromatic taste. Slightly soluble in water; miscible with alcohol, with ether, and with fixed and volatile oils. Store in well-filled, airtight containers. Protect from light.

Profile

Benzaldehyde is used as a flavour as an alternative to volatile bitter almond oil. It may cause contact dermatitis.

Preparations

USNF 26: Compound Benzaldehyde Elixir

Benzyl Cinnamate

Benzylu cynamonian; Cinnamein. Phenylmethyl 3-phenyl-2-propenoate.

$C_{16}H_{14}O_2 = 238.3$.

CAS — 103-41-3.

Profile

Benzyl cinnamate is a constituent of various balsams and resins, including Peru balsam (p.2365), to which it has been used similarly. It is also used as a flavour and in perfumery.

Preparations

Proprietary Preparations (details are given in Part 3)

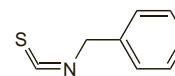
Multi-ingredient: **Belg.:** Pulmex; Pulmex Baby; **Braz.:** Ozonyl; **UK:** Sudocrem.

Benzyl Isothiocyanate

Bencilo, isotiocinato de; Benzyl Mustard Oil; Benzylsenföhl; Oleum Tropaeoli.

$C_8H_7NS = 149.2$.

CAS — 622-78-6.



Pharmacopoeias. *Fr.* includes Capucine (*Tropaeolum majus*).

Profile

Benzyl isothiocyanate is an oil obtained from *Tropaeolum majus* (Capuchin cress; common nasturtium) (Tropaeolaceae) that has been given as an antibacterial.

Tropaeolum majus has been used in herbal medicine.

Homoeopathy. *Tropaeolum majus* has been used in homoeopathic medicines.

Preparations

Proprietary Preparations (details are given in Part 3)

Multi-ingredient: **Ger.:** Angocin Anti-Infekt N; Nephroselect M.

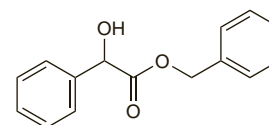
Benzyl Mandelate

Benzyl Phenylglycolate; Benzylin; Benzylis Mandelas; Benzylum Amygdalicum; Benzyl-DL-mandelate; Mandelsäurebenzylester.

БЕНЗИЛ МАНДЕЛАТ

$C_{15}H_{14}O_3 = 242.3$.

CAS — 890-98-2.

**Profile**

Benzyl mandelate has been used for its antispasmodic actions. It has also been included in preparations with analgesics in an attempt to increase the analgesic effect.

Preparations

Proprietary Preparations (details are given in Part 3)

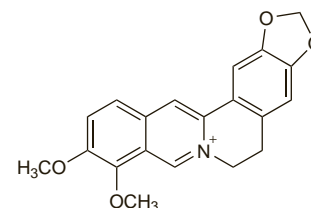
Multi-ingredient: **Austria:** Spasmo Claim; Spasmocor; **Ger.:** Fohnetten N†; **Switz.:** Seranex sans codeine†; **Turk.:** Spalt.

Berberine

Berberina. 5,6-Dihydro-9,10-dimethoxybenzo[*g*]-1,3-benzodioxolo[5,6-*a*]quinolinizinium.

$C_{20}H_{18}NO_4 = 336.4$.

CAS — 2086-83-1 (berberine); 633-65-8 (berberine chloride); 633-66-9 (berberine sulfate).



Pharmacopoeias. *Chin.* includes berberine chloride. *Jpn* includes berberine chloride hydrate and berberine tannate. *Viet.* includes berberine chloride dihydrate.

Profile

Berberine is a quaternary alkaloid present in hydrastis, in various species of *Berberis*, and in many other plants. It has been used as a bitter and as a flavour in food and alcoholic drinks. It possesses antimicrobial activity and has also been tried as various salts in a number of infections.

◇ References.

- Khin-Maung-U, *et al.* Clinical trial of berberine in acute watery diarrhoea. *BMJ* 1985; **291**: 1601-5.
- Rabbani GH, *et al.* Randomized controlled trial of berberine sulfate therapy for diarrhea due to enterotoxigenic *Escherichia coli* and *Vibrio cholerae*. *J Infect Dis* 1987; **155**: 979-84.
- Vennerstrom JL, *et al.* Berberine derivatives as antileishmanial drugs. *Antimicrob Agents Chemother* 1990; **34**: 918-21.
- Phillipson JD, Wright CW. Medicinal plants in tropical medicine: 1 Medicinal plants against protozoal diseases. *Trans R Soc Trop Med Hyg* 1991; **85**: 18-21.

Preparations

Proprietary Preparations (details are given in Part 3)

Austral.: Murine; **Venez.:** Irisol†.

Multi-ingredient: **Braz.:** Neo Quimica Colirio; Visazut; Visolon; **Fr.:** Decollyre; **India:** Emantid†.

Bergamot Oil

Bergamot Essence; Bergamota, aceite esencial de; Oleum Bergamottae.

Pharmacopoeias. In *Fr.* and *It.*

Profile

Bergamot oil is a greenish or brownish-yellow volatile oil with a characteristic fragrant odour and a bitter aromatic taste, obtained by expression from the fresh peel of fruit of *Citrus bergamia* (Rutaceae). Constituents include linalyl acetate and 5-methoxypsoralen (p.1607) and photosensitivity reactions have occurred following the topical use of preparations containing bergamot oil.

Bergamot oil is used in perfumery and as a flavour in Earl Grey tea. It has been included in some preparations for upper respiratory-tract disorders and hyperhidrosis. It is also used in aromatherapy.

♦ Muscle cramps have been reported¹ in a patient who drank up to 4 litres of 'Earl Grey' tea daily.

1. Finsterer J. Earl Grey tea intoxication. *Lancet* 2002; **359**: 1484.

Preparations

Proprietary Preparations (details are given in Part 3)

Multi-ingredient: *Fr.*: Ephydrol; *Ital.*: Bergacid; *Philipp.*: Kamillosan M; *Switz.*: Perskindol Classic.

Betahistine (BAN, rINN)

Betahistini; Betahistin; Betahistina; Bétahistine; Betahistinum. *N*-Methyl-2-(2-pyridyl)ethylamine.

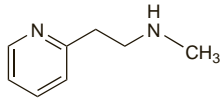
Бетагистин

$C_8H_{12}N_2 = 136.2$.

CAS — 5638-76-6.

ATC — N07CA01.

ATC Vet — QN07CA01.



Betahistine Hydrochloride (USAN, rINN)

Betahistini dihydrokloridi; Betahistin Dihydroklorür; Betahistin-dihydrochlorid; Betahistindihydroklorid; Bétahistine, Chlorhydrate de; Bétahistine, dichlorhydrate de; Betahistine Dihydrochloride (BANM); Betahistini dihydrochloridum; Betahistini Dihydrochloridum; Betahistino dihydrochloridas; Hidrocloruro de betahistina; PT-9. *N*-Methyl-2-(2-pyridyl)ethylamine dihydrochloride.

Бетагистина Гидрохлорид

$C_8H_{12}N_2 \cdot 2HCl = 209.1$.

CAS — 5579-84-0.

ATC — N07CA01.

ATC Vet — QN07CA01.

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

Ph. Eur. 6.2 (Betahistine Dihydrochloride). A white to slightly yellow, very hygroscopic, powder. Very soluble in water; soluble in alcohol; practically insoluble in isopropyl alcohol. A 10% solution in water has a pH of 2.0 to 3.0. Store in airtight containers.

USP 31 (Betahistine Hydrochloride). A white to almost yellow, very hygroscopic, crystalline powder. Very soluble in water; freely soluble in alcohol; practically insoluble in isopropyl alcohol. pH of a 10% solution in water is between 2.0 and 3.0.

Betahistine Mesilate (BANM, rINN)

Betahistini mesilaatti; Betahistin-dimesylát; Bétahistine, mésilate de; Betahistine Mesylate; Betahistini Dimesilas; Betahistini mesilas; Betahistinmesilat; Betahistino mesilasas; Betahisztin-mezilát; Mesilato de betahistina. *N*-Methyl-2-(2-pyridyl)ethylamine bismethanesulphonate.

Бетагистина Мезилат

$C_8H_{12}N_2 \cdot (CH_4O_3S)_2 = 328.4$.

CAS — 54565-23-4.

ATC — N07CA01.

ATC Vet — QN07CA01.

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

Ph. Eur. 6.2 (Betahistine Mesilate). A white or almost white, crystalline, very hygroscopic powder. Very soluble in water; freely soluble in alcohol; very slightly soluble in isopropyl alcohol. A 10% solution in water has a pH of 2.0 to 3.0. Store in airtight containers.

Adverse Effects

Gastrointestinal disturbances, headache, skin rashes, and pruritus have been reported.

Precautions

Betahistine should not be given to patients with phaeochromocytoma. It should be given with care to patients with asthma, peptic ulcer disease, or a history of peptic ulcer disease.

The symbol † denotes a preparation no longer actively marketed

Porphyria. Betahistine hydrochloride is considered to be unsafe in patients with porphyria because it has been shown to be porphyrinogenic in *in-vitro* systems.

Uses and Administration

Betahistine is an analogue of histamine and is claimed to improve the microcirculation of the labyrinth resulting in reduced endolymphatic pressure. It is used to reduce the symptoms of vertigo (p.565), tinnitus (p.1866), and hearing loss associated with Ménière's disease (p.564).

Betahistine is given orally as the hydrochloride or mesilate. The usual initial dose (of the hydrochloride) is 16 mg three times daily taken preferably with meals; maintenance doses are generally in the range of 24 to 48 mg daily. Betahistine mesilate is used in similar doses.

Reviews

1. Lacour M, Sterkers O. Histamine and betahistine in the treatment of vertigo: elucidation of mechanisms of action. *CNS Drugs* 2001; **15**: 853–70.

2. James AL, Burton MJ. Betahistine for Ménière's disease or syndrome. Available in The Cochrane Database of Systematic Reviews; Issue 1. Chichester: John Wiley; 2001 (accessed 30/05/06).

Preparations

BP 2008: Betahistine Dihydrochloride Tablets.

Proprietary Preparations (details are given in Part 3)

Arg.: Meniex; Microser; Ronistina; Travelmin; **Austral.:** Serc; **Austria:** Betaser; **Belg.:** Betahistop; Betaser; Docbetahi; **Braz.:** Betaser; Labinin; **Canad.:** Serc; **Chile:** Microser; **Cz.:** Avertin; Betaser; Microser; Polvertic; Zenostig; **Denm.:** Betaser; **Fin.:** Betaser; **Fr.:** Betaser; Evolis; Extovyt; Lectil; Serc; **Ger.:** Aequamen; Betaver; Melopat; Vasomotal; **Gr.:** Antivom; Betaser; Katabexin; Ribrain; Riva; **Hong Kong:** Beta-Synto; Betaser; Bymeniere; Meniero; Merislon; **Hung.:** Betagen; Betaser; Elven; Microser; **India:** Betahist; Vertin; **Indon.:** Betaser; Merislon; Mertigo; Noverty; Vastigo; Vercure; Verslon; Vertex; **Irl.:** By-Vertin; Serc; Vertigon; **Israel:** Agiser; Betistine; **Ital.:** Microser; Sincrover; Vertiser; **Jpn:** Merislon; **Malaysia:** Alfinor; Betaser; Merislon; **Mex.:** Serc; **Neth.:** Betaser; **NZ:** Serc; Vergo; **Philipp.:** Merislon; Serc; Vertilate; **Pol.:** Betaser; Histimer; Microser; **Port.:** Betaser; Merislon; **Rus.:** Betaser (Betacepi); Vestibo (Вестибо); **S.Afr.:** Serc; **Singapore:** Betaser; Merislon; **Spain:** Fidium; Serc; **Switz.:** Betaser; **Thai.:** Behistin; Betahist-B; Merislon; Merlin; Serc; **Turk.:** Betaser; Vasoser; **UK:** Serc; **Venez.:** Microser; Serc.

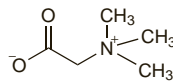
Betaine

Betaina; Glycine Betaine; Glycocol Betaine; Lcine; Trimethylglycine. (Carboxymethyl)trimethylammonium hydroxide inner salt. $C_5H_{11}NO_2 = 117.1$.

CAS — 107-43-7.

ATC — A16AA06.

ATC Vet — QA16AA06.



Betaine Hydrochloride

Betainihydrokloridi; Betaina, hidrocloruro de; Betainhydroklorid; Betaini Hydrochloridum; Trimethylglycine Hydrochloride. (Carboxymethyl)trimethylammonium hydroxide inner salt hydrochloride.

$C_5H_{11}NO_2 \cdot HCl = 153.6$.

CAS — 590-46-5.

ATC — A09AB02.

ATC Vet — QA09AB02.

Pharmacopoeias. In *US*.

USP 31 (Betaine Hydrochloride). A white crystalline powder. Soluble in water and in alcohol; practically insoluble in chloroform and in ether. A 25% solution in water has a pH of 0.8 to 1.2.

Profile

Betaine is used as a methyl donor to remethylate homocysteine to methionine in the treatment of patients with homocystinuria (see Amino Acid Metabolic Disorders, p.1922). It is given orally in a usual dose of 3 g twice daily. Doses are adjusted according to plasma-homocysteine concentrations; up to 20 g daily has been required in some patients. In children under 3 years old, an initial dose of 100 mg/kg daily given in 2 divided doses may be used.

Severe cerebral oedema and hypermethioninaemia have been reported in a few patients, and it is recommended that plasma-methionine concentrations should be monitored at the start of betaine treatment and periodically thereafter. Patients being treated for cystathionine beta-synthase deficiency may pose particular problems because betaine may further raise their already elevated methionine concentrations increasing the risk of cerebral oedema.

Betaine has also been used as a variety of salts in preparations for liver and gastrointestinal disorders. The hydrochloride has been given as a source of hydrochloric acid in the treatment of hypochlorhydria.

Adverse effects. References.

1. Devlin AM, *et al.* Cerebral edema associated with betaine treatment in classical homocystinuria. *J Pediatr* 2004; **144**: 545–8.

Homocystinuria. References.

- Smolin LA, *et al.* The use of betaine for the treatment of homocystinuria. *J Pediatr* 1981; **99**: 467–72.
- Wilcken DEL, *et al.* Homocystinuria—the effects of betaine in the treatment of patients not responsive to pyridoxine. *N Engl J Med* 1983; **309**: 448–53.
- Holme E, *et al.* Betaine for treatment of homocystinuria caused by methylenetetrahydrofolate reductase deficiency. *Arch Dis Child* 1989; **64**: 1061–4.
- Anonymous. Betaine for homocystinuria. *Med Lett Drugs Ther* 1997; **39**: 12.

Liver disorders. Betaine has also been investigated for the treatment of nonalcoholic steatohepatitis.

References.

- Miglio F, *et al.* Efficacy and safety of oral betaine glucuronate in non-alcoholic steatohepatitis: a double-blind, randomized, parallel-group, placebo-controlled prospective clinical study. *Arzneimittelforschung* 2000; **50**: 722–7.
- Abdelmalek MF, *et al.* Betaine, a promising new agent for patients with nonalcoholic steatohepatitis: results of a pilot study. *Am J Gastroenterol* 2001; **96**: 2711–7.

Pharmacokinetics. References.

- Schwahn BC, *et al.* Pharmacokinetics of oral betaine in healthy subjects and patients with homocystinuria. *Br J Clin Pharmacol* 2003; **55**: 6–13.

Preparations

Proprietary Preparations (details are given in Part 3)

Austral.: Cystadane; **Canad.:** Cystadane; **Cz.:** Cystadane; **Israel:** Cystadan; **Ital.:** Somaty; **Port.:** Cystadane; **USA:** Cystadane.

Multi-ingredient: **Arg.:** Eucos-L; **Austral.:** Betaine Digestive Aid; Bioglan Digestive Zyme; Digestaid; **Austria:** CO Granulat; Oroacid; **Belg.:** Digestomen; **Braz.:** Aminotox; Anekron; Betalver; Biohexac; Colachofra; Enterofigon; Epocler; Hepacitron; Hepalin; Hepatobef; Hepatox; Hormo Hepatico; Meticolin Composto; Necro B-6; Xantinox Complex; **Cz.:** Citrargine; CO Granulat; **Fr.:** Citrargine; Gastrobul; Hepagrum; Nivabetol; Ornitate; **Ger.:** CO Granulat; Flacar; Unexym MD S; **Gr.:** Klorof; **Hong Kong:** Jeteap; **Hung.:** Betacid; Gastrobul; **Indon.:** Naturica DFM; **Israel:** Betazim; **Ital.:** Citroepatina; Epabestina; Jeteap; **Malaysia:** Jeteap; **Neth.:** Serc; **Philipp.:** Jeteap; **S.Afr.:** Klorof; **Singapore:** Jeteap; **Switz.:** Pepsi-Chlor; **UK:** Enzyme Digest; Enzyme Plus; Klorof.

Bethanechol Chloride (BAN)

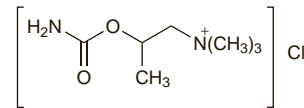
Betanecol, cloruro de; Betanekolklorid; Betanekolklorid; Bethanecholi Chloridum; Carbamylmethylcholine Chloride. (2-Carbamoyloxypropyl)trimethylammonium chloride.

$C_7H_{17}ClN_2O_2 = 196.7$.

CAS — 674-38-4 (bethanechol); 590-63-6 (bethanechol chloride).

ATC — N07AB02.

ATC Vet — QN07AB02.



Pharmacopoeias. In *Jpn* and *US*.

USP 31 (Bethanechol Chloride). Colourless or white crystals, or white crystalline powder, usually having a slight, amine-like odour. It is hygroscopic and exhibits polymorphism. Freely soluble in water and in alcohol; insoluble in chloroform and in ether. pH of a 1% solution in water is between 5.5 and 6.5. Store in airtight containers.

Stability. References to the stability of oral liquid preparations of bethanechol chloride prepared extemporaneously from tablets.

- Schlatter JL, Saulnier J-L. Bethanechol chloride oral solutions: stability and use in infants. *Ann Pharmacother* 1997; **31**: 294–6.
- Allen LV, Erickson MA. Stability of bethanechol chloride, pyrazinamide, quinidine sulfate, rifampin, and tetracycline hydrochloride in extemporaneously compounded oral liquids. *Am J Health-Syst Pharm* 1998; **55**: 1804–9.

Sterilisation. The US manufacturers state that solutions of bethanechol chloride may be autoclaved at 120° for 20 minutes without discoloration or loss of potency.

Adverse Effects and Treatment

As described for choline esters under Acetylcholine Chloride, p.1877.

Precautions

As described for choline esters under Acetylcholine Chloride, p.1877.

Bethanechol should not be given by the intravenous or intramuscular routes as very severe muscarinic adverse effects are liable to occur, calling for emergency use of atropine.

Autonomic neuropathy. Patients with autonomic neuropathy might be more susceptible to the adverse effects of bethanechol and they should be started on low-dosage regimens and observed closely for signs of toxicity.¹

1. Caraco Y, *et al.* Bethanechol-induced cholinergic toxicity in diabetic neuropathy. *DICP Ann Pharmacother* 1990; **24**: 327–8.

Interactions

As for Neostigmine, p.632.