Hyoscine Butylbromide *(BANM)*

Butilbromuro de hioscina; Butylscopolamine Bromide; Butylscopolaminii Bromidum; *N*-Butylscopolammonium Bromide; Butylscopolamonii Bromidum; Butylskopolaminium-bromid; Escopolamina, butilbromuro de; Hioscino butilbromidas; Hioszcin-butilbromid; Hiyosin Bütilbromür; Hyoscinbutylbromid; Hyoscine-*N*-butyl Bromide; Hyoscini butylbromidum; Hyoskiinibutyylibromidi; Scopolamine *N*-Butyl Bromide; Scopolamine Butylbromide; Scopolamine, butylbromure de; Scopolamini butylbromidum; Scopolomini Butylbromidum; Skopolamino butilbromidas; Szkopolamin-butilbromid. (–)-(1*S*,3*s*,5*R*,6*R*,7*S*,8*r*)-6,7-Epoxy-8-butyl-3-[(*S*)-tropoyloxy]tropanium bromide.

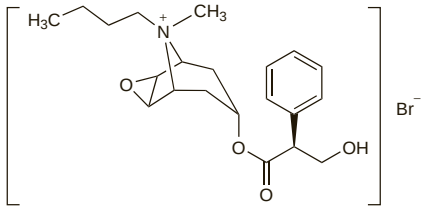
Гиосцина Бутилбромид

$C_{21}H_{30}BrNO_4$ = 440.4.

CAS — 149-64-4.

ATC — A03BB01.

ATC Vet — QA03BB01.



Pharmacopoeias. In *Chin.*, *Eur.* (see p.vii), and *Jpn*.
Ph. Eur. 6.2 (Hyoscine Butylbromide). A white or almost white, crystalline powder. Freely soluble in water and in dichloromethane; sparingly soluble in dehydrated alcohol. A 5% solution in water has a pH of 5.5 to 6.5.

Hyoscine Hydrobromide *(BANM)*

Bromhidrato de Escopolamina; Escopolamina, hidrobromuro de; Hidrobromuro de hioscina; Hioscino hidrobromidas; Hioscyny bromowodorek; Hioszcin-hidrobromid; Hiyosin Hidrobromür; Hyoscinhydrobromid; Hyoscini hydrobromidum; Hyoskiinihydrobromidi; Ioscina Bromidrato; Scopolamine Bromhydrate; Scopolamine, bromhydrate de; Scopolamine Hydrobromide; Scopolamini hydrobromidum; Scopolamini Hydrobromidum Trihydricum; Skopolamiinihydrobromidi; Skopolamin-bromid trihydrát; Skopolaminhydrobromid; Skopolamino hidrobromidas; Szkopolamin-butilbromid. (–)-(1*S*,3*s*,5*R*,6*R*,7*S*)-6,7-Epoxytropan-3-yl (*S*)-tropate hydrobromide trihydrate.

Гиосцина Гидробромид

$C_{17}H_{21}NO_4$,HBr,$3H_2O$ = 438.3.

CAS — 114-49-8 (anhydrous hyoscine hydrobromide); 6533-68-2 (hyoscine hydrobromide trihydrate).

ATC — A04AD01; N05CM05; S01FA02.

ATC Vet — QA04AD01; QN05CM05; QS01FA02.

NOTE. HYO is a code approved by the BP 2008 for use on single unit doses of eye drops containing hyoscine hydrobromide where the individual container may be too small to bear all the appropriate labelling information.

Pharmacopoeias. In *Chin.*, *Eur.* (see p.vii), *Jpn*, and *US*.
Ph. Eur. 6.2 (Hyoscine Hydrobromide). A white or almost white, efflorescent, crystalline powder or colourless crystals. Freely soluble in water; soluble in alcohol. A 5% solution in water has a pH of 4.0 to 5.5. Store in well-filled airtight containers of small capacity. Protect from light.
USP 31 (Scopolamine Hydrobromide). Colourless or white crystals, or white granular powder. Is odourless and slightly efflorescent in dry air. Soluble 1 in 1.5 of water and 1 in 20 of alcohol; slightly soluble in chloroform; insoluble in ether. pH of a 5% solution in water is between 4.0 and 5.5. Store in airtight containers. Protect from light.

Hyoscine Methobromide *(BAN)*

Epoxymethamine Bromide; Escopolamina, metilbromuro de; Hyoscine Methylbromide; Methscopolamine Bromide; Metilbromuro de hioscina; Metobromuro de escopolamina; Metobromuro de hioscina; Scopolamine Methobromide; Scopolamine Methylbromide. (–)-(1*S*,3*s*,5*R*,6*R*,7*S*)-6,7-Epoxy-8-methyl-3-[(*S*)-tropoyloxy]tropanium bromide.

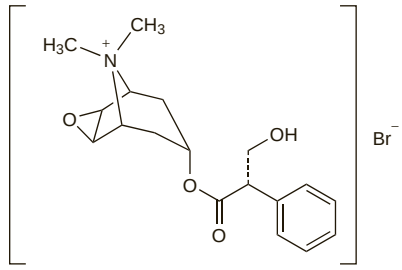
Гиосцина Метобромид

$C_{18}H_{24}BrNO_4$ = 398.3.

CAS — 155-41-9.

ATC — A03BB03; S01FA03.

ATC Vet — QA03BB03; QS01FA03.



Pharmacopoeias. In *US*.
USP 31 (Methscopolamine Bromide). Store in airtight containers. Protect from light.

Hyoscine Methonitrate *(BANM)*

Escopolamina, metilnitrato de; Hyoscine Methylnitrate; Methscopolamine Nitrate; Methylhyoscini Nitras; Methylscopolamine Nitrate; Methylscopolamini Nitras; Metilnitrato de hioscina; Metonitrato de escopolamina; Metonitrato de hioscina; Metylskopolaminnitrat; Metyyliskopolamiininitraatti; Scopolamine Methonitrate; Scopolamine Methylnitrate. (–)-(1*S*,3*s*,5*R*,6*R*,7*S*)-6,7-Epoxy-8-methyl-3-[(*S*)-tropoyloxy]tropanium nitrate.

Гиосцина Метонитрат

$C_{18}H_{24}N_2O_7$ = 380.4.

CAS — 6106-46-3.

ATC — A03BB03; S01FA03.

ATC Vet — QA03BB03; QS01FA03.

Adverse Effects, Treatment, and Precautions

As for Atropine Sulfate, p.1219. In contrast to atropine, hyoscine produces central depression at therapeutic doses and symptoms include drowsiness and fatigue. Toxic doses of hyoscine produce stimulation of the CNS in a similar manner to atropine. However, hyoscine does not stimulate the medullary centres and therefore does not produce the increases in respiration rate or blood pressure seen with atropine. Hyoscine may produce CNS stimulation rather than depression at therapeutic doses if used in the presence of pain without opioid analgesics; symptoms include excitement, restlessness, hallucinations, or delirium.

Patients who experience drowsiness should not drive or operate machinery. Caution has been advised in elderly patients and in patients with impaired liver, or kidney function, as adverse CNS effects have been stated to be more likely in these patients. There have been rare reports of an increase in frequency of seizures in epileptic patients.

The quaternary derivatives, such as the butylbromide, methobromide, or methonitrate, do not readily cross the blood-brain barrier, so central effects are rare.

Abuse. Hyoscine has been used by criminals to incapacitate and produce anterograde amnesia in their victims in crimes such as drug-facilitated rape ('date rape'), robbery, and kidnapping. In some countries in South America there has been a particular problem with the use of powders or extracts of plants containing hyoscine for such crimes. A powder, known locally as burundanga, prepared from the borrachero or borracchio tree (also referred to as cacao sabanero) has been blown into the victim's face or given in drinks, chocolate, or chewing gum.

Breast feeding. The American Academy of Pediatrics[1] states that there have been no reports of any clinical effect on the infant associated with the use of hyoscine by breast-feeding mothers, and that therefore it may be considered to be usually compatible with breast feeding.

1. American Academy of Pediatrics. The transfer of drugs and other chemicals into human milk. *Pediatrics* 2001; **108:** 776–89. Correction. *ibid.*; 1029. Also available at: http://aappolicy.aappublications.org/cgi/content/full/pediatrics%3b108/3/776 (accessed 19/01/06)

Effects on the eyes. ***ANISOCORIA.*** Although bilateral mydriasis has occurred with the use of transdermal hyoscine, development of a unilateral fixed dilated pupil (anisocoria) may be due to contamination of a finger with hyoscine in handling the device, and then rubbing the eye.[1-6] Similarly, anisocoria has been attributed[7] to ocular contamination after handling broken hyoscine methobromide tablets.

1. Chiaramonte JS. Cycloplegia from transdermal scopolamine. *N Engl J Med* 1982; **306:** 174.
2. Lepore FE. More on cycloplegia from transdermal scopolamine. *N Engl J Med* 1982; **307:** 824.
3. McCrary JA, Webb NR. Anisocoria from scopolamine patches. *JAMA* 1982; **248:** 353–4.
4. Bienia RA, *et al.* Scopolamine skin-disks and anisocoria. *Ann Intern Med* 1983; **99:** 572–3.
5. Riddick FA, Jordan JD. Cruise ship anisocoria. *Ann Intern Med* 1992; **117:** 95.
6. Lin Y-C. Anisocoria from transdermal scopolamine. *Paediatr Anaesth* 2001; **11:** 626–7.
7. Nussdorf JD, Berman EL. Anisocoria associated with the medical treatment of irritable bowel syndrome. *J Neuroophthalmol* 2000; **20:** 100–101.

GLAUCOMA. A few cases of angle-closure glaucoma, both unilateral[1] and bilateral,[2] have been associated with transdermal hyoscine devices.

1. Hamill MB. *et al.* Transdermal scopolamine delivery system (TRANSDERM-V) and acute angle-closure glaucoma. *Ann Ophthalmol* 1983; **15:** 1011–12.
2. Fraunfelder FT. Transdermal scopolamine precipitating narrow-angle glaucoma. *N Engl J Med* 1982; **307:** 1079.

STRABISMUS. Strabismus developed in a 4-year-old boy during treatment with transdermal hyoscine patches for drooling.[1] The strabismus resolved shortly after stopping hyoscine.

1. Good WV, Crain LS. Esotropia in a child treated with a scopolamine patch for drooling. *Pediatrics* 1996; **97:** 126–7.

Effects on mental function. There have been reports of psychotic reactions associated with the transdermal use of hyoscine.[1-6] Psychotic reactions have also occurred after instillation of hyoscine eye drops.[7]

1. Osterholm RK, Camoriano JK. Transdermal scopolamine psychosis. *JAMA* 1982; **247:** 3081.
2. Rodysill KJ, Warren JB. Transdermal scopolamine and toxic psychosis. *Ann Intern Med* 1983; **98:** 561.
3. MacEwan GW, *et al.* Psychosis due to transdermally administered scopolamine. *Can Med Assoc J* 1985; **133:** 431–2.
4. Ziskind AA. Transdermal scopolamine-induced psychosis. *Postgrad Med* 1988; **84:** 73–6.
5. Rubner O, *et al.* Ungewöhnlicher Fall einer Psychose infolge einer Langzeiteinwirkung mit einem Skopolaminmembranpflaster: Paranoid-halluzinatorische und delirante Symptomatik. *Nervenarzt* 1997; **68:** 77–9.
6. Minagar A, *et al.* Transderm-induced psychosis in Parkinson's disease. *Neurology* 1999; **53:** 433–4.
7. Barker DB, Solomon DA. The potential for mental status changes associated with systemic absorption of anticholinergic ophthalmic medications: concerns for the elderly. *DICP Ann Pharmacother* 1990; **24:** 847–50.

Effects on the oesophagus. A patient developed pain on swallowing after 4 days of treatment with hyoscine. Endoscopy showed oesophageal ulceration, which healed completely after 8 weeks of esomeprazole treatment.[1]

1. Philcox S, Keegan A. A case of hyoscine-related oesophagitis. *Med J Aust* 2007; **186:** 650–1.

Effects on the skin. Contact dermatitis occurred in 16 men being treated for seasickness with transdermal hyoscine for 6 weeks to 15 months.[1]

1. Gordon CR, *et al.* Allergic contact dermatitis caused by transdermal hyoscine. *BMJ* 1989; **298:** 1220–1.

Porphyria. Hyoscine butylbromide has been associated with acute attacks of porphyria and is considered unsafe in porphyric patients.

Pregnancy. A report[1] of hyoscine toxicity in a neonate born to a mother who had received a total of 1.8 mg of hyoscine in divided doses with pethidine and levorphanol before delivery. The neonate was lethargic, barrel chested, and had a heart rate of 200 beats/minute. Symptoms subsided when physostigmine 100 micrograms was given intramuscularly.

1. Evens RP, Leopold JC. Scopolamine toxicity in a newborn. *Pediatrics* 1980; **66:** 329–30.

Withdrawal. A withdrawal syndrome of dizziness and nausea[1,2] can occur in patients who have used transdermal hyoscine patches for several days; hypersalivation and diarrhoea has also been described.[3] In reported cases, transdermal hyoscine had been used continuously for 7 or 10 days to prevent motion sickness. Symptoms usually begin 2 or 3 days after the last patch has been removed, and may last for a few days.

1. Meyboom RHB. More on Transderm Scop patches. *N Engl J Med* 1984; **311:** 1377.
2. Saxena K, Saxena S. Scopolamine withdrawal syndrome. *Postgrad Med* 1990; **87:** 63–6.
3. Feder RE. Transdermal scopolamine withdrawal syndrome. *Clin Neuropharmacol* 1999; **22:** 120.

Interactions

As for antimuscarinics in general (see Atropine Sulfate, p.1220).

The sedative effect of hyoscine may be enhanced by alcohol or other CNS depressants.

Pharmacokinetics

Hyoscine is readily absorbed from the gastrointestinal tract after oral doses of the hydrobromide. It is almost entirely metabolised, probably in the liver; only a small proportion of an oral dose is excreted unchanged in the urine. It crosses the blood-brain barrier and has been stated to cross the placenta. Hyoscine is also well absorbed after application to the skin.

The quaternary derivatives, such as the butylbromide or methobromide, are poorly absorbed from the gastrointestinal tract and do not readily pass the blood-brain barrier.

◊ References.

1. Ebert U, *et al.* Pharmacokinetics and pharmacodynamics of scopolamine after subcutaneous administration. *J Clin Pharmacol* 1998; **38:** 720–6.
2. Nachum Z, *et al.* Scopolamine bioavailability in combined oral and transdermal delivery. *J Pharmacol Exp Ther* 2001; **296:** 121–3.

Uses and Administration

Hyoscine is a tertiary amine antimuscarinic with central and peripheral actions (see Action of Antimuscarinics, p.1221). It is a more powerful suppressant of salivation than atropine, and usually slows rather than increases heart rate, especially in low doses. Its central action differs from that of atropine in that it depresses the cerebral cortex and produces drowsiness and amnesia. Hyoscine hydrobromide is also a tertiary amine, whereas hyoscine butylbromide, hyoscine methobromide, and hyoscine methonitrate are quaternary ammonium derivatives.

Hyoscine and hyoscine hydrobromide are used in the management of motion sickness and other forms of nausea and vomiting; hyoscine hydrobromide is also given as a premedicant in anaesthesia, and to produce mydriasis and cycloplegia. Hyoscine butylbromide and other quaternary ammonium derivatives are used in conditions associated with visceral spasms. Hyoscine methobromide has also been employed as an adjunct in the treatment of peptic ulcer disease.

Other hyoscine salts or derivatives that have been used include hyoscine borate, hyoscine hydrochloride, and hyoscine oxide hydrobromide.

See under headings below for details of dosage and administration of hyoscine and its salts in specific indications.

Anaesthesia. The role of antimuscarinics, including hyoscine, in anaesthesia is discussed under Atropine on p.1221. For the use of hyoscine in the prevention of postoperative nausea and vomiting, see below.

For premedication hyoscine hydrobromide is injected subcutaneously or intramuscularly in doses of 200 to 600 micrograms, usually with papaveretum about half to one hour before induction of general anaesthesia. In the UK, a dose of 15 micrograms/kg is licensed in children (the *BNFC* suggests that this dose is appropriate from 1 to 12 years of age; older children may be given the adult dose). If necessary for acute use, the same doses may be given by intravenous injection.

Anoxic seizures. For mention of the use of transdermal hyoscine as an alternative to atropine in the management of reflex anoxic seizures in children, see p.1221.

Biliary and renal colic. Hyoscine has been used as an adjunct to opioid analgesics for symptomatic relief of biliary or renal colic (see p.5) although the evidence for such use is weak. Hyoscine butylbromide 20 mg is given by intramuscular or slow intravenous injection; this may be repeated after 30 minutes if necessary to a maximum daily dose of 100 mg. See also Palliative Care, below.

References.

1. Holdgate A, Oh CM. Is there a role for antimuscarinics in renal colic? A randomized controlled trial. *J Urol (Baltimore)* 2005; **174:** 572–5.

Cardiac disorders. Although hyoscine is not one of the conventional therapies for heart failure (p.1165) or myocardial infarction (p.1175), low-dose transdermal hyoscine can increase cardiac vagal activity and thereby reduce the autonomic imbalance seen in patients with these conditions.[1-3] Improved exercise tolerance has been reported after 1 week of treatment with transdermal hyoscine in a small open study in 14 patients with mild to moderate heart failure.[4]

1. Casadei B, *et al.* Low doses of scopolamine increase cardiac vagal tone in the acute phase of myocardial infarction. *Circulation* 1993; **88:** 353–7.
2. La Rovere MT, *et al.* Scopolamine improves autonomic balance in advanced congestive heart failure. *Circulation* 1994; **90:** 838–43.
3. Venkatesh G, *et al.* Double blind placebo controlled trial of short term transdermal scopolamine on heart rate variability in patients with chronic heart failure. *Heart* 1996; **76:** 137–43.
4. De Vecchis R, *et al.* Different impact of carvedilol and transdermal scopolamine on cardiovascular performance of mild-moderate chronic heart failure patients: evidence of useful effects of scopolamine on tolerance to work load. *Minerva Cardioangiol* 2000; **48:** 393–401.

Depression. Rapid reductions in severity of depression were seen after intravenous hyoscine hydrobromide 4 micrograms/kg was given to patients with major depressive disorders or bipolar disorders (see Depression, p.373). Repeat doses showed more benefit than single doses. Clinical effects persisted beyond the treatment period, which led the authors to conclude the effects were not due to anticholinergic euphoria. While noting that the optimal schedule and potential long-term use of hyoscine as an antidepressant needed further study, they also concluded that hyoscine could be a relatively safe and well-tolerated intervention for achieving a rapid initial antidepressant response.[1]

1. Furey ML, Drevets WC. Antidepressant efficacy of the antimuscarinic drug scopolamine: a randomized, placebo-controlled clinical trial. *Arch Gen Psychiatry* 2006; **63:** 1121–9.

Dysmenorrhoea. Hyoscine as the butylbromide or hydrobromide has been used for its antispasmodic action in the treatment of dysmenorrhoea. (p.6), but the *BNF* considers that antispasmodics do not generally provide significant relief.

Eye disorders. Hyoscine hydrobromide is used in the eye for its mydriatic and cycloplegic actions (p.1874) usually in a concentration of 0.25%. It has a faster onset and shorter duration of action than atropine although the effects may still persist for up to 3 to 7 days. It may be useful for patients who are hypersensitive to atropine.

Gastrointestinal disorders. Hyoscine has been used as an antispasmodic (p.1692) to relieve the pain of smooth muscle spasm associated with the gastrointestinal tract.[1]

In such conditions the licensed UK dose is 20 mg of hyoscine butylbromide intramuscularly or by slow intravenous injection, repeated after 30 minutes if necessary, up to a maximum of 100 mg daily; alternatively, 20 mg may be given orally four times daily. In irritable bowel syndrome (p.1699) the recommended oral starting dose is 10 mg three times daily which may be increased to 20 mg four times daily, if necessary. Children aged 6 to 12 years may be given 10 mg three times daily by mouth for gastrointestinal spasms. As an adjunct in the treatment of peptic ulcer disease; hyoscine methobromide has been licensed in the USA in a dose of 2.5 mg half an hour before meals and 2.5 to 5 mg at bedtime. Hyoscine may also be useful as an antispasmodic in diagnostic procedures of the gastrointestinal tract.

The antiemetic effect of hyoscine is discussed under Nausea and Vomiting, below.

1. Tytgat GN. Hyoscine butylbromide: a review of its use in the treatment of abdominal cramping and pain. *Drugs* 2007; **67:** 1343–57.

Hyperhidrosis. Adverse effects of antimuscarinics given orally generally preclude their use by this route for the management of hyperhidrosis (p.1580), but some, such as hyoscine, have been applied topically as alternatives to aluminium salts. Hyoscine hydrobromide applied as a 3% cream was successful in reducing gustatory sweating, consisting of flushing and sweating over the right mandible during eating, in a patient who had previously undergone surgical excision of the right submandibular salivary gland.[1] The use of transdermal or injectable hyoscine was reported[2] to be effective for the control of opioid-associated sweating in 2 patients receiving palliative care (see also below for other uses of hyoscine in palliative care).

1. Bailey BMW, Pearce DE. Gustatory sweating following submandibular salivary gland removal. *Br Dent J* 1985; **158:** 17–18.
2. Mercadante S. Hyoscine in opioid-induced sweating. *J Pain Symptom Manage* 1998; **15:** 214–15.

Nausea and vomiting. Hyoscine is an effective agent in the prevention of **motion sickness** and is one of the principal drugs used. It may be given orally for short-term protection or by transdermal patch for a prolonged duration of action.

In the UK, a usual oral dose of hyoscine hydrobromide is 300 micrograms taken 30 minutes before a journey, followed by 300 micrograms every 6 hours if required up to a maximum of 3 doses in 24 hours. Children aged 4 to 10 years may be given 75 to 150 micrograms and those over 10 years, 150 to 300 micrograms. Children aged 3 to 4 years may be given 75 micrograms 20 minutes before a journey, repeated if necessary to a maximum total dose of 150 micrograms in 24 hours. Hyoscine is also given via a transdermal patch which is placed behind the ear and supplies 1 mg over 3 days. The patch is licensed in the UK for adults and children aged 10 years and over and should be applied 5 to 6 hours before travelling or on the preceding evening and removed at the end of the journey.

An intranasal formulation of hyoscine hydrobromide has been investigated for the treatment and prevention of motion sickness.

Transdermal hyoscine has been used in adults and children for the prevention of **postoperative nausea and vomiting**.

Hyoscine hydrobromide has also been given by intravenous, subcutaneous, or intramuscular injection for its antiemetic effect in a usual dose of 300 to 600 micrograms.

The other drugs used in the management of motion sickness and postoperative nausea and vomiting are discussed on p.1700.

References.

1. Kranke P, *et al.* The efficacy and safety of transdermal scopolamine for the prevention of postoperative nausea and vomiting: a quantitative systematic review. *Anesth Analg* 2002; **95:** 133–43.
2. Nachum Z, *et al.* Transdermal scopolamine for prevention of motion sickness: clinical pharmacokinetics and therapeutic applications. *Clin Pharmacokinet* 2006; **45:** 543–66.
3. Spinks AB, *et al.* Scopolamine (hyoscine) for preventing and treating motion sickness. Available in The Cochrane Database of Systematic Reviews; Issue 3. Chichester: John Wiley; 2007 (accessed 03/04/08).

Palliative care. The *BNF* includes doses for hyoscine in palliative care. *Hyoscine hydrobromide* is used in palliative care to reduce excessive respiratory secretions. A dose of 400 to 600 micrograms may be given by subcutaneous injection every 4 to 8 hours. Alternatively 0.6 to 2.4 mg may be given over 24 hours by continuous subcutaneous infusion. In younger patients the *BNFC* suggests a dose of 10 micrograms/kg (up to a maximum of 600 micrograms) by subcutaneous or intravenous injection every 4 to 8 hours. Alternatively, 1.5 to 2.5 micrograms/kg per hour may be given by continuous subcutaneous or intravenous infusion. Care should be taken to avoid the discomfort of a dry mouth. Hyoscine may also be given as a transdermal patch in some countries.

Hyoscine hydrobromide may be given sublingually for the pain of bowel colic in a dose of 300 micrograms 3 times daily.

Hyoscine butylbromide is also used in palliative care in the treatment of bowel colic; however, it may not be adequate for the control of respiratory secretion. It is given as a subcutaneous infusion in a dose of 20 to 60 mg every 24 hours. A single subcutaneous dose of 20 mg reviewed after 30 minutes, has been suggested if it is tried for excessive respiratory secretion.[1]

The use of hyoscine in palliative care has been reviewed.[2,3] Hyoscine hydrobromide may be more effective than glycopyrronium bromide in drying secretions, and has a rapid onset of action, but it can produce both sedation and agitation; there is no clear evidence favouring one antimuscarinic over another.[1]

1. Bennett M, *et al.* Using anti-muscarinic drugs in the management of death rattle: evidence-based guidelines for palliative care. *Palliat Med* 2002; **16:** 369–74.
2. Muir JC, von Gunten CF. Antisecretory agents in gastrointestinal obstruction. *Clin Geriatr Med* 2000; **16:** 327–34.
3. Spiller JA, Fallon M. The use of Scopoderm in palliative care. *Hosp Med* 2000; **61:** 782–4.

Urinary incontinence. Antimuscarinics have been used in the management of urge incontinence (p.2180) but the incidence of adverse effects can be high. Results of a small study[1] suggested that transdermal hyoscine might be of benefit in females with detrusor instability.

1. Muskat Y, *et al.* The use of scopolamine in the treatment of detrusor instability. *J Urol (Baltimore)* 1996; **156:** 1989–90.

Vertigo. Hyoscine has a long history of use in the management of vertigo, although other drugs are now preferred (p.565).

Preparations

BP 2008: Hyoscine Butylbromide Injection; Hyoscine Butylbromide Tablets; Hyoscine Eye Drops; Hyoscine Injection; Hyoscine Tablets;
USP 31: Methscopolamine Bromide Tablets; Scopolamine Hydrobromide Injection; Scopolamine Hydrobromide Ophthalmic Ointment; Scopolamine Hydrobromide Ophthalmic Solution; Scopolamine Hydrobromide Tablets.

Proprietary Preparations (details are given in Part 3)
Arg.: Buscapina; Cifespasmo; Colobolina; Luar-G; Pasmodina; Rupe-N†; ***Austral.:*** Buscopan; Kwells; Setacol; Travacalm HO; ***Austria:*** Buscopan; Scopoderm; ***Belg.:*** Aspasmine†; Buscopan; ***Braz.:*** Buscopan; Hiospan; Uni Hioscin; ***Canad.:*** Buscopan; Transderm-V; ***Chile:*** Buscapina; ***Cz.:*** Buscolysin†; Buscopan; ***Denm.:*** Buscopan; Scopoderm; ***Fin.:*** Buscopan; Scopoderm; ***Fr.:*** Scoburen; Scopoderm TTS; ***Ger.:*** Boro-Scopol; BS Carino; BS-ratiopharm; Buscolysin†; Buscopan; Scopoderm TTS; Spasman scop; Spasmowern; ***Gr.:*** Buscopan; ***Hong Kong:*** Buscopalamin; Buscopan; Busopin; Copan; Dhacopan; Hysopan; Scopoderm TTS†; Vidaspan; ***Hung.:*** Buscopan; ***India:*** Buscopan; Hyospan; ***Indon.:*** Buscopan; Gitas; Hyscopan; Scobutrin; Scopamin; Spashi; Spasmolit; ***Irl.:*** Buscopan; Kwells; ***Ital.:*** Buscopan; Transcop; ***Jpn:*** Buscopan; ***Malaysia:*** Buscopan; Colospan†; Dhacopan; Fucon; Hyomide; Spasmoliv†; Vacopan; Vascopan†; ***Mex.:*** Alpin; Biomesina; Bipasmin; Bipasmin N; Brolamina; Buscapina; Busina; Busprina-S†; Butiral; Cryopina; Espacil; Excosine-S; Grafin; Hiosinotil†; Hiosultrina; Lemophar; Liliam†; Selpiran-S; Serralpina; ***Neth.:*** Buscopan; Scopoderm TTS; ***Norw.:*** Buscopan; Scopoderm; ***NZ:*** Buscopan; Gastro-Soothe; Scopoderm TTS; ***Philipp.:*** Ascopen; Buscomed; Buscopan; Busopin; Gastride; Rotomide; Scolmin; Spasmosan; ***Pol.:*** Buscolysin; Buscopan; Scopolan; ***Port.:*** Buscopan; ***Rus.:*** Buscopan (Бускопан); ***S.Afr.:*** Buscopan; Hyospasmol; Scopaject; Scopex; ***Singapore:*** Buscopan; Colospan†; Dhacopan; Fucon; Hyomide; Spasmoliv; Vacopan; ***Spain:*** Buscapina; Vorigeno†; ***Swed.:*** Buscopan; Scopoderm; ***Switz.:*** Buscopan; ***Thai.:*** Amcopan; Antispa; Bacotan; Buscono; Buscopan; Butyl; Cencopan; Eralga; Higan; Hy-Spa; Hybutyl; Hyosmed; Hyospan; Hyostan; Hyozin†; Hytic†; Kanin; Myspa; Scopas; Spalox; Spascopan; Spasgone-H; Spatab†; U-Oscine; Uricine; Vacopan; Vescopolamine; ***Turk.:*** Buscopan; Butopan; Molit; Spazmol; ***UAE:*** Scopinal; ***UK:*** Buscopan; Joy-Rides; Kwells; Scopoderm TTS; ***USA:*** Pamine; Scopace; Transderm Scop; ***Venez.:*** Buscapina; Hiocin.

Multi-ingredient: ***Arg.:*** 6 Copin; Buscapina Compositum; Buscapina Compositum N; Buscapina Fem; Cavodan†; Cifespasmo Compuesto; Colobolina D; Dislembral†; Espasmo Biotenk; Gastrolina Compuesta; Ibu-Buscapina†; Lisalgil Compuesto; Luar-G Compositum; Novopasmil Compuesto; Pasmodina Compuesta; Rupe-N Compuesto; ***Austral.:*** Donnagel; Donnalix; Donnatab; Travacalm; ***Austria:*** Buscopamol; Buscopan Compositum; Modiscop; ***Belg.:*** Buscopan Compositum; Spasma†; ***Braz.:*** Algexin; Analverin Composto†; Analverin Plus†; Binospan; Bioscina Composta†; Buscopan Composto; Buscopan Plus; Buscoveran Composto; Butilamin; Disbuspan; Dorspan; Ductopan†; Espasmodid Composto; Hioariston; Hiospan Composto; Inib-Dor†; Kindpasm; Neocopan; Sedabel†; Tropinal; Uzara†; Vagoplex†; Veratropan Composto; ***Chile:*** Algion; Buscapina Compositum; Dolcopin; Kordinol Compuesto†; Novalona; ***Ger.:*** Buscopan Plus; ***Gr.:*** Buscopan Plus; Spasmo-Apotel; ***Hong Kong:*** Epilon; Unigan; Virulex Forte; ***Indon.:*** Aludonna; Buscopan Plus; Gitas Plus; Procolic; Scopamin Plus; Spashi Plus; Spaslic; Unthecol; ***Irl.:*** Feminax; ***Ital.:*** Buscopan Compositum; Spasmeridan; ***Mex.:*** Algosfar; Anadil; Benfol; Biomesina Compuesta; Bipasmin Compuesto; Bipasmin Compuesto N; Bipasmin Compuesto NF†; Buscapina Compositum; Buscapina Compositum N; Busconet; Busepan; Busprina; Colepren; Donodol Compuesto; Escapin-N; Espacil Compuesto;

Espasmogress; Hiosinotil Compuesto†; Hiosultrina-F; Infafren Compuesto; Neo-Pasmonal; Ortran†; Pasmodil; Pirobutil; Precicol; Prestodol Compuesto; Retodol Compositum; Selpiran; Selpiran Compuesto; Serralpina Compuesta; Viladol Plus; ***Philipp.:*** Buscopan Plus; ***Pol.:*** Scopolan Compositum; Vegantalgin H; ***Port.:*** Buscopan Compositum N; ***S.Afr.:*** Buscopan Compositum; Donnatal; Millerspas; Respinol; Respinol Compound; Scopex Co; Virobis†; ***Spain:*** Buscapina Compositum; Midriati; Nolotil Compositum†; Oragalin Espasmolitico; Psico Blocan; ***Swed.:*** Spasmofen; ***Switz.:*** Nardyl; ***Thai.:*** Amcopan Plus; Buscopan Plus; Donnatal†; Pacopan; Spasgone; Unigan; ***Turk.:*** Buscopan Compositum; Molit Plus; Skopolin; Spazmol Plus; Tanko-Buskas; Tranko-Buskas; ***UK:*** Feminax; ***USA:*** Accuhist LA†; AeroHist Plus; AeroKid; AH-chew; Alkabel; AllePak; AlleRx; Antispasmodic Elixir; Barbidonna†; Bellahist-D; Bellatal; Chlor-Mes; Chlor-Mes D; CPM PSE MSC; CPM/PE/MSC; DA Chewable; DA II; Dallergy; Dehistine; Dexphen M; Donnatal; DriHist; Dura-Vent/DA; Durahist; Durahist D; Ex-Histine; Extendryl; Extendryl DM; Extendryl PEM; Hista-Vent DA; Histatab D; Histor-D Timecelles; Hyosophen; Mescolor†; Murocoll-2; Nacon; NoHist Plus; Norel DM; Omnihist LA; Pamine FQ Kit; Pannaz; PCM; Prehist D; PSE MSC; Ralix; Redur-PCM; Relcof PSE; Rescon-MX; Ryneze; Stahist; Susano; Xiral†; ***Venez.:*** Brugesina; Buscapina Compositum; Buscapina Plus; Butilamina Compuesta; Diezol Compuesto†; Fenopol†; Hioscinol Compuesto†; Sarifan Compuesto†; Vuscobras.

Hyoscyamine *(BAN)*

Hiosciamina; Hyoscyamin; (–)-Hyoscyamine; *l*-Hyoscyamine; Hyoscyaminum; Hyoskyamiini. (–)-(1*R*,3*r*,5*S*)-Tropan-3-yl (*S*)-tropate.

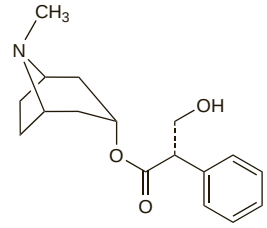
Гиосциамин

$C_{17}H_{23}NO_3$ = 289.4.

CAS — 101-31-5.

ATC — A03BA03.

ATC Vet — QA03BA03.



Description. Hyoscyamine is an alkaloid obtained from various solanaceous plants. It is the laevo-isomer of atropine into which it can be converted by heating or by the action of alkali.

Pharmacopoeias. In *US*.

USP 31 (Hyoscyamine). A white crystalline powder. M.p. 106° to 109°. Slightly soluble in water and in benzene; freely soluble in alcohol, in chloroform, and in dilute acids; sparingly soluble in ether. Its solutions are alkaline to litmus. Store in airtight containers. Protect from light.

Hyoscyamine Hydrobromide *(BANM)*

Bromidrato de Hiosciamina; Hiosciamina, hidrobromuro de; Hyoscyamine Bromhydrate.

Гиосциамина Гидробромид

$C_{17}H_{23}NO_3$,HBr = 370.3.

CAS — 306-03-6.

ATC — A03BA03.

ATC Vet — QA03BA03.

Pharmacopoeias. In *US*.

USP 31 (Hyoscyamine Hydrobromide). White, odourless, crystals or crystalline powder. M.p. not less than 149°. Freely soluble in water; soluble 1 in 2.5 of alcohol, 1 in 1.7 of chloroform, and 1 in 2300 of ether. pH of a 5% solution in water is about 5.4. Store in airtight containers. Protect from light.

Hyoscyamine Sulfate

Hiosciamina, sulfato de; Hiosciamino sulfatas; Hioscyjaminy siarczan; Hioszciamin-szulfát; Hyoscyamin sulfát dihydrát; Hyoscyamine, sulfate d'; Hyoscyamine Sulphate *(BANM)*; Hyoscyamini sulfas; Hyoscyamini Sulfas Dihydricus; Hyoscyaminsulfat; Hyoscyaminum Sulfuricum; Hyoskyamiinisulfaatti; Iosciamina Solfato.

Гиосциамина Сульфат

$(C_{17}H_{23}NO_3)_2$,H_2SO_4,$2H_2O$ = 712.8.

CAS — 620-61-1 (anhydrous hyoscyamine sulfate); 6835-16-1 (hyoscyamine sulfate dihydrate).

ATC — A03BA03.

ATC Vet — QA03BA03.

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

Ph. Eur. 6.2 (Hyoscyamine Sulphate). A white or almost white, crystalline powder or colourless needles. Very soluble in water; sparingly soluble or soluble in alcohol. A 2% solution in water has a pH of 4.5 to 6.2. Store in airtight containers. Protect from light.

USP 31 (Hyoscyamine Sulfate). A white or almost white, crystalline powder or colourless needles. It is deliquescent and affected by light. Soluble 1 in 0.5 of water and 1 in 5 of alcohol; practically insoluble in ether. pH of a 1% solution in water is about 5.3.

Adverse Effects, Treatment, and Precautions

As for Atropine Sulfate, p.1219.

Interactions

As for antimuscarinics in general (see Atropine Sulfate, p.1220).

Uses and Administration

Hyoscyamine is a tertiary amine antimuscarinic with the actions of atropine (which is racemic hyoscyamine, see p.1219); hyoscyamine, the laevo-isomer, has about twice the potency of atropine since the dextro-isomer has only very weak antimuscarinic activity. Hyoscyamine is used mainly in the relief of conditions associated with visceral spasm. It has also been given for rhinitis and was formerly used in the treatment of parkinsonism.

Hyoscyamine is given in usual doses of 150 to 300 micrograms up to four times daily by mouth, but it is more usually employed as the sulfate; the hydrobromide is also used. Suggested doses of hyoscyamine sulfate are 125 to 250 micrograms orally or sublingually every four hours as needed, up to a maximum of 1.5 mg in 24 hours. Modified-release oral preparations of hyoscyamine sulfate are available in some countries; dosage is specific to a particular formulation. Hyoscyamine sulfate has also been given by injection.

Preparations

USP 31: Hyoscyamine Sulfate Elixir; Hyoscyamine Sulfate Injection; Hyoscyamine Sulfate Oral Solution; Hyoscyamine Sulfate Tablets; Hyoscyamine Tablets.

Proprietary Preparations (details are given in Part 3)
Canad.: Levsin†; ***Denm.:*** Egazil; ***Fin.:*** Egazil†; ***Fr.:*** Duboisine†; ***Hong Kong:*** Levsin; ***Norw.:*** Egazil; ***Swed.:*** Egazil; ***USA:*** A-Spas†; Anaspaz; Cystospaz; Donnamar; ED-SPAZ; Gastrosed; IB-Stat; Levbid; Levsin; Levsinex; Mar-Spas; Neosol; NuLev; Symax.

Multi-ingredient: ***Austral.:*** Donnagel; Donnalix; Donnatab; ***Braz.:*** Analverin†; Neogrein; Ormigrein; Tropinal; ***Cz.:*** Solutan†; ***Indon.:*** Aludonna; Feminax; ***Ital.:*** Antispasmina Colica; ***S.Afr.:*** Donnatal; Millerspas; ***Switz.:*** Nardyl; ***Thai.:*** Donnatal†; ***USA:*** Accuhist LA†; Alkabel; Antispasmodic Elixir; Atrosept; Barbidonna†; Bellacane; Bellahist-D; Bellatal; Dolsed†; Donnatal; Hyosophen; MHP-A; MSP-Blu; Phenazopyridine Plus; Prosed/DS; Pyridium Plus; Stahist; Susano; Trac Tabs 2X†; Trellium Plus; UAA; Urelief Plus; Urelle; Uretron; Uridon Modified†; Urimar-T; Urimax; Urised; Uriseptic; UriSym†; Uritact; Uro Blue; Urogesic Blue; Utira.

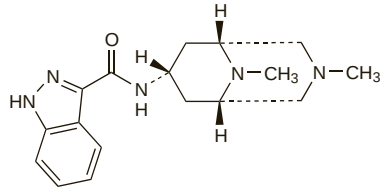
Indisetron Hydrochloride *(rINNM)*

Hidrocloruro de indisetrón; Indisétron, Chlorhydrate d'; Indisetron Dihydrochloride; Indisetroni Hydrochloridum; N-3389. *N*-(3,9-Dimethyl-*endo*-3,9-diazabicyclo[3.3.1]non-7-yl)-1*H*-indazole-3-carboxamide dihydrochloride.

Индисетрона Гидрохлорид

$C_{17}H_{23}N_5O$,2HCl = 386.3.

CAS — 141549-75-9 (indisetron); 160472-97-9 (indisetron dihydrochloride).



(indisetron)

Profile

Indisetron is a 5-HT_3-receptor antagonist with general properties similar to those of ondansetron (p.1756); it is also stated to be an antagonist at 5-HT_4 receptors. Indisetron hydrochloride is used as an antiemetic in the management of nausea and vomiting associated with chemotherapy.

Ipomoea

Ipomoea Root; Mexican Scammony Root; Orizaba Jalap Root; Scammony Root.

Ипомея

Ipomoea Resin

Ipomoea, resina de; Mexican Scammony Resin; Scammony Resin.

CAS — 9000-34-4.

Profile

Ipomoea is the dried root of *Ipomoea orizabensis* (Convolvulaceae). Ipomoea resin is a mixture of glycosidal resins obtained from ipomoea and it has a drastic purgative and irritant action. It has been superseded by less toxic laxatives.

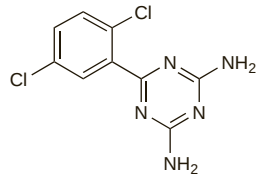
Irsogladine Maleate *(rINNM)*

Irsogladine, Maléate d'; Irsogladini Maleas; Maleato de irsogladina; MN-1695. 2,4-Diamino-6-(2,5-dichlorophenyl)-*S*-triazine maleate.

Ирсогладина Малеат

$C_9H_7Cl_2N_5.C_4H_4O_4$ = 372.2.

CAS — 57381-26-7 (irsogladine); 84504-69-8 (irsogladine maleate).



(irsogladine)

Profile

Irsogladine maleate is a cytoprotective drug that is used in the treatment of peptic ulcer disease (p.1702) in a usual oral dose of 4 mg daily. It has also been investigated for mucositis and mouth ulceration.

Mucositis. Irsogladine maleate 2 mg twice daily by mouth has been reported[1] to reduce the incidence of aphthous stomatitis in a small study in patients being treated with methotrexate for rheumatoid arthritis.

1. Yoshida T, Hirakata M. Therapeutic benefits of irsogladine maleate on aphthous stomatitis induced by methotrexate in rheumatoid arthritis. *J Rheumatol* 2003; **30:** 2082–3.

Preparations

Proprietary Preparations (details are given in Part 3)
Jpn: Gaslon N.

Isopropamide Iodide *(BAN, rINN)*

Ioduro de isopropamida; Isopropamide, Iodure d'; Isopropamidi Iodidum. (3-Carbamoyl-3,3-diphenylpropyl)di-isopropylmethylammonium iodide.

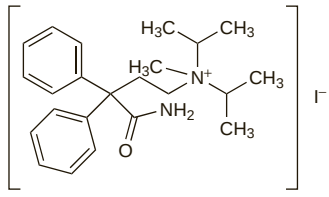
Изопропамида Йодид

$C_{23}H_{33}IN_2O$ = 480.4.

CAS — 7492-32-2 (isopropamide); 71-81-8 (isopropamide iodide).

ATC — A03AB09.

ATC Vet — QA03AB09.



Pharmacopoeias. In *US*.

USP 31 (Isopropamide Iodide). A white to pale yellow crystalline powder. Soluble 1 in 50 of water, 1 in 10 of alcohol, and 1 in 5 of chloroform; very slightly soluble in ether and in benzene. Protect from light.

Profile

Isopropamide iodide is a quaternary ammonium antimuscarinic with peripheral effects similar to those of atropine (p.1219). It has been used as an adjunct in the treatment of peptic ulcer disease, in the relief of gastrointestinal and urinary-tract disorders associated with smooth muscle spasm, in rhinitis, and for the relief of symptoms of colds.

Isopropamide bromide has been used similarly.

Preparations

USP 31: Isopropamide Iodide Tablets.

Proprietary Preparations (details are given in Part 3)
Multi-ingredient: ***Arg.:*** Plidex†; ***Braz.:*** Ornatrol†; ***Canad.:*** Stelabid†; ***Ital.:*** Raffreddoremed; Valtrax; ***Mex.:*** Stelabid.