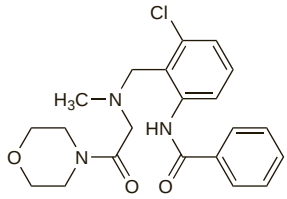
Fominoben Hydrochloride *(rINNM)*

Fominobène, Chlorhydrate de; Fominobeni Hydrochloridum; Hidrocloruro de fominobén; PB-89. 3′-Chloro-2′-[*N*-methyl-*N*-(morpholinocarbonylmethyl)aminomethyl]benzanilide hydrochloride.

Фоминобена Гидрохлорид

$C_{21}H_{24}ClN_3O_3$,HCl = 438.3.

CAS — 18053-31-1 (fominoben); 24600-36-0 (fominoben hydrochloride).



(fominoben)

Profile
Fominoben hydrochloride is a centrally acting cough suppressant (see p.1547) that is also reported to have respiratory stimulant properties. It is given in oral doses of 160 mg up to three times daily; it has also been given by slow intravenous injection.

Preparations
Proprietary Preparations (details are given in Part 3)
Jpn: Noleptan; ***Mex.:*** Noleptan; ***Spain:*** Tosifar.

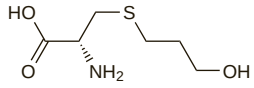
Fudosteine *(rINN)*

Fudosteína; Fudostéine; Fudosteinum; SS-320A. (–)-3-[(3-Hydroxypropyl)thio]-L-alanine.

Фудостеин

$C_6H_{13}NO_3S$ = 179.2.

CAS — 13189-98-5.



Profile
Fudosteine is an expectorant given orally in a dose of 400 mg three times daily.

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

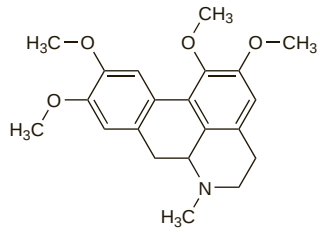
Glaucine

Boldine Dimethyl Ether; DL-832 (*dl*-glaucine phosphate); Glaucina; *dl*-Glaucine; MDL-832 (*dl*-glaucine phosphate). DL-1,2,9,10-Tetramethoxyaporphine.

Глауцин

$C_{21}H_{25}NO_4$ = 355.4.

CAS — 5630-11-5 (dl-glaucine); 73239-87-9 (dl-glaucine phosphate); 475-81-0 (d-glaucine); 5996-06-5 (d-glaucine hydrobromide).



(dl-glaucine)

Profile
Glaucine is a centrally acting cough suppressant used in non-productive cough (p.1547); it has been given as the phosphate.

d-Glaucine has also been used, as the hydrobromide and the hydrochloride. It has been obtained from *Glaucium flavum* (Papaveraceae).

Preparations
Proprietary Preparations (details are given in Part 3)
Rus.: Glauvent (Глаувент)†.

Multi-ingredient: ***Rus.:*** Bronchitussin (Бронхитусен); Bronchocin (Бронхоцин); Broncholytin (Бронхолитин).

Guacetisal *(rINN)*

Acetylsalicylic Acid Guaiacol Ester; Guacétisal; Guacetisalum. *o*-Methoxyphenyl salicylate acetate.

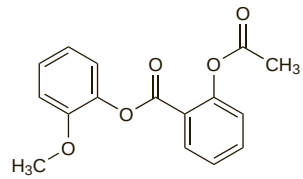
Гуацетисал

$C_{16}H_{14}O_5$ = 286.3.

CAS — 55482-89-8.

ATC — N02BA14.

ATC Vet — QN02BA14.



Profile
Guacetisal has been used in respiratory disorders as an expectorant (see p.1547). It has also been used as an antipyretic to reduce fever (p.10). It has been given by mouth and rectally.

Preparations
Proprietary Preparations (details are given in Part 3)
Ital.: Prontomucil.

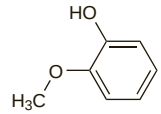
Guaiacol

Gaïacol; Guaiacolum; Guajacol; Guayacol; Gwajakol; Methyl Catechol. 2-Methoxyphenol.

Гваякол

$C_7H_8O_2$ = 124.1.

CAS — 90-05-1 (guaiacol); 553-17-3 (guaiacol carbonate); 60296-02-8 (calcium guaiacolglycolate); 4112-89-4 (guaiacol phenylacetate).



Pharmacopoeias. In *Eur.* (see p.vii). *Fr.* also includes guaiacol carbonate.

Ph. Eur. 6.2 (Guaiacol). A crystalline mass or colourless or yellowish hygroscopic liquid. Sparingly soluble in water; freely soluble in alcohol; very soluble in dichloromethane. Store in airtight containers. Protect from light.

Profile
Guaiacol has disinfectant properties and has been used in dentistry and as an expectorant for productive cough (p.1547).

In high concentrations, adverse effects are similar to, but less severe than, those of phenol (p.1656).

A wide range of salts and derivatives of guaiacol have been used similarly including the carbonate, cinnamate, ethylglycolate, calcium and sodium glycolates, phenylacetate, and phenylbutyrate. See also Guaifenesin, p.1561 and Sulfogaiacol, p.1573.

Preparations
Proprietary Preparations (details are given in Part 3)
Mex.: Eucaliptine.

Multi-ingredient: ***Arg.:*** Aseptobron; Atomo Desinflamante; Atomo Desinflamante Familiar; ***Belg.:*** Eucalyptine; Eucalyptine Pholcodine; Inopectol; ***Braz.:*** Canfomenol†; Egotussano†; Ozonyl; Transpulmin; Transpulmin Balsamo; Tripulmin Balsamico†; ***Canad.:*** Creo-Rectal; Demo-Cineol; Omni-Tuss†; Valda; ***Cz.:*** Biocalyptol S†; ***Fr.:*** Bronchorectine au Citral; Essence Algerienne; Pulmo Bailly; Pulmoserum; Valda; ***Ger.:*** Dalet Med Balsam†; ***Gr.:*** Gulamyl; ***Hong Kong:*** Biocalyptol†; Valda†; ***Irl.:*** Valda†; ***Ital.:*** Eugenol-Guaiacolo Composto; Fosfoguaiacol; Lactocol; Lipobalsamo; ***Mex.:*** Eucalin†; Guayalin; Guayalin-Plus†; ***Port.:*** Algina; Analgil; Valda†; ***Spain:*** Bronco Aseptilex Fuerte; Eucalyptospirine†; Tos Mai; ***UK:*** Dragon Balm; Pulmo Bailly; ***USA:*** Methagual; ***Venez.:*** Derpinol†.

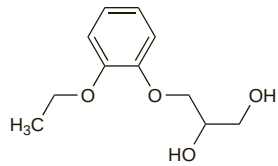
Guaietolin *(rINN)*

Glycerylguethol; Glyguetol; Guaietolina; Guaïétoline; Guaietolinum; Guayetolina. 3-(2-Ethoxyphenoxy)propane-1,2-diol.

Гвайэтолин

$C_{11}H_{16}O_4$ = 212.2.

CAS — 63834-83-3.



Profile
Guaietolin is an analogue of guaifenesin which is used as an expectorant (see p.1547). It has been given in oral doses of 300 to 600 mg two or three times daily.

Preparations
Proprietary Preparations (details are given in Part 3)
Fr.: Guethural.

Guaifenesin *(BAN, USAN, rINN)*

Glyceryl Guaiacolate; Glycerylguayacolum; Guaiacol Glycerol Ether; Guaiacyl Glyceryl Ether; Guaifenesiini; Guaifenesina; Guaïfénésine; Guaifénésine; Guaifenesinum; Guaiphenesin; Guajacolum Glycerolatum; Gvajfenezin; Gvajfenezinas. (*RS*)-3-(2-Methoxyphenoxy)propane-1,2-diol.

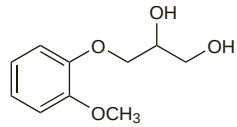
Гвайфенезин

$C_{10}H_{14}O_4$ = 198.2.

CAS — 93-14-1.

ATC — R05CA03.

ATC Vet — QM03BX90; QR05CA03.



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

Ph. Eur. 6.2 (Guaifenesin). A white or almost white, crystalline powder. Sparingly soluble in water; soluble in alcohol.

USP 31 (Guaifenesin). A white to slightly grey crystalline powder. May have a slight characteristic odour. Soluble 1 in 60 to 70 of water; soluble in alcohol, in chloroform, and in propylene glycol; sparingly soluble in glycerol. Store in airtight containers.

Adverse Effects and Precautions
Gastrointestinal discomfort, nausea, and vomiting have occasionally been reported with guaifenesin, particularly in very large doses.

Abuse. Urinary calculi have been reported in patients consuming large quantities of over-the-counter preparations containing guaifenesin.[1,2] Spectroscopic analysis[1] revealed that the stones were composed of a calcium salt of beta-(2-methoxyphenoxy)-lactic acid, which is a metabolite of guaifenesin. Small quantities of ephedrine were also present in the stones of one of several patients who had ingested preparations containing a combination of guaifenesin and ephedrine.[2]

1. Pickens CL, *et al.* Abuse of guaifenesin-containing medications generates an excess of a carboxylate salt of beta-(2-methoxyphenoxy)-lactic acid, a guaifenesin metabolite, and results in urolithiasis. *Urology* 1999; **54:** 23–7.
2. Assimos DG, *et al.* Guaifenesin- and ephedrine-induced stones. *J Endourol* 1999; **13:** 665–7.

Porphyria. Guaifenesin is considered to be unsafe in patients with porphyria because it has been shown to be porphyrinogenic in *animals*.

Pharmacokinetics
Guaifenesin is well absorbed from the gastrointestinal tract. It is metabolised and then excreted in the urine.

Uses and Administration
Guaifenesin is reported to increase the volume and reduce the viscosity of tenacious sputum and is used as an expectorant for productive cough. It is given in oral doses of 200 to 400 mg every 4 hours. Modified-release preparations, given every 12 hours, are also available. For doses in children see Administration in Children, below.

Guaifenesin has been used similarly as the calcium salt.

Guaifenesin is used as an adjunct to anaesthesia in veterinary medicine.

Administration in children. Guaifenesin is licensed for use as an expectorant in children; however, over-the-counter cough and cold preparations containing expectorants (including guaifenesin) should be used with caution in children and generally avoided in those under 2 years of age (see p.1547). Typical licensed oral doses, given every 4 hours, are:

- 6 months to 2 years, 25 to 50 mg
- 2 to 6 years, 50 to 100 mg
- 6 to 12 years, 100 to 200 mg

UK preparations suggest that these doses be given up to a maximum of 4 times daily, although in other countries higher total doses may be given.

Respiratory disorders. An FDA review of preparations available over-the-counter concluded that guaifenesin was an effective expectorant.[1] The use of expectorants for productive cough is discussed on p.1547. A small study[2] found that guaifenesin also appeared to reduce cough reflex sensitivity in patients with upper respiratory-tract infections, which produce a transient increase in sensitivity, although it had no effect on cough reflex in healthy subjects. The mechanism for this effect was unclear.

Guaifenesin has been given to patients with altered nasal mucociliary clearance associated with HIV infection.[3]

1. Thomas J. Guaiphenesin—an old drug now found to be effective. *Aust J Pharm* 1990; **71:** 101–3.
2. Dicpinigaitis PV, Gayle YE. Effect of guaifenesin on cough reflex sensitivity. *Chest* 2003; **124:** 2178–81.
3. Rosen EJ, Calhoun KH. Alterations of nasal mucociliary clearance in association with HIV infection and the effect of guaifenesin therapy. *Laryngoscope* 2005; **115:** 27–30.

Preparations

USP 31: Dyphylline and Guaifenesin Elixir; Dyphylline and Guaifenesin Tablets; Guaifenesin and Codeine Phosphate Syrup; Guaifenesin and Pseudoephedrine Hydrochloride Capsules; Guaifenesin Capsules; Guaifenesin Syrup; Guaifenesin Tablets; Guaifenesin, Pseudoephedrine Hydrochloride, and Dextromethorphan Hydrobromide Capsules; Theophylline and Guaifenesin Capsules; Theophylline and Guaifenesin Oral Solution.

Proprietary Preparations (details are given in Part 3)
Arg.: Guaifen; Omega 100 Bronquial; Plenum; Robitussin†; Vick 44 Exp; Vickmiel; ***Austral.:*** Actifed CC Chesty; Robitussin Chesty Cough; Robitussin EX; Strepsils Chesty Cough†; Vicks Cough Syrup for Chesty Coughs†; ***Austria:*** Resyl; Waldheim Husten; ***Belg.:*** Vicks Vaposyrup Expectorant; ***Braz.:*** Broncofenil; Dimetapp Expectorante; Transpulmin; Vick Xarope; ***Canad.:*** Balminil Expectorant; Benylin E; Bronchophan Expectorant; Cough Syrup Expectorant; Expectorant; Expectorant Cough Formula; Expectorant Cough Syrup†; Expectorant Syrup; Extra Strength Cough Syrup Expectorant†; Koffex Expectorant†; Robitussin; Sirop Expectorant†; Tussin Expectorant†; Vicks Chest Congestion Relief; ***Cz.:*** Coldrex Broncho; Guajacuran; Robitussin Expectorans; ***Fin.:*** Tintus; ***Fr.:*** Vicks Expectorant; ***Ger.:*** Fagusan; Wick Formel 44 Husten-Loser; ***Gr.:*** VP-Syrup†; ***Hong Kong:*** Breacol; Excough†; Gufensin; Mucolex; Robitussin Expectorant; Uni-Colex; ***Hung.:*** Relaxil-G; Robitussin Expectorans; Wick Formula 44 kopteto†; ***Indon.:*** Probat; ***Irl.:*** Benylin Childrens Chesty Coughs; Robitussin Chesty Cough; Tixylix Chesty Cough; ***Israel:*** Resyl; Robitussin; Vitussin; ***Ital.:*** Broncovanil; Resyl; Vicks Tosse Fluidificante; ***Malaysia:*** Fuston†; Robitussin Expectorant†; ***Mex.:*** Robitussin; Tukol; Vick 44 Exp; ***NZ:*** Actifed CC Chesty†; Lemsip Chesty Cough†; Robitussin EX; ***Philipp.:*** Bena; Benadryl Expectorant; Guais; Robitussin Expectorant; Suprekof; Transpulmin G; ***Pol.:*** Guajazyl; Robitussin Expectorans; ***Rus.:*** Novo-Passit (Ново-Пассит); Theraflu KV (Терафлю КВ); Tussin (Туссин); ***S.Afr.:*** Actospect; Benylin Wet Cough; Borstol Linctus; Chamberlains Cough Remedy Honey and Liquorice; Chamberlains Cough Remedy Peppermint; Dilinct Junior; Expelinct; Flemmi-Ped; Med-Lemon Cough Syrup; Vicks Acta Plus Expectorant; ***Singapore:*** Breacol; Cofen; Robitussin; ***Spain:*** Formulaexpec; Robitussin; Serraspec; ***Swed.:*** Resyl; ***Switz.:*** Bronchol; Nicobrevin N†; Resyl; Vicks Formule 44 Expectine; ***Thai.:*** Glycolate; Glyryl; Mulade; Robitussin; Tussa; ***Turk.:*** Vicks VapoSyrup; ***UK:*** Adult Chesty Cough Non Drowsy; Benylin Childrens Chesty Coughs; Boots Chesty Cough Syrup 1 Year Plus; CalCough Chesty; Expectorant Cough Syrup; Hill's Balsam Chesty Cough; Jackson's All Fours; Jackson's Bronchial Balsam; Robitussin for Chesty Coughs; Tixylix Chesty Cough; Venos for Kids; Vicks Cough Syrup for Chesty Coughs; Vicks Vaposyrup for Chesty Coughs; ***USA:*** Allfen; Anti-Tuss†; Buckleys Chest Congestion; Duratuss G†; Fenesin†; Ganidin NR; Glycotuss; Guaifenex G†; Guaifenex LA†; Guiatuss; Halotussin†; Humavent; Humibid Maximum Strength; Hytuss†; Liquibid; Mucinex; Muco-Fen†; Naldecon Senior EX; Organidin NR; Refenesen; Respa-GF†; Robitussin; Scot-Tussin Expectorant; Siltussin; Touro Ex†; Tusibron; Xpect; ***Venez.:*** Alivetos Pediatrico; Robitessin; Robitessin Kit Tos†.

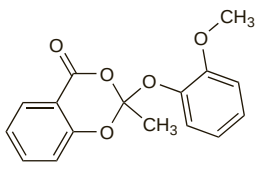
Multi-ingredient: Numerous preparations are listed in Part 3.

Guaimesal *(rINN)*

Guaïmésal; Guaimesalum. (±)-2-(*o*-Methoxyphenoxy)-2-methyl-1,3-benzodioxan-4-one.

Гваймесал

$C_{16}H_{14}O_5$ = 286.3.
CAS — 81674-79-5.



Profile

Guaimesal is reported to have expectorant and antipyretic properties and has been given orally as an adjunct in the treatment of respiratory-tract disorders. It has also been given rectally in suppositories.

Helicidine

Helicidina; Helixinum.

Гелицидин

Profile

Helicidine is a mucoglycoprotein from the snail *Helix pomatia* that has been used as a cough suppressant.

◊ References.

1. Pons F, *et al.* L'effect bronchorelaxant de l'helicidine, un extrait d'Helix pomatia, fait intervenir une liberation de prostaglandine E2. *Pathol Biol (Paris)* 1999; **47:** 73–80.

Preparations

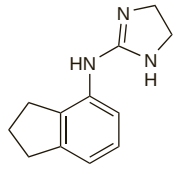
Proprietary Preparations (details are given in Part 3)
Multi-ingredient: ***Ger.:*** Original Schneckensirup†.

Indanazoline Hydrochloride *(rINNM)* ⊗

Hidrocloruro de indanazolina; Indanazolin Hidroklorür; Indanazoline, Chlorhydrate d'; Indanazolini Hydrochloridum.

Инданазолина Гидрохлорид

$C_{12}H_{15}N_3$,HCl = 237.7.
CAS — 56601-85-5.



(indanazoline)

Profile

Indanazoline is a sympathomimetic with effects similar to those of naphazoline (p.1565). It has been used as the hydrochloride for its vasoconstrictor effect in the management of nasal congestion (p.1548). It has been given as nasal drops, a nasal gel, or a nasal spray in a concentration equivalent to indanazoline 0.1%.

Preparations

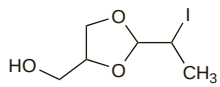
Proprietary Preparations (details are given in Part 3)
Ger.: Farial; ***Turk.:*** Farial.

Iodinated Glycerol *(BAN, USAN)*

Glicerol yodado; Iodopropylidene Glycerol.

Глицерин Йодированный

$C_6H_{11}IO_3$ = 258.1.
CAS — 5634-39-9.



Profile

Iodinated glycerol, a methyl derivative of domiodol, is an isomeric mixture of iodinated dimers of glycerol. It has been used as an expectorant. The limitations of iodides as expectorants are discussed in Cough on p.1547. The actions of iodides and iodine compounds are discussed under Iodine p.2169. Prolonged use of iodinated glycerol has been associated with thyroid dysfunction (see Effects on the Thyroid Gland, below) and severe skin eruptions; gastrointestinal disturbances and hypersensitivity reactions have also occurred. Malignant neoplasms have developed in *animals* given iodinated glycerol.

Chronic obstructive pulmonary disease. Studies[1-3] of the use of iodinated glycerol in patients with chronic bronchitis have produced conflicting results. The use of mucolytics or expectorants in chronic obstructive pulmonary disease (p.1112) is controversial.

1. Petty TL. The National Mucolytic Study: results of a randomized, double-blind, placebo-controlled study of iodinated glycerol in chronic obstructive bronchitis. *Chest* 1990; **97:** 75–83.
2. Repsher LH. Treatment of stable chronic bronchitis with iodinated glycerol: a double-blind, placebo-controlled trial. *J Clin Pharmacol* 1993; **33:** 856–60.
3. Rubin BK, *et al.* Iodinated glycerol has no effect on pulmonary function, symptom score, or sputum properties in patients with stable chronic bronchitis. *Chest* 1996; **109:** 348–52.

Effects on the thyroid gland. Thyroid dysfunction (both hyperthyroidism and hypothyroidism) has developed after giving iodinated glycerol to previously euthyroid patients. It was recommended that baseline thyroid function tests should be carried out before starting treatment with iodinated glycerol;[1] it should be withdrawn if abnormal results are obtained during use.

1. Gittoes NJL, Franklyn JA. Drug-induced thyroid disorders. *Drug Safety* 1995; **13:** 46–55.

Preparations

Proprietary Preparations (details are given in Part 3)
USA: Iophen; Par Glycerol; R-Gen.

Ipecacuanha

Hlavěnkový kořen; Ipecac; Ipecacuana; Ipécacuanha, racine d'; Ipecacuanha Root; Ipecacuanhae radix; Ipekakuána-gyökér; Ipekakuananjuuri (ipecacuanha root); Ipekakuanarot (ipecacuanha root); Ipekakuanų šaknys; Korzeń ipekakuany; Raíz de ipecacuana.

Ипекакуана

CAS — 8012-96-2.
ATC — R05CA04; V03AB01.
ATC Vet — QR05CA04; QV03AB01.

Pharmacopoeias. In *Eur.* (see p.vii), *Int.*, *Jpn*, and *US*.
Eur., *Jpn*, and *US* also include a monograph for Prepared Ipecacuanha or a similar standardised form.
Ph. Eur. 6.2 (Ipecacuanha Root; Ipecacuanha BP 2008). It consists of the fragmented and dried underground organs of *Cephaelis ipecacuanha* known as Matto Grosso ipecacuanha, or of *C. acuminata* known as Costa Rica ipecacuanha, or a mixture of both species. It contains not less than 2.0% of total alkaloids, calculated as emetine. It has a slight odour. Store in airtight containers. Protect from light.
The BP 2008 directs that when Ipecacuanha, Ipecacuanha Root, or Powdered Ipecacuanha is prescribed or demanded, Prepared Ipecacuanha shall be dispensed or supplied.
Ph. Eur. 6.2 (Ipecacuanha, Prepared; Ipecacuanhae Pulvis Normatus). It is ipecacuanha root powder adjusted to an alkaloidal content of 1.9 to 2.1% of total alkaloids, calculated as emetine. Store in airtight containers. Protect from light.
USP 31 (Ipecac). The dried rhizome and roots of *Cephaelis acuminata* or of *C. ipecacuanha* (Rubiaceae). It yields not less than 2% of ether-soluble alkaloids of which not less than 90% is emetine and cephaeline; the content of cephaeline varies from an amount equal to, to an amount not more than 2.5 times, that of emetine.
USP 31 (Powdered Ipecac). It contains 1.9 to 2.1% of ether-soluble alkaloids, with emetine and cephaeline content as for Ipecacuanha. It is pale brown, weak yellow, or light olive-grey powder that should be stored in airtight containers.

Adverse Effects

Large doses of ipecacuanha have an irritant effect on the gastrointestinal tract, and persistent bloody vomiting or bloody diarrhoea may occur. Mucosal erosions of the entire gastrointestinal tract have been reported. The absorption of emetine, which is most likely if vomiting does not occur after emetic doses of ipecacuanha, may give rise to adverse effects on the heart, such as conduction abnormalities or myocardial infarction. These, combined with dehydration due to vomiting may cause vasomotor collapse followed by death.

There have been several reports of chronic abuse of ipecacuanha to induce vomiting in eating disorders; cardiotoxicity and myopathy have occurred and may be a result of accumulation of emetine.

There have also been several reports of ipecacuanha poisoning due to the unwitting substitution of Ipecac Fluidextract (a former USP preparation) for Ipecac Syrup (USP); the fluidextract was about 14 times the strength of the syrup.

◊ References.

1. Manno BR, Manno JE. Toxicology of ipecac: a review. *Clin Toxicol* 1977; **10:** 221–42.

Hypersensitivity. Allergy, characterised by rhinitis, conjunctivitis, and chest tightness, has occurred due to inhalation of ipecacuanha dust in packers of ipecacuanha tablets.[1]

1. Luczynska CM, *et al.* Occupational allergy due to inhalation of ipecacuanha dust. *Clin Allergy* 1984; **14:** 169–75.

Vomiting. Prolonged vomiting has been reported in 17% of patients given ipecacuanha in the treatment of poisoning and may lead to gastric rupture, Mallory-Weiss tears of the oesophagogastric junction, cerebrovascular events, and pneumomediastinum and pneumoperitoneum.[1]

1. Bateman DN. Adverse reactions to antidotes. *Adverse Drug React Bull* 1988; **133:** (Dec.): 496–9.

Treatment of Adverse Effects

After acute overdose of ipecacuanha, activated charcoal is given to delay absorption followed if necessary by gastric lavage. Prolonged vomiting may be controlled by the injection of antiemetics. Fluid and electrolyte imbalance should be corrected and facilities should be available to correct any cardiac effects and subsequent shock.

When ipecacuanha is withdrawn after chronic abuse, recovery may be prolonged due to the slow elimination of emetine.