

trolav; Gastrulcer; Pep-Rani; Peptab; Peptifar; Quardin; Ran; Ranidine; Stacer; Ulcercur; Ulcerof; Zantac. **Rus.:** Ацилос (Ацилок); Хистак (Хистак); Ранигаст (Ранигаст); Ранисан (Ранисан); Рантак (Рантак); Улан (Ульпан); Зантак (Зантак); Зоран (Зоран). **S.Afr.:** Gl-Tak; Histak; Ranihexal; Raniteen; Ulaaid; Ultak; Zantac. **Singapore:** Gastran; Histac; Hyzan; Lumaren; Neceptin-R; Rani; Ranidine; Ratic; Xanidine; Zantac; Zenthin; Zoran. **Spain:** Alquen; Arcid; Ardoral; Coralen; Denulcer; Fagus; Lake; Meticef; Quantor; Ran H2; Ranidin; Ranix; Ranuber; Rubulcer; Tandin; Terposen; Toriol; Underacid; Zantac. **Swed.:** Artonil; Inside; Rani-Q; Zantac. **Switz.:** Ranimed; Ranisfar; Uclidine; Zantic. **Thai.:** Acilloc; Histac; Radinef; Ranid; Ranidine; Rantac; Ratic; Ratica; Utac; Xanidine; Zanamet; Zantac; Zantidon; Zardil. **Turk.:** Ranitab; Ranitac; Ranobel; Rozon; Santanol; Ucuran; Zandid; Zantac. **UAE:** Ranitac. **UK:** Gavilast; Ranitic; Raniti; Rantec; Ranzac; Vivatak; Zaedoc; Zantac. **USA:** Zantac. **Venez.:** Aplom; Enterac; Ranicac; Ranibloc; Ranifesa; Ranix; Ranizan; Retamin; Vizerul; Zantac; Zoran.

**Multi-ingredient:** Arg.; Duo Vizerul; Euciton Reflux; Megalex; **India:** Acilloc RD; **Mex.:** Ergex.

### Ranitidine Bismuth Citrate (BAN, USAN)

A complex of ranitidine and bismuth citrate; GR-122311X; Ranitidin Bizmut Sitrát; Ranitidin Bizmutreks; Ranitidina y bizmut, citrato de; Ranitidine Bismutrex. N-[2-((5-[(Dimethylamino)methyl]furfuryl)thio)ethyl]-N'-methyl-2-nitro-1,1-ethenediamine, compound with bismuth(3+) citrate (1:1).

РАНИТИДИН ВИСМУТ ЦИТРАТ

$C_{13}H_{22}N_4O_3S_2C_6H_5BiO_7 = 712.5$ .

CAS — 128345-62-0.

ATC — A02BA07.

ATC Vet — QA02BA07.

### Adverse Effects and Precautions

Ranitidine bismuth citrate would be expected to combine the adverse effects of both bismuth compounds (p.1711) and ranitidine (p.1766). Blackening of the tongue and faeces is common, and gastrointestinal disturbances, headache, mild anaemia, and altered liver enzyme values have been reported. Rarely, hypersensitivity reactions (including anaphylaxis), have occurred.

Ranitidine bismuth citrate should not be given to patients with moderate to severe renal impairment. It is not suitable for long-term or maintenance therapy because of the risk of bismuth accumulation. As with other antsecretory drugs, the possibility of malignancy should be considered when giving ranitidine bismuth citrate to patients with gastric ulcers since the drug may mask symptoms and delay diagnosis.

### Interactions

Ranitidine bismuth citrate would be expected to have the interactions of bismuth compounds (p.1712), and ranitidine (p.1766).

### Pharmacokinetics

After oral doses, ranitidine bismuth citrate dissociates into its ranitidine and bismuth components in the stomach. For the pharmacokinetics of ranitidine, see p.1766, and for those of bismuth, see p.1712.

### References.

- Lacey LF, *et al.* Comparative pharmacokinetics of bismuth from ranitidine bismuth citrate (GR122311X), a novel anti-ulcerant and tripotassium dicitrate bismuthate (TDB). *Eur J Clin Pharmacol* 1994; **47**: 177–80.
- Koch KM, *et al.* Pharmacokinetics of bismuth and ranitidine following single doses of ranitidine bismuth citrate. *Br J Clin Pharmacol* 1996; **42**: 201–5.
- Koch KM, *et al.* Pharmacokinetics of bismuth and ranitidine following multiple doses of ranitidine bismuth citrate. *Br J Clin Pharmacol* 1996; **42**: 207–11.

### Uses and Administration

Ranitidine bismuth citrate is a complex of ranitidine with bismuth and citrate, which releases ranitidine and bismuth in the gastrointestinal tract and therefore possesses both the actions of the bismuth compounds (p.1712) and of ranitidine (p.1767). It has been used in the management of peptic ulcer disease (p.1702), and may be given with antibacterials for the eradication of *Helicobacter pylori* infection and the prevention of relapse of peptic ulcer disease.

Doses are 400 mg twice daily orally; treatment has usually been given for 4 to 8 weeks for duodenal ulceration and for 8 weeks for benign gastric ulceration. Ranitidine bismuth citrate should not be used for maintenance therapy, and a maximum of 16 weeks of treatment (two 8-week courses or four 4-week courses) may be given in a 12-month period. For duodenal ulceration where *H. pylori* infection is present, ranitidine bismuth citrate has been given as part of a 7-day triple therapy regimen, typically combined with any two of clarithromycin 500 mg twice daily, amoxicillin 1 g twice daily, or metronidazole 400 mg twice daily. Alternatively, a 14-day dual therapy regimen of ranitidine bismuth citrate combined with clarithromycin 500 mg two or three times daily has been used. In both regimens ranitidine bismuth citrate alone may be continued to a total of 28 days.

### References.

- Bardhan KD, *et al.* GR122311X (ranitidine bismuth citrate), a new drug for the treatment of duodenal ulcer. *Aliment Pharmacol Ther* 1995; **9**: 497–506.
- Peterson WL, *et al.* Ranitidine bismuth citrate plus clarithromycin is effective for healing duodenal ulcers, eradicating *H. pylori* and reducing ulcer recurrence. *Aliment Pharmacol Ther* 1996; **10**: 241–61.

- Anonymous. Pylorid, *H. pylori* and peptic ulcer. *Drug Ther Bull* 1996; **34**: 69–70.

- van der Wouden EJ, *et al.* One-week triple therapy with ranitidine bismuth citrate, clarithromycin and metronidazole versus two-week dual therapy with ranitidine bismuth citrate and clarithromycin for *Helicobacter pylori* infection: a randomized, clinical trial. *Am J Gastroenterol* 1998; **93**: 1228–31.

### Preparations

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

**Arg.:** Pylorid; **Austria:** Helirad; Pyloridin; **Belg.:** Pylorid; **Braz.:** Pylorid; **Cz.:** Eradipak; **Denm.:** Pylorid; **Fin.:** Pylorid; **Gr.:** Pylorid; **Hong Kong:** Pylorid; **Hung.:** Pylorid; **Ir.:** Pylorid; **Ital.:** Elcodil; **Pylorid. Mex.:** Azanplus; **Neth.:** Pylorid; **Norw.:** Pylorid; **Port.:** Pylorid; **Spain:** Pylorid; **Switz.:** Pylorid; **Thai.:** Pylorid; **Turk.:** Pylorid; **UK:** Pylorid; **Venez.:** Pylorid.

**Multi-ingredient:** Austral.; Pylorid-KA.

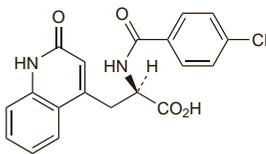
### Rebamipide (rINN)

Rebamipid; Rébamipid; Rebamipidum. (±)-α-(p-Chlorobenzamido)-1,2-dihydro-2-oxo-4-quinolinepropionic acid.

Ревамипид

$C_{19}H_{15}ClN_2O_4 = 370.8$ .

CAS — 90098-04-7; 111911-87-6.



and enantiomer

### Profile

Rebamipide is stated to possess cytoprotective properties and is used in the treatment of peptic ulcer disease (p.1702) and gastritis in usual oral doses of 100 mg three times daily. It has also been used rectally for the treatment of intestinal inflammation. Rebamipide eye drops are under investigation in the treatment of dry eye.

### References.

- Makiyama K, *et al.* Efficacy of rebamipide enemas in active distal ulcerative colitis and proctitis: a prospective study report. *Dig Dis Sci* 2005; **50**: 2323–9.
- Miyata M, *et al.* Successful treatment of severe pouchitis with rebamipide refractory to antibiotics and corticosteroids: a case report. *World J Gastroenterol* 2006; **12**: 656–8.
- Miwa H, *et al.* Effect of a gastro-protective agent, rebamipide, on symptom improvement in patients with functional dyspepsia: a double-blind placebo-controlled study in Japan. *J Gastroenterol Hepatol* 2006; **21**: 1826–31.

### Preparations

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

**Indon.:** Mucosta; **Jpn:** Mucosta; **Philipp.:** Mucosta; **Thai.:** Mucosta.

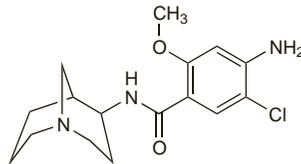
### Renzapride (BAN, rINN)

ATL-1251; BRL-24924A; Renzaprida; Renzapridum. (±)-endo-4-Amino-N-(1-azabicyclo[3.3.1]non-4-yl)-5-chloro-o-anisamide.

Рензаприд

$C_{16}H_{22}ClN_3O_2 = 323.8$ .

CAS — 88721-77-1; 112727-80-7.



### Profile

Renzapride is a substituted benzamide with prokinetic actions on gastrointestinal motility. It also has 5-HT<sub>4</sub> agonist and 5-HT<sub>3</sub> antagonist activity. It is under investigation for the management of gastrointestinal disorders including irritable bowel syndrome.

### References.

- Tack J, *et al.* Pilot study of the efficacy of renzapride on gastrointestinal motility and symptoms in patients with constipation-predominant irritable bowel syndrome. *Aliment Pharmacol Ther* 2006; **23**: 1655–65.
- George AM, *et al.* Clinical trial: renzapride therapy for constipation-predominant irritable bowel syndrome—multicentre, randomized, placebo-controlled, double-blind study in primary healthcare setting. *Aliment Pharmacol Ther* 2008; **27**: 830–7.

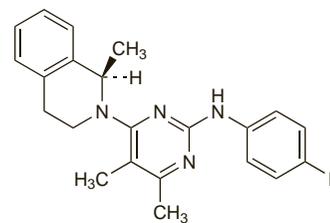
### Revaprazan (rINN)

Révaprazan; Revaprazán; Revaprazanum. N-(4-Fluorophenyl)-4,5-dimethyl-6-[(1R)-1-methyl-3,4-dihydroisoquinolin-2(1H)-yl]pyrimidin-2-amine.

Ревапразан

$C_{22}H_{23}FN_4 = 362.4$ .

CAS — 199463-33-7.



### Revaprazan Hydrochloride (USAN, rINNM)

Hidrocloruro de revaprazán; Révaprazan. Chlorhydrate de; Revaprazani Hydrochloridum; YH-1238; YH-1885. N-(4-Fluorophenyl)-5,6-dimethyl-4-[(1R)-1-methyl-3,4-dihydroisoquinolin-2(1H)-yl]pyrimidin-2-amine hydrochloride.

Ревапразана Гидрохлорид

$C_{22}H_{23}FN_4 \cdot HCl = 398.9$ .

CAS — 178307-42-1.

### Profile

Revaprazan is a proton pump inhibitor that is under investigation for the management of gastric and duodenal ulceration, functional dyspepsia, and gastro-oesophageal reflux disease.

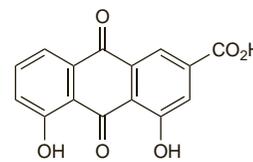
### References.

- Sorbera LA, *et al.* Revaprazan hydrochloride. *Drugs Of The Future* 2004; **29**: 455.
- Yu K-S, *et al.* Pharmacokinetic and pharmacodynamic evaluation of a novel proton pump inhibitor, YH1885, in healthy volunteers. *J Clin Pharmacol* 2004; **44**: 73–82.

### Rhubarb

Chinese Rhubarb; Korzeń rzewienia; Rabarbaro; Rabarbaru; šaknys; Rabarberrot; Raparperinjum; Ravent; Rebarbara-gyökértörzs; Revenjový kořen; Rhabarber; Rhei radix; Rhei Rhizoma; Rheum; Rhubarb Rhizome; Rhubarbe; Ruibarbo.

Ревень Аптечный



(rhein)

**Description.** Indian rhubarb (Himalayan rhubarb) consists of the dried rhizome and roots of *Rheum emodi*, *R. webbianum*, or some other related species of *Rheum*.

Rhapontic rhubarb (Chinese rhapontica) consists of the dried rhizomes of *R. rhaponticum*. It may occur as an adulterant of rhubarb, and pharmacopoeias specify a test to confirm its absence. Garden rhubarb, of which the leaf-stalks are used as food, is derived from *R. rhaponticum*.

**Pharmacopoeias.** In *Chin.*, *Eur.* (see p.vii), and *Jpn. Chin.* and *Jpn* also permit *Rheum tanguticum*, and *Jpn* also permits *R. coreanum*.

**Ph. Eur. 6.2** (Rhubarb). The whole or cut, dried underground parts of *Rheum palmatum* or of *R. officinale* or of hybrids of these two species or of a mixture. The underground parts are often divided; the stem and most of the bark with the rootlets are removed. It contains not less than 2.2% of hydroxyanthracene derivatives, expressed as rhein ( $C_{15}H_8O_6 = 284.2$ ), calculated with reference to the dried drug. Protect from light.

### Adverse Effects and Precautions

As for Senna, p.1769.

### Uses and Administration

Rhubarb is an anthraquinone stimulant laxative used similarly to senna (p.1770). It also exerts an astringent action due to the presence of gallic acid derivatives and tannins.

**Homeopathy.** Rhubarb has been used in homeopathic medicines under the following names: Rheum; Rhei radix; Rheum palmatum.

## Preparations

**BP 2008:** Compound Rhubarb Tincture.

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

**Cz.:** Bukosan†; **Ger.:** Phytoestrol N; **Pol.:** Laxitab; Radirex; Rzewex.

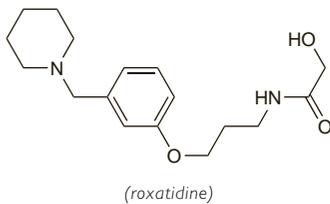
**Multi-ingredient:** **Arg.:** Calculina†; LX-30; Oralsone Topic; Parodium; Pyralvex; **Austral.:** Betaine Digestive Aid; Neo-Cleanse; Pyralvex†; **Austria:** Abufhrtee†; Eucarbon; Eucarbon Herbal; Novocholin; Pyralvex; Sabatiff; Silberne; **Belg.:** Pyralvex; **Braz.:** Bilifelt†; Bisuisant†; Boldopeptant†; Camonila; Eparema; Regulator Xavier N-2†; **Canada:** Extra Strong Formula 12†; Herbal Laxative; Herbalax†; Herbolax; **Cz.:** Abdomilon†; Cynarosan†; Dr Theiss Rheuma Creme†; Dr Theiss Schweden Krauter; Dr Theiss Schwedenbitter; Pyralvex; Species Chologogae Planta; Zlucnikovaja Cajova Smes; **Fr.:** Carres Parapsyllium; Depuratum; Parodium; Pyralvex; Resource Rhubagil; **Ger.:** Pyralvex; **Gr.:** Pyralvex; **Hong Kong:** Hepatofalk; Pyralvex; **Hung.:** Bolus Laxans; **Indon.:** Pyralvex; **Irl.:** Pyralvex; **Israel:** Davilla; Encypalmed; Eucarbon; Novicarbon; **Ital.:** Amaro Medicinale; Caramelle alle Erbe Digestive; Colax; Critichol; Digelax†; Dis-Cinil Complex; Eparema; Eparema-Levul; Eucarbon; Eupato; Frenchs Maldifassi†; Lactolas; Lassatina†; Las-sativi Vetegali; Magsibille†; Mepalax; Neoform†; Puntualax†; Pyralvex; Schias-Amaro Medicinale†; Stimolfit; **Malaysia:** Eucarbon†; **Neth.:** Pyralvex; **Philipp.:** Boie Carminative (Carminasen); Pyralvex; **Pol.:** Betasol; Digest-Tonic; Laxantol; Rhexal; **Port.:** Pyralvex; **Rus.:** Perodium (Пародиум); **S.Afr.:** Helmontskruie; Lewenssensens; Moutlons Herbal Extract; Pyralvex; Rubilax†; Wonderkroonessens; **Singapore:** Pyralvex; **Spain:** Crisilaxo; Lax-ante Bescansa Aloico; Menabil Complex†; Pyralvex; Solucion Schoum; **Switz.:** Padma-Lax; Padmed Laxan; Pyralvex; Schweden-Mixtur H nouvelle formulation; **Thai.:** Pyralvex; **Turk.:** Eucarbon; Karboseptin; Piraladyne; Pyralvex; **UK:** Acidosis Digestive; Fam-Lax; Fam-Lax Senna; HRI Golden Seal Digestive; Indian Brande; Jacksons Herbal Laxative; Pegina; Pyralvex; Rhuaka; Stomach Mixture; Wind & Dyspepsia Relief; **USA:** Black-Draught†; **Venez.:** Cynasool; Natrossil; Oraflim†; Pinvex; Pyralvex†; Rheu-Tarx 1.

## Roxatidine Acetate Hydrochloride

(BANM, USAN, rINNIM)

Hydrocloruro de acetato de roxatidina; Hoe-760; Hoe-062 (roxatidine); Pifatinide Hydrochloride; Roxatidine, Acétate Chlorhydrique de; Roxatidini Acetati Hydrochloridum; TZU-0460. N-{3-[( $\alpha$ -Piperidino-m-tolyl)oxy]propyl}glycolamide acetate monohydrochloride.

Роксатидина Ацетат Гидрохлорид  
 $C_{17}H_{26}N_2O_3 \cdot C_2H_3O_2 \cdot HCl = 384.9$ .  
 CAS — 78273-80-0 (roxatidine); 97900-88-4 (roxatidine hydrochloride); 78628-28-1 (roxatidine acetate); 93793-83-0 (roxatidine acetate hydrochloride).  
 ATC — A02BA06.  
 ATC Vet — QA02BA06.



### Pharmacopoeias. In *Jpn*.

**Stability.** The stability of roxatidine acetate hydrochloride in parenteral nutrition solutions was influenced by storage temperature and amino acid content and composition.<sup>1</sup>

1. Oh J, *et al.* Stability of roxatidine acetate in parenteral nutrient solutions containing different amino acid formulations. *Am J Health-Syst Pharm* 2005; **62**: 289–91.

### Adverse Effects and Precautions

As for Cimetidine, p.1716.

### Interactions

Unlike cimetidine (p.1718) roxatidine does not appear to affect cytochrome P450, and therefore is considered to have little effect on the metabolism of other drugs. However, like other H<sub>2</sub>-antagonists its effects on gastric pH may alter the absorption of some other drugs.

### Pharmacokinetics

Roxatidine acetate hydrochloride is rapidly and almost completely absorbed from the gastrointestinal tract with peak concentrations in plasma occurring about 1 to 3 hours after doses by mouth. It is rapidly hydrolysed to the active desacetyl metabolite, roxatidine, by esterases in the liver, small intestine, and serum. Over 90% of a dose is excreted in the urine as roxatidine and other metabolites. The elimination half-life of roxatidine is about 6 hours and is prolonged in renal impairment.

Small amounts of roxatidine have been reported to be distributed into breast milk.

### Uses and Administration

Roxatidine acetate hydrochloride is an H<sub>2</sub>-antagonist with actions and uses similar to those of cimetidine (p.1719).

In the management of peptic ulcer disease the oral dose is 150 mg at bedtime or 75 mg twice daily for 4 to 6 weeks. Where appropriate a maintenance dose of 75 mg at bedtime may be given to prevent the recurrence of ulcers. In gastro-oesophageal reflux disease the recommended dose is 150 mg at bedtime or 75 mg twice daily for 6 to 8 weeks. Gastritis has been managed with 75 mg once daily in the evening, and a dose of 75 mg twice daily has been used for Zollinger-Ellison syndrome.

The symbol † denotes a preparation no longer actively marketed

When used as a pre-anaesthetic medication, an oral dose of roxatidine acetate hydrochloride 75 mg is given in the evening on the day before surgery and repeated 2 hours before the induction of anaesthesia; alternatively a single dose of 150 mg may be given the night before surgery.

Roxatidine acetate hydrochloride may also be given intravenously for the treatment of upper gastrointestinal tract haemorrhage in a dose of 75 mg twice daily by slow intravenous injection or by intravenous infusion.

For dosage in renal impairment, see below.

### Reviews.

1. Murdoch D. Roxatidine acetate: a review of its pharmacodynamic and pharmacokinetic properties, and its therapeutic potential in peptic ulcer disease and related disorders. *Drugs* 1991; **42**: 240–60.

**Administration in renal impairment.** The dosage of roxatidine acetate hydrochloride should be reduced in patients with renal impairment. Suggested oral doses, based on creatinine clearance (CC), for patients on acute therapy are:

- CC 20 to 50 mL/minute: 75 mg at bedtime
- CC less than 20 mL/minute: 75 mg every 2 days

However, results in 6 patients with chronic renal failure and CC less than 20 mL/minute indicated that giving the recommended dose of roxatidine acetate hydrochloride, 75 mg every other day, was inadequate to maintain gastric pH above 4 for more than 6 hours. Subsequent study in 8 patients showed that a dose of 75 mg daily was well tolerated and effective.<sup>1</sup>

1. Gladziwa U, *et al.* Pharmacokinetics and pharmacodynamics of roxatidine in patients with renal insufficiency. *Br J Clin Pharmacol* 1995; **39**: 161–7.

## Preparations

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

**Ger.:** Roxit†; **Gr.:** Roxane†; **India:** Rotane; **Ital.:** Gastralgin; Neo H2; Roxit; **Jpn:** Altat; **Neth.:** Roxit†; **S.Afr.:** Roxit†; **Spain:** Roxiwas†; Zaros.

## Senna

Alexandriai szenna termés (senna pods, Alexandrian); Listek sennesu (senna leaf); Plod kasie ostrolisté (senna pods, Alexandrian); Plod kasie úzkolité (senna pods, Tinnevely); Sen; Séné de Khar-toum ou d'Alexandrie, fruit de (senna pods, Alexandrian); Séné de l'Inde ou de Tinnevely, fruit de (senna pods, Tinnevely); Séné, feuille de (senna leaf); Sennabalja, alexandriinsk (senna pods, Alexandrian); Sennabalja, Tinnevely- (senna pods, Tinnevely); Sennae folium (senna leaf); Sennae fructus acutifoliae (senna pods, Alexandrian); Sennae fructus angustifoliae (senna pods, Tinnevely); Sennanpalko, Aleksandrian (senna pods, Alexandrian); Sennanpalko, Tinnevelly (senna pods, Tinnevely); Sen-nový list (senna leaf); Senų lapai (senna leaf); Senų vaisiai (senna pods, Alexandrian); Siauralapių senų vaisiai (senna pods, Tinnevely); Sinameki; Szennalevel (senna leaf); Tinevely szenna termés (senna pods, Tinnevely).

Кассия Остролистная (Alexandrian senna); Сenna Остролистная (Alexandrian senna); Александрийский Лист (Alexandrian senna leaf)

CAS — 8013-11-4.

ATC — A06AB06.

ATC Vet — QA06AB06.

**Description.** Senna obtained commercially from *Cassia senna* (*C. acutifolia*) (Leguminosae) is known as Alexandrian senna or Khartoum senna and that from *Cassia angustifolia* (Leguminosae) as Tinnevely senna.

**Pharmacopoeias.** Senna fruit, from Alexandrian and Tinnevely senna is included in *Eur.* (see p.vii), *Int.*, and *US*. Senna leaf, from Alexandrian or Tinnevely senna or both, is included in *Chin.*, *Eur.*, *Int.*, *Jpn.*, and *US*.

**Ph. Eur. 6.2** (Senna Pods, Alexandrian; Sennae Fructus Acutifoliae; Alexandrian Senna Fruit BP 2008). The dried fruit of *Cassia senna* (*Cassia acutifolia*) containing not less than 3.4% of hydroxyanthracene glycosides, calculated as sennoside B (C<sub>22</sub>H<sub>38</sub>O<sub>20</sub> = 862.7) with reference to the dried drug. Protect from light and moisture.

**Ph. Eur. 6.2** (Senna Pods, Tinnevely; Sennae Fructus Angustifoliae; Tinnevely Senna Fruit BP 2008). The dried fruit of *Cassia angustifolia* containing not less than 2.2% of hydroxyanthracene glycosides, calculated as sennoside B (C<sub>22</sub>H<sub>38</sub>O<sub>20</sub> = 862.7) with reference to the dried drug. Protect from light and moisture.

**Ph. Eur. 6.2** (Senna Leaf; Sennae Folium). The dried leaflets of *Cassia senna* (= *Cassia acutifolia*), known as Alexandrian or Khartoum senna, or *Cassia angustifolia*, known as Tinnevely senna, or a mixture of the two species. It contains not less than 2.5% of hydroxyanthracene glycosides, calculated as sennoside B (C<sub>22</sub>H<sub>38</sub>O<sub>20</sub> = 862.7) with reference to the dried drug. Protect from light and moisture.

**USP 31** (Senna Leaf). The dried leaflet of *Cassia acutifolia*, known in commerce as Alexandria senna, or *Cassia angustifolia*, known in commerce as Tinnevely senna (Leguminosae), protect from moisture and from light.

**USP 31** (Senna Pods). The dried ripe fruit of *Cassia acutifolia* (Alexandrian senna) or *Cassia angustifolia* (Tinnevely senna)

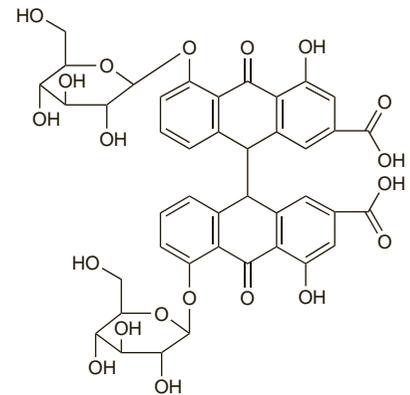
containing not less than 3.4% or 2.2% respectively of anthraquinone glycosides, calculated as sennosides, on the dried basis. Protect from moisture and from light.

## Sennosides

Сеннозиды.

Сеннозиды.

CAS — 81-27-6 (sennoside A); 128-57-4 (sennoside B); 52730-36-6 (sennoside A, calcium salt); 52730-37-7 (sennoside B, calcium salt).



(sennoside A)

### Pharmacopoeias. In *US*.

**USP 31** (Sennosides). A partially purified natural complex of anthraquinone glycosides found in senna, isolated from *Cassia acutifolia* or *Cassia angustifolia* as calcium salts. It is a brownish powder. Soluble 1 in 35 of water, 1 in 2100 of alcohol, 1 in 3700 of chloroform, and 1 in 6100 of ether. A 10% solution in water has a pH of 6.3 to 7.3. Store at a temperature of 20° to 25°. Protect from moisture and from light.

### Adverse Effects

Senna may cause mild abdominal discomfort such as colic or cramps. Prolonged use or overdosage can result in diarrhoea with excessive loss of water and electrolytes, particularly potassium; there is also the possibility of developing an atonic non-functioning colon. Anthraquinone derivatives may colour the urine yellowish-brown at acid pH, and red at alkaline pH. Reversible melanosis coli has been reported following chronic use.

**Abuse.** Prolonged use or abuse of senna laxatives has been associated with finger clubbing,<sup>1-5</sup> hypokalaemia<sup>3</sup> and tetany,<sup>1</sup> hypertrophic osteoarthropathy,<sup>4,5</sup> intermittent urinary excretion of aspartylglucosamine,<sup>2</sup> hypogammaglobulinaemia,<sup>3</sup> reversible cachexia,<sup>3</sup> and hepatitis<sup>6</sup> or hepatic failure.<sup>7</sup> In one case, nephrocalcinosis was attributed to hypercalcaemia caused by excessive ingestion of calcium sennosides.<sup>3</sup>

1. Prior J, White I. Tetany and clubbing in patient who ingested large quantities of senna. *Lancet* 1978; **ii**: 947.
2. Malmquist J, *et al.* Finger clubbing and aspartylglucosamine excretion in a laxative-abusing patient. *Postgrad Med J* 1980; **56**: 862–4.
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**Effects on the liver.** Hepatitis has been reported in a patient drinking herbal tea containing senna. The patient was found to be a poor metaboliser for hepatic detoxification reactions; the authors cautioned against even small doses of herbal preparations in such patients.<sup>1</sup>

Hepatitis and hepatic failure have also been reported after abuse of senna laxatives, see Abuse, above.

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**Hypersensitivity.** Hypersensitivity reactions manifesting as asthma and rhinoconjunctivitis have been reported in those manufacturing<sup>1</sup> or dispensing<sup>2</sup> senna products. However, a study of 125 workers involved in the manufacture of laxatives found only 4 cases of occupational asthma, although sensitisation to senna or ispaghula dust was present in 18 and 9 of the workers