

causes an increase in the secretion of pancreatic enzymes and stimulates gallbladder contraction.

Pancreozymin has been used, usually with secretin, as a test for exocrine pancreatic function and in the diagnosis of biliary-tract disorders; these tests generally involved duodenal intubation of the patient and examination of duodenal aspirate. Pancreozymin has also been used as an adjunct to cholecystography. Vasomotor reactions, abdominal discomfort, and hypersensitivity have been reported.

Biliary-tract disorders. It was concluded that cholecystokinin provocation testing was ineffective in predicting which patients with acalculous biliary pain would receive symptomatic relief from cholecystectomy in a study involving 58 patients.¹

1. Smythe A, et al. A reequiem for the cholecystokinin provocation test? *Gut* 1998; **43**: 571-4.

Pangamic Acid

Pangámico, ácido.

Profile

The name pangamic acid has been applied variously to gluconic acid 6-[bis(diisopropylamino)acetate] ($C_{20}H_{40}N_2O_8 = 436.5$), gluconic acid, 6-ester with N,N-dimethylglycine ($C_{10}H_{19}NO_8 = 281.3$), gluconic acid, 6-ester with N,N-diisopropylglycine ($C_{14}H_{27}NO_8 = 337.4$), and a substance or mixture of substances isolated from apricot kernels and rice bran. It has also been known as 'vitamin B₁₅' although there is no evidence that pangamic acid is a vitamin. Preparations containing the vasoactive substance di-isopropylammonium dichloroacetate (p.1265) have sometimes been described as pangamic acid or 'vitamin B₁₅'. There is much uncertainty about the identity of products sold in health food stores as 'vitamin B₁₅', pangamic acid, or sodium or calcium pangamate and different brands have been reported to have completely different compositions.

Claims for the activity of pangamic acid as a promoter of tissue oxygenation and its alleged value in numerous disorders have not been substantiated.

Preparations

Proprietary Preparations (details are given in Part 3)

Arg.: B15†; **Ger.:** Oyo†; **Port.:** Desfatigan; Pulsor.

Multi-ingredient. Mex.: B1-12-15; **Spain:** Policolinosil.

Panthenol (BAN, USAN, rINN)

Pantenol; Panthénol; *dl*-Panthenol; Panthenolum; (±)-Pantothényl Alcohol.

ПАНТЕНОЛ

$C_9H_{19}NO_4 = 205.3$.

CAS — 16485-10-2.

Pharmacopoeias. In *US*.

USP 31 (Panthenol). A racemic mixture of the dextrorotatory and laevorotatory isomers of panthenol. A white to creamy white, crystalline powder with a slight, characteristic odour. Freely soluble in water, in alcohol, and in propylene glycol; soluble in chloroform and in ether; slightly soluble in glycerol. Store in airtight containers.

Dexpanthenol (BAN, USAN, rINN)

Dekspantenoli; Dekspantenolis; Dexpanthenol; Dexpanthénol; Dexpanthenolum; Dextro-Pantothényl Alcohol; Pantothénol; Provitamin B₅. (R)-2,4-Dihydroxy-N-(3-hydroxypropyl)-3,3-dimethylbutyramide.

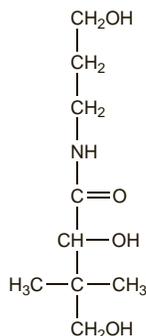
Декспантенол

$C_9H_{19}NO_4 = 205.3$.

CAS — 81-13-0.

ATC — A11HA30; D03AX03; S01XA12.

ATC Vet — QA11HA30; QD03AX03; QS01XA12.



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

Ph. Eur. 6.2 (Dexpanthenol). A colourless or slightly yellowish, hygroscopic, viscous liquid, or a white or almost white, crystalline powder. Very soluble in water; freely soluble in alcohol. A 5% solution in water has a pH not greater than 10.5. Store in airtight containers.

USP 31 (Dexpanthenol). A clear, viscous, somewhat hygroscopic liquid, having a slight characteristic odour. Some crystallisation may occur on standing. Freely soluble in water, in alcohol, in methyl alcohol, and in propylene glycol; soluble in chloroform and in ether; slightly soluble in glycerol. Store in airtight containers.

Adverse Effects and Precautions

There have been a few reports of allergic reactions possibly associated with dexpanthenol. Dexpanthenol is contra-indicated in haemophiliacs and in patients with ileus due to mechanical obstruction.

Uses and Administration

Dexpanthenol is the alcoholic analogue of D-pantothenic acid (p.1959). It has been given intramuscularly in doses of 250 to 500 mg to prevent or control gastrointestinal atony but its value has not been established. It has also been given by slow intravenous infusion.

Dexpanthenol and the racemate panthenol have been used topically in strengths of 2 or 5% for the treatment of various minor skin disorders. They are also included in some vitamin preparations.

References

- Kehl W, Sonnemann U. Verbesserung der Wundheilung nach Nasenoperationen durch kombinierte Anwendung von Xylometazolin und Dexpanthenol. *Laryngorhinotologie* 2000; **79**: 151-4.
- Gehring W, Gloor M. Effect of topically applied dexpanthenol on epidermal barrier function and stratum corneum hydration: results of a human in vivo study. *Arzneimittelforschung* 2000; **50**: 659-63.
- Ebner F, et al. Topical use of dexpanthenol in skin disorders. *Am J Clin Dermatol* 2002; **3**: 427-33.
- Biro K, et al. Efficacy of dexpanthenol in skin protection against irritation: a double-blind, placebo-controlled study. *Contact Dermatitis* 2003; **49**: 80-4.
- Rockmann H, et al. Anaphylaxis after dexpanthenol exposure by multivitamin tablets. *Clin Exp Dermatol* 2005; **30**: 714-16.

Preparations

USP 31: Dexpanthenol Preparation.

Proprietary Preparations (details are given in Part 3)

Arg.: Nutraisid†; Recugel; **Austria:** Bepanthen; Corneregel; Panthothen; **Braz.:** Bepantol; Uvless; **Chile:** Bepantol; **Cz.:** Bepanthen; Panthenol; **Fin.:** Bepanthen; **Fr.:** Bepanthen; Bepanthen; Pan-Sun; **Ger.:** Bepanthen; Corneregel; Marolderm; NasenSpray Panthenol; Nasic-cur; Otriven mit Dexpanthenol; Pan Rhinol; Pan-Ophtal; Panthenol; Panthogenat†; Pelina; Rhinodir†; Siozwo Sana; Ucee D†; Urupant†; Wund- und Heilsalbe N†; Wund- und Heilcreme N; **Gr.:** Corneregel; **Hung.:** Bepanthen; Corneregel; Panthenol; **Indon.:** Bepanthen; Pasquam; **Israel:** Bepanthen; Neocutan; **Ital.:** Bepanthen; **Mex.:** Bepanthen; Corneregel; **NZ:** Bepanthen; **Philipp.:** Corneregel; **Pol.:** Bepanthen; Corneregel; Dermopanten†; **Port.:** Bepanthen; **Rus.:** Bepanthen (Бепантен); Corneregel (Корнерегель); Panthenol (Пантенол); Panthoderm (Пантодерм); **S.Afr.:** Bepanthen; Bepantol†; **Singapore:** Bepanthen; **Spain:** Bepanthen; **Switz.:** Bepanthen; **Turk.:** Bepanthen; Bepantol; Pantenol; **UAE:** Dexipan; **UK:** Bepanthen; **USA:** Ilopan; Panthoderin; **Venez.:** Beducen†.

Multi-ingredient. Arg.: Dermocridin; Dermivien†; Heduline; Hydratone†; Locherip Liposomas Vitaminado; Mucobase; Nutraisid†; Sebulex; Talowin; **Austral.:** Macro Natural Vitamin E Cream; Sebinrise; Superfade; **Austria:** Beneuran Vit B-Komplex†; Bepanthen; Bepanthen Plus; Colda; Coldistan; Dolobene; Keratosis; Keratosis forte; Oleovit; Panto Likvid; Siccaprotect; Sigman-Haustropfen; Venobene; **Belg.:** Algi-Cool; Pungel NF; **Braz.:** Capel; Dolobene; Nandrin; Narilux; Nazobio†; Varizol†; **Canad.:** Selsun with Provitamin B †; **Chile:** Acnoxyl Shampoo Cabello Graso†; Cicapost; Eucerin Piel Grasa; Panthoderin-A; Pomada Vitaminica; Queratopit; Ureadin Rx DB; Ureadin Rx RD; Vitis Encias Colutorio; Vitis Encias Pasta; **Cz.:** Bepanthen Plus; Brand- und Wundgel†; Dolobene; Lipovitan†; Panlid; Siccaprotect; **Fin.:** Oftan A-Pant; Pantyson; Vwicar; Vwicarba; Wicnevit; **Fr.:** Alkagin; Mela'aura; Parogencyl gencives fragilisees†; Tonimer; **Ger.:** Bepanthen Antiseptische; Brand- und Wund-Gel Eü Rho†; Dispatenol; Dolobene; Essaven Tri-Complex†; GeloBacin; Hermalind†; Hewekzem novo N; Hydro Cordes; Hylo-Care; Lipo Cordes; Lipovitan†; Mar Plus†; Nasic; PC 30 V; Remederm; Saseem; Siccaprotect; **Gr.:** Aquasol A†; Novaquasol-A; **Hong Kong:** Dolobene; Mar Plus; Pregnacare; Sebinrise; **Hung.:** Alkasebor; Aurobin; Bepanthen Plus; Dolobene; Phlogosam; Vip-sogal†; **India:** Optineuron; Sioneuron; Vitneurin; **Indon.:** Romliar; Skintex; **Israel:** Bepanthen Plus; Kamil Blue; Neocutan Silver; Panthisone; Pedisol; **Ital.:** Alfa Acid; Emazian B12†; Emoantitossina†; Gastrotuss; Keto Z; Lenirose†; Parogencyl; Rinopanteina; **Malaysia:** Mar Plus; **Mex.:** Bexident Pediatrics†; Cetopic; Emolin Neo; Nutrem; Sallix; **Neth.:** Prunacolon; Prunasin; **NZ:** Sebinrise; **Philipp.:** pHCare; Remederm; Sebo Fluid; **Pol.:** Acodin; Alantán-Plus; Bepanthen Plus; Dolobene; **Port.:** Bepanthen; Bepanthen Plus; Bexident; Carmitol; Cicapost; Efluvium Anti-seborreico; Lactigriet; Nutraisid; Ureadin 10 Plus; **Rus.:** Aurobin (Ауробин); Bepanthen Plus (Бепантен Плюс); Dolobene (Долобене); Hepatrombin (Гепатромбин); **Switz.:** Alphrasia; Bepanthen Plus; Carbamide + VAS; Carbamide Creme; Cortimycine; Demostan N; Dermalin-d; Dolobene; Galamil; Gorgonium; Hepathrombin†; Leniderm†; Lyman; Nose Fresh au D-panthenol; Osa Gel de dentition; Parapic; Pelsano; Pigmanorm; Remexal; Siccax; Siccaprotect; Sportium; Sportusal; Sportusal Spray sine heparino; Siclix; Tendro; Turexan Capilla; Turexan Lotion; Unathene; Unatol; Venucreme; Venugel; Wulnasin; **Thai.:** Mar Plus; Romliar; **Turk.:** Bepanthen Plus; Pantenol Plus; Siccaprotect; Stilex; **UK:** Ollatum Scalp Intensive; Uvistat; Eye Drops; Vipsogal; **Venez.:** Cepin; Diadex Pantonic; Vitenof†.

Papain

Papaína; Papaina; Papayotin.

CAS — 9001-73-4.

Pharmacopoeias. In *US*.

USP 31 (Papain). A purified proteolytic substance derived from *Carica papaya* (Caricaceae). It contains not less than 6000 USP units per mg. A white to light tan, amorphous powder. Soluble in water, the solution being colourless to light yellow and more or less opalescent; practically insoluble in alcohol, in chloroform, and in ether. pH of a 2% solution in water is between 4.8 and 6.2. Store in airtight containers at a temperature of 8° to 15°. Protect from light.

Units

USP 31 defines the USP unit of papain activity as the activity that releases the equivalent of 1 microgram of tyrosine from a specified casein substrate under the conditions of the assay, using the enzyme concentration that liberates 40 micrograms of tyrosine per mL of test solution.

One FIP unit of papain is defined as the enzyme activity which under specified conditions hydrolyses 1 micromol of *N*-benzoyl-L-arginine ethyl ester per minute.

The Warner-Chilcott unit, based on the quantity of enzyme required to clot 2.64 microlitre of milk substrate in 2 minutes at 40°, under specified conditions, has also been used for papain.

Adverse Effects

Hypersensitivity reactions have occurred.

Effects on the eyes. Ocular and periorbital angioedema occurring within 4 hours of use of a contact lens cleansing solution containing papain has been reported.¹

1. Bernstein DI, et al. Local ocular anaphylaxis to papain enzyme contained in a contact lens cleansing solution. *J Allergy Clin Immunol* 1984; **74**: 258-60.

Oesophageal perforation. Extensive destruction of the oesophageal wall, with perforation, resulted from the use of a papain suspension given to treat an obstruction caused by impacted meat.¹ The patient had been given 1.2 g of papain over a 12-hour period. Ten days after a thoracotomy, the descending thoracic aorta ruptured, and she died from haemorrhage.

1. Holsinger JW, et al. Esophageal perforation following meat impaction and papain ingestion. *JAMA* 1968; **204**: 734-5.

Uses and Administration

Papain consists chiefly of a mixture of papain and chymopapain, proteolytic enzymes that hydrolyse polypeptides, amides, and esters, especially at bonds involving basic amino acids, or leucine or glycine, yielding peptides of lower molecular weight. It is used with urea as a topical debriding agent. It is also used for the removal of protein deposits from the surface of soft contact lenses (p.1622).

Preparations of papain, alone or combined with antibacterial agents and/or other substances, have been taken orally for their supposed anti-inflammatory properties, and it has also been used as an ingredient of various mixtures claimed to aid digestion.

Papain is widely used as a meat tenderiser and in the clarification of beverages.

Malignant neoplasms. Papain has been included in proteolytic enzyme preparations used in oncology to reduce the adverse effects of chemotherapy and radiotherapy. Although the number of clinical studies on which to judge efficacy is limited, a review¹ of such studies suggested that systemic enzyme therapy might be beneficial. Clinical studies have used a preparation containing papain, trypsin, and chymotrypsin in a weight ratio of 5:2:2, and the beneficial effect seems to be based on its anti-inflammatory potential.

1. Leipner J, Saller R. Systemic enzyme therapy in oncology: effect and mode of action. *Drugs* 2000; **59**: 769-80.

Preparations

USP 31: Papain Tablets for Topical Solution.

Proprietary Preparations (details are given in Part 3)

Arg.: Tromasin†; **Austral.:** Hydrocare Enzymatic Protein Remover†; Stop Itch; **Canad.:** Solarcaine Stop Itch; Stop Itch†; **Chile:** Papenzima; **Ger.:** Vermizym†; **Hong Kong:** Eurolase; **Malaysia:** Beazyme; **NZ:** Stop Itch; **USA:** Allergan Enzymatic; ProFree.

Multi-ingredient. Arg.: Butimerin; Docechol; Homocisteon Compuesto; Opoenterol†; Pancreon Total; Solustres; Tromasin con Aspirina†; Vulnoflin Compuesto†; **Austral.:** Betaine Digestive Aid; Bio-Disc; Bioglan Discone†; Digestaid; Digestive Aid; Enzyme; Prost-1†; Prozymet†; **Austria:** Rennie Digestif; Wobe-Mugos; Wobenzym; **Belg.:** Digestom; **Braz.:** Filogaster†; **Cz.:** Digestif Rennie; Wobe-Mugos†; Wobenzym; **Ger.:** Arbutz; Enzym-Wied†; Mulsal N†; Wobe-Mugos Et†; Wobenzym N; **Gr.:** Lysopaine; Sopain-Plus; **Hong Kong:** Digezym; **Hung.:** Digestif Rennie; **India:** Bestozyme; Catazyne-P; Dipep; Molzyme†; Neopeptine; Nutrozyme; Papytazyme; Unienzyme; **Indon.:** Papaven; **Ital.:** Digestopan†; **Malaysia:** Pepsif; **Mex.:** Dermobion†; Digenor; **Neth.:** Wobe-Mugos; Wobenzym; **Pol.:** Carident; **Port.:** Caroid†; **Rus.:** Pepsif (Пепсиф); Wobe-Mugos E (Воба-Мугос Е); Wobenzym (Вобэнзим); **Singapore:** Stop-Itch Plus; **Spain:** Digestomen Complex; Liziprina; **Switz.:** Lysopaine; **Thai.:** Papytazyme†; Pepsif; Pepsitase; Polyenzymel-†; **UK:** Enzyme Digest; Herbal Indigestion Naturals; Indigestion and Flatulence; **USA:** Accuzyme; AllanEnzyme; AllanfillEnzyme; Ethezyme; Gladase; Gladase-C; Kovia; Panafil; Panafil-White; Pap-Urea; Papaya Enzyme; Ziox; **Venez.:** Enzima de Lechoza†; Wobenzym N.