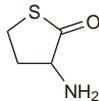


Homocysteine Thiolactone Hydrochloride

3-Aminodihydro-2(3H)-thiophenone hydrochloride.

C₄H₉ClNOS = 153.6.

CAS — 10593-85-8 (homocysteine thiolactone); 3622-59-1 (homocysteine thiolactone hydrochloride).



(homocysteine thiolactone)

Profile

Homocysteine thiolactone has been used in preparations for the treatment of liver disorders. Its hydrochloride salt has been used as a mucolytic. Homocysteine thiolactone is a metabolite of homocysteine and has been implicated in the pathogenesis of some cardiovascular diseases (see p.1941).

◇ References.

- Chwatko G, Jakubowski H. Urinary excretion of homocysteine-thiolactone in humans. *Clin Chem* 2005; **51**: 408–15.
- Jakubowski H. The molecular basis of homocysteine thiolactone-mediated vascular disease. *Clin Chem Lab Med* 2007; **45**: 1704–16.

Preparations**Proprietary Preparations** (details are given in Part 3)**Multi-ingredient:** **Braz:** Filogaster†.**Horseradish**

Armoracia; Meerrettich; Rábano rusticano; Raifort.

Profile

Horseradish, the root of *Cochlearia armoracia* (*A Armoracia rusticana*; *Nasturtium armoracia*; *Radicula armoracia*) (Cruciferae), has diuretic and antiseptic properties and stimulates the digestion. It is used in gastrointestinal, respiratory-tract, and urinary-tract disorders, and has also been used externally.

Horseradish is widely used as a food flavouring and condiment.

Homoeopathy. Horseradish has been used in homoeopathic medicines under the following names: *Cochlearia armoracia*; *Coch. ar.*

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

Multi-ingredient: **Austral:** Garlic and Horseradish + C Complex; Garlic, Horseradish, A & C Capsules†; Procolid†; **Braz:** Infantost†; **Ger:** Angocin Anti-Infekt N†; **Malaysia:** Horseradish Plus†; **Switz:** Kermosan Elixir; Pectosan N†; Sanogenciver; **UK:** Mixed Vegetable Tablets.

Hyaluronic Acid (BAN)

Hialurónico, ácido. (1→3)-O-(2-Acetamido-2-deoxy-β-D-glucopyranosyl)-:(1→4)-O-β-D-glucopyranosiduronan.

CAS — 9004-61-9.

ATC — D03AX05; M09AX01; S01KA01.

ATC Vet — QD03AX05; QM09AX01; QS01KA01.

NOTE: The term Hyaluronan is used to cover both hyaluronic acid and sodium hyaluronate.

Sodium Hyaluronate (BANM)

Hialuronato sódico; Hyaluronate Sodium (USAN); Natrii hyaluronas; Natrio hialuronatas; Nátrium-hialuronát; Natriumhyaluronat; Natriumhyaluronat; Natrium-hyaluronát; Sodium, hyaluronate de; Sodium Hialuronat.

CAS — 9067-32-7.

ATC — D03AX05; M09AX01; S01KA01.

ATC Vet — QD03AX05; QM09AX01; QS01KA01.

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

Ph. Eur. 6.2 (Sodium Hyaluronate). The sodium salt of hyaluronic acid, a glycosaminoglycan consisting of D-glucuronic acid and N-acetyl-D-glucosamine disaccharide units. It is extracted from cocks' combs or obtained by fermentation from streptococci (Lancefield Groups A and C). A white or almost white, very hygroscopic powder or a fibrous aggregate. Sparingly soluble to soluble in water; practically insoluble in dehydrated alcohol and in acetone. A 0.5% solution in water has a pH of 5.0 to 8.5. Store in airtight containers. Protect from light and humidity.

Adverse Effects

There have been reports of a transient rise in intra-ocular pressure when sodium hyaluronate was given into the eye. When injected into the knee, pain and inflammation may occur at the injection site. There have also been occasional reports of hypersensitivity, including, rarely, anaphylaxis.

Effects on the eyes. Crystalline deposits on intra-ocular lenses have been reported in patients after use of a high viscosity sodium hyaluronate preparation during cataract surgery.¹

- Jensen MK, *et al.* Crystallization on intraocular lens surfaces associated with the use of Healon GV. *Arch Ophthalmol* 1994; **112**: 1037–42.

Effects on the skin. A cutaneous granulomatous reaction has been reported in a woman 5 weeks after treatment with synthetic hyaluronic acid for cosmetic use as a dermal filler.¹ All cutaneous lesions resolved spontaneously within 3 months without scarring.

- Ghislazoni M, *et al.* Cutaneous granulomatous reaction to injectable hyaluronic acid gel. *Br J Dermatol* 2006; **154**: 755–8.

Inflammatory reaction. Severe peritoneal inflammation has been reported¹ after use of a sodium hyaluronate-based bioresorbable membrane to prevent postoperative adhesion formation.

- Klingler PJ, *et al.* Sefrapim™-induced peritoneal inflammation: a previously unknown complication: report of a case. *Dis Colon Rectum* 1999; **42**: 1639–43.

Uses and Administration

Hyaluronic acid is widely distributed in body tissues and intracellular fluids, including the aqueous and vitreous humour, and synovial fluid; it is a component of the ground substance or tissue cement surrounding cells.

A viscous solution of sodium hyaluronate is used during surgical procedures on the eye, for example for cataract extraction. Introduction of the solution into the anterior or posterior chamber via a fine cannula or needle allows tissues to be separated during surgery and protects them from trauma. Sodium hyaluronate eye drops 0.1% are also used for the relief of dry eye and as a contact lens lubricant.

Sodium hyaluronate is given by intra-articular injection in the treatment of osteoarthritis of the knee. Doses vary according to the preparation used, but are of the order of 20 to 25 mg once weekly for 5 weeks or up to 30 mg once weekly for 3 or 4 weeks; it is generally recommended that the treatment course for any individual joint should not be repeated within 6 months. Sodium hyaluronate is also used during arthroscopic procedures to flush out irrigating solutions and act as a temporary substitute for synovial fluid.

Hyaluronic acid is applied topically to promote wound healing. Zinc hyaluronate has also been used. A film containing sodium hyaluronate and carmellose is used to prevent surgical adhesion. Sodium hyaluronate has also been used in the management of lesions of the oral mucosa.

Hyalans, which are polymers derived from hyaluronic acid, are used similarly for osteoarthritis and wound care.

Sodium hyaluronate instilled intravesically has been used as a temporary replacement of the glycosaminoglycan layer in the bladder for the symptomatic treatment of interstitial cystitis.

Topical formulations of diclofenac in hyaluronic acid (CT-1101, AT-2101) are used in the treatment of actinic keratoses (but distinguish from an oral formulation of isofagomine tartrate (p.2327) under investigation for use in Gaucher disease that also carries the code AT-2101).

Hyaluronic acid has been used as a dermal filler for the correction of moderate to severe facial wrinkles and folds (see Photageing, p.1581).

◇ Reviews.

- Goa KL, Benfield P. Hyaluronic acid: a review of its pharmacology and use as a surgical aid in ophthalmology, and its therapeutic potential in joint disease and wound healing. *Drugs* 1994; **47**: 536–66.
- Adams ME, *et al.* A risk-benefit assessment of injections of hyaluronan and its derivatives in the treatment of osteoarthritis of the knee. *Drug Safety* 2000; **23**: 115–30.

Actinic keratoses. For references to the use of diclofenac in a hyaluronic acid gel in the treatment of actinic keratoses, see p.46.

Dry eye. The usual management of dry eye (p.2140) is with artificial tears. Sodium hyaluronate has also been reported to be of some benefit. Alleviation of symptoms^{1,3} and an increase in tear film stability^{1,2} has been shown after topical application of sodium hyaluronate solution (0.1 or 0.2%) compared with saline-based placebo solutions. However, another study⁴ failed to show any advantage over placebo, although it has been suggested^{4,5} that sodium hyaluronate might play a role in maintaining a healthy corneal epithelium.

- Mengher LS, *et al.* Effect of sodium hyaluronate (0.1%) on break-up time (NIBUT) in patients with dry eyes. *Br J Ophthalmol* 1986; **70**: 442–7.
- Sand BB, *et al.* Sodium hyaluronate in the treatment of keratoconjunctivitis sicca: a double masked clinical trial. *Acta Ophthalmol (Copenh)* 1989; **67**: 181–3.
- Condon PI, *et al.* Double blind, randomised, placebo controlled, crossover, multicentre study to determine the efficacy of a 0.1% (w/v) sodium hyaluronate solution (Fermavis) in the treatment of dry eye syndrome. *Br J Ophthalmol* 1999; **83**: 1121–4.
- Shimmura S, *et al.* Sodium hyaluronate eyedrops in the treatment of dry eyes. *Br J Ophthalmol* 1995; **79**: 1007–11.
- Aragona P, *et al.* Long term treatment with sodium hyaluronate-containing artificial tears reduces ocular surface damage in patients with dry eye. *Br J Ophthalmol* 2002; **86**: 181–4.

Osteoarthritis. In osteoarthritis, the size and concentration of hyaluronic acid molecules naturally present in synovial fluid is reduced. Thus, one approach in the management of osteoarthritis

(p.11) of the knee is viscosupplementation of the synovial fluid by the intra-articular injection of hyaluronic acid or its derivatives. Such injections may reduce pain over 1 to 6 months but may be associated with a short-term increase in knee inflammation; there is some suggestion that any benefit is longer lasting than with intra-articular corticosteroids. Some studies suggest that viscosupplementation may be an effective option for patients who are unable to take oral NSAIDs or have regular intra-articular corticosteroids, and who are unsuitable candidates for joint replacement surgery, although there appears to be considerable variability in clinical response between products, as well as in the variables being assessed and length of treatment.

References.

- Altman RD, Moskowitz R. Intraarticular sodium hyaluronate (Hyalgan) in the treatment of patients with osteoarthritis of the knee: a randomized clinical trial. *J Rheumatol* 1998; **25**: 2203–12. Correction. *ibid.* 1999; **26**: 1216.
- Anonymous. Hyaluronan or hylans for knee osteoarthritis? *Drug Ther Bull* 1999; **37**: 71–2.
- Huskisson EC, Donnelly S. Hyaluronic acid in the treatment of osteoarthritis of the knee. *Rheumatology (Oxford)* 1999; **38**: 602–7.
- Wobig M, *et al.* The role of elastoviscosity in the efficacy of viscosupplementation for osteoarthritis of the knee: a comparison of hylan G-F 20 and a lower-molecular-weight hyaluronan. *Clin Ther* 1999; **21**: 1549–62.
- Felson DT, Anderson JJ. Hyaluronate sodium injections for osteoarthritis: hope, hype, and hard truths. *Arch Intern Med* 2002; **162**: 245–7.
- Lo GH, *et al.* Intra-articular hyaluronic acid in treatment of knee osteoarthritis: a meta-analysis. *JAMA* 2003; **290**: 3115–21.
- Bellamy N, *et al.* Viscosupplementation for the treatment of osteoarthritis of the knee. Available in The Cochrane Database of Systematic Reviews; Issue 2. Chichester: John Wiley; 2006 (accessed 09/05/06).

Wound healing. Hyaluronic acid has been used to aid wound healing.^{1,2} the overall management of which is discussed on p.1585.

- Soldati D, *et al.* Mucosal wound healing after nasal surgery: a controlled clinical trial on the efficacy of hyaluronic acid containing cream. *Drugs Exp Clin Res* 1999; **25**: 253–61.
- Harris PA, *et al.* Use of hyaluronic acid and cultured autologous keratinocytes and fibroblasts in extensive burns. *Lancet* 1999; **353**: 35–6.

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

Arg: Aquify; Artflex; Dropstar; Gengigel; Hialudorf; Hialart†; Hyasol; Luronocoderm; Lacrifarmat†; Maxiostenil†; Mniostenil; Provisc; Synvisc; **Austral:** AMO Vitrac; Fermathron†; Healon; Ophthalin; Provisc; Synvisc; Vismed†; **Austria:** Artzart; Connettivina; Etamucin; Hyalgan; **Belg:** Gengigel; Healon†; Hyalgan; **Braz:** Healon; Hyaludermin; Polireumin; Suprahyal; Synvisc; **Canada:** Biolon†; Cystistat; Eystil†; Healon†; Hyalgan; Hyalofill†; NeoVisc; Orthovisc; Suplasy; Synvisc; **Chile:** Biolon; Eucerin Emulsion; Healon; Hyalgan; Lagricel Ofteno; Suprahyal; Synvisc; Toptear; **Cz:** Curasan†; Healon†; Hyalgan; **Denm:** Artz; Hyalgan; **Fin:** Artzart; Healon†; Hyalgan; **Fr:** Adant; Arthrum H; Effidia; Hyabak; Hyal-Drop; Hyalgan; Hyafolemme; Hyafofill; Hyaaluge; Hyafo-COMOD; Hyafo-Protect; Ialuset; Ostenil; Provisc; Sinovial; Suplasy; Synvisc; Vismed†; **Ger:** Arthrease†; Biolon; Biolon; Dispasan; Endogel; Fermathron; Gelbag; Go-On; Healon†; Hy-GAG; Hya-ject; Hya-Ophthal†; Hya-System†; Hyalar; HyaLubrix; Hyaform†; Hylan; Hyafo-COMOD; Hyafo-Vision; Hysan; Laservis; Orthovisc; Ostenil; Oxyal; Provisc; Suplasy; Synvisc; TwinVisc; Viscoaseal; Visiol; Vislube; Vismed; VisThesia; Xidan EDO; **Gr:** Hylart; **Hong Kong:** Connettivina; Go-On; Healon; Hialid; Hyalgan; Hyruan; Provisc†; Vismed; **Hung:** Curiosin; Healon†; Hyalgan; Ial†; Ophthalin†; Provisc†; **India:** Halonic; Lghyal; Synvisc; Visial; **Indon:** Adant; Durolane; Hialid; Hyalgan; Osflex; Suplasy; **Irl:** Hyalgan; Ophthalin†; Provisc†; **Israel:** Adant; Arthrease; Biolon; Curavisc; Eyecon; Healon; Hyafo-COMOD; Hysan; Ophthalin; Orthovisc; Suplasy; Synvisc†; **Ital:** Artz; Connettivina; Dropstar; Durolane; Go-On; Hy-Drop; Hyabak; Hylart; Hyalgan; HyaHilist; Hyafo-COMOD; Hyafo-Protect; Ial; Iallect†; Ialun; Ialurex; Ialurex; Ocusil†; Ophthalin; Oxyal; Provisc; Synocrom; Synvisc; Vismed; **Jpn:** Hyaletin; Suvenyi; **Malaysia:** Curiosin; Gengigel; Go-On; Healon†; Hya; Hyalgan; Hyruan; Laservis†; Provisc; Sinovial; Synvisc; Viscoaseal; Visiol; Vislube; Vismed; **Mex:** Biolon; Hyasol; Lagricel; Suprahyal; Synvisc; Zonaker; **Mon:** Oxyal; **NZ:** AMO Vitrac†; Healon; Hyaform; Ophthalin; Provisc; Synvisc; **Philipp:** Hialid; Provisc; **Pol:** Hyalgan; Synvisc; **Port:** Artz; Gengigel†; Hylart; Hyafofill†; Hyafo-COMOD†; **Rus:** Curiosin (Курюзин); Healon (Хеалон)†; Hyafo-COMOD (Хило-КОМОД)†; **S.Afr:** AMO Vitrac; Biolon; Biolone; Healon; Provisc; **Singapore:** AMO Vitrac†; Healon†; Hialid; Hyalgan; Hyaform; Provisc; Restylane†; Suplasy; Synvisc; **Spain:** Hyalar†; Hyalgan; **Swed:** Artzart; Hyalgan; Synvisc; **Switz:** Fermavis†; Healon†; Hyafo-Drop; Hycosan†; Hyafo-COMOD; Hysan; Ial; Ialugen; Laservis; Ostenil; Rhinogen; Sinovial; Suplasy; Synvisc; Viscoaseal; Visiol; Vislube; Vismed; **Thai:** Adant; Connettivina†; Healon†; Hialid; Hyalgan; Hyruan; Ial; Ophthalin; Provisc; Synvisc; **Turk:** Adant; Amvisc; Biolon; Healon; Hyalgan; Ial; Ophthalin Plus; Ostenil; Provisc; Synvisc; **UK:** Arthrease; Cystistat; Euflexa; Fermathron; Gengigel; Healonid†; Hyabak; Hyalgan; Hyafofill; Hycosan; Ophthalin; Optrex Contact Lens Friendly Eye Drops; Orthovisc; Ostenil; Supartz†; Suplasy; Synocrom; Synvisc; Viscoaseal; **USA:** AMO Vitrac; Amvisc; Bionect; Ceoase; Euflexa; Healon; Hyalgan; Hyaform†; Hylira; Juvederm; Orthovisc; Perlane; Restylane; Shellgel; Supartz; Synvisc; **Venez:** Healon†; Hyalgan; Lagricel Ofteno; Provisc†; Suprahyal; Synvisc; Toptear.

Multi-ingredient: **Arg:** Blink Contacts; Cellskinlab Hydrigel B5; Cremisona†; Culuflex H; Epitheliale AH; Estri-Atlas; Hyaalrom; Hyaalrom NF; Hyanact†; Hydratone†; Ingebrax; Luronico Biotic; Lacrimax; Maxilom; Maxus; Muvar; Panoxi; Timed 0.5; Viscoat; Vita-C Derm's; Yusin Tears II; **Austral:** Blink Contacts; Duovisc; Viscoat; **Belg:** Chile; Hydrating B5 Gel; Ureadin Rx RD; **Cz:** Curiosin†; Ialugen Plus; **Fr:** Cicaplast; Cicatridine; Hyaalogram; Hyarhinol; Ialuset Plus; Mucogyne; Saugella; Tonimer; Viscoat; **Ger:** Duovisc; Hya-Care; Viscoat; **Hong Kong:** Duovisc†; Viscoat†; **Hung:** Ialugen Plus; Viscoat†; **Israel:** Aptaogen; Apta-X; Geldair†; **Ital:** Altergen; Connettivina Plus; Dropyal; Idroskin C; Migel; Osmogel; Sirmio-gel†; Trofo 5; Viscoat; **Malaysia:** Duovisc; Viscoat; **Mex:** Cetopic; Emolin Neo; Grimal; Hyaalrom NF; Hyaalox; **Mon:** Monasens; **NZ:** Viscoat; **Philipp:** Viscoat; **Port:** Synchrore; Synchrore†; **Rus:** Hyaalzo-COMOD

(Хиауар-КОМОА). **S.Afr.:** Duovisc; Viscoat; **Singapore:** Duovisc; Viscoat; **Switz.:** Alphastris; Ialugen Plus; Lacrycon; **Thai.:** Duovisc; Viscoat; **Turk.:** Duovisc; Viscoat; **UK:** Atopidair; Gelclair; Seprafilm; Xclair; Zudec; **USA:** Atopidair; DeFlux; DisCoVisc; Gelclair; Healon Yellow; RadiaFlex Rx; Seprafilm; Viscoat; Zicare Kit; **Venez.:** Cepin; Epitheliale AH; Viscoat†.

Hyaluronidase (BAN, rINN)

Hialuronidasa; Hialuronidáz; Hialuronidazé; Hiyalürönidaz; Hialuronidasi; Hialuronidas; Hialuronidasa; Hialuronidasum.

Гиалуронидаза

CAS — 9001-54-1.

ATC — B06AA03.

ATC Vet — QB06AA03.

NOTE. The name kinetin (p.1603) has also been used as a proprietary name for hyaluronidase.

Pharmacopoeias. In *Chin.* and *Eur.* (see p.vii). *US* includes as an injectable form.

Ph. Eur. 6.2 (Hyaluronidase). An enzyme capable of hydrolysing mucopolysaccharides of the hyaluronic acid type. It is prepared from the testes of mammals by a method that has been shown to reduce contamination by known infectious agents to acceptable limits; a suitable stabilising agent may be added to the purified preparation. A white or yellowish-white, amorphous powder; it contains not less than 300 international units of hyaluronidase activity per mg, calculated with reference to the dried substance. Soluble in water; practically insoluble in alcohol and in acetone. A 0.3% solution in water has a pH of 4.5 to 7.5. Store at 2° to 8° in airtight containers.

Units

The international and USP units are equivalent. One international or USP unit is equivalent to one turbidity-reducing unit or about 3.3 viscosity-reducing units.

Adverse Effects and Precautions

Sensitivity to hyaluronidase occasionally occurs. Because of the danger of spreading infection, the enzyme generally should not be injected into or around an infected area. It has been suggested that the presence of malignancy may similarly be a contra-indication to the use of hyaluronidase. It should not be given by intravenous injection nor should it be used for anaesthetic procedures in cases of unexplained premature labour. Hyaluronidase should not be applied directly to the cornea. It should not be used to reduce the swelling of bites or stings.

Uses and Administration

Hyaluronidase is an enzyme that reversibly depolymerises hyaluronic acid (above), a component of the ground substance or tissue cement surrounding cells, thereby temporarily reducing its viscosity and rendering the tissues more readily permeable to injected fluids.

Hyaluronidase is used to increase the speed of absorption and reduce discomfort due to subcutaneous or intramuscular injection of fluids, to promote resorption of excess fluids and extravasated blood in the tissues, and to increase the effectiveness of local anaesthesia.

In the UK, the usual dose as an adjunct to subcutaneous or intramuscular injection is 1500 units, added directly to the injection. To aid the dispersal of extravasated fluids or blood, the same dose is given in 1 mL of Water for Injections or 0.9% sodium chloride into the affected area. Lower doses of hyaluronidase are used in some countries; in the USA, the usual dose is 150 units.

In hypodermoclysis, hyaluronidase is used to aid the subcutaneous administration of relatively large volumes of fluids, especially in infants and young children, where intravenous injection is difficult. Care should be taken in the treatment of children and the elderly to control the speed and total volume given and to avoid overhydration. Hyaluronidase may be added to the injection fluid or may be injected into the site before the fluid is given. In the UK, 1500 units of hyaluronidase is generally given with each 500 to 1000 mL of fluid for subcutaneous use, but in the USA, 150 units of hyaluronidase is considered adequate for each litre of hypodermoclysis solution.

The diffusion of local anaesthetics is accelerated by the addition of 1500 units (in the USA, 150 units) of hyaluronidase to the anaesthetic solution. It has also been used in ophthalmology as an aid to local anaesthesia at recommended doses of 15 units/mL of local anaesthetic solution. Hyaluronidase has also been used for the treatment of vitreous haemorrhage and diabetic retinopathy.

To improve the resorption of radiopaque agents in subcutaneous urography, hyaluronidase is injected subcutaneously in a dose of 75 units over each scapula followed by injection of the contrast medium at the same site.

Recombinant human hyaluronidase is used for the preparation of oocytes during IVF.

Hyalosidase (GL enzyme) is a highly purified form of hyaluronidase that has been studied.

◇ General references.

1. Watson D. Hyaluronidase. *Br J Anaesth* 1993; **71**: 422–5.

Ophthalmic surgery. In a study¹ involving 150 consecutive patients undergoing surgery for senile cataract, retrobulbar anaesthesia with lidocaine 2% solution plus adrenaline 1:100 000

and hyaluronidase 15 units/mL produced successful anaesthesia in 69 of 75 cases (92%), which was significantly better than 42 of 75 treated with lidocaine plus adrenaline alone. Although poor results have been reported from hyaluronidase and a local anaesthetic without adrenaline to restrict local anaesthetic absorption, the use of the enzyme and adrenaline was recommended as an aid to achieving complete ocular akinesia and anaesthesia in cataract surgery. Hyaluronidase has also been used with a mixture of bupivacaine and lidocaine for peribulbar anaesthesia, but results have been conflicting. In a study² in 50 patients, addition of hyaluronidase 25 units/mL of local anaesthetic mixture had no significant effect on time to satisfactory anaesthesia. However, in a second study³ involving 200 patients, addition of hyaluronidase 50 or 300 units/mL improved the quality of the peribulbar block and, in the case of the higher concentration, also increased the speed of onset.

- Thomson I. Addition of hyaluronidase to lignocaine with adrenaline for retrobulbar anaesthesia in the surgery of senile cataract. *Br J Ophthalmol* 1988; **72**: 700–2.
- Prosser DP, et al. Re-evaluation of hyaluronidase in peribulbar anaesthesia. *Br J Ophthalmol* 1996; **80**: 827–30.
- Dempsey GA, et al. Hyaluronidase and peribulbar block. *Br J Anaesth* 1997; **78**: 671–4.

Preparations

BP 2008: Hyaluronidase Injection;

USP 31: Hyaluronidase for Injection; Hyaluronidase Injection.

Proprietary Preparations (details are given in Part 3)

Arg.: Unidas; **Austral.:** Hyalase; **Braz.:** Hyalozima; **Chile:** Wydase†; **Cz.:** Hyasaf†; **Hylase;** **Ger.:** Hylase; **Gr.:** Hylase; **Hung.:** Hylase†; **India:** Hynidase; **Israel:** Hylase; **Ital.:** Jaluran†; **Neth.:** Hylason; **NZ:** Hylase; **S.Afr.:** Hylase; **Turk.:** Orthovisc; **UK:** Hylase; **USA:** Amphadase; Hyladase; Hylencex; Vitrase; Wydase†.

Multi-ingredient: **Arg.:** Nilflux; **Austria:** Lemuval; **Braz.:** Oto Xilodase; Postec; Xilodase; **Ital.:** Lido-Hyal; **Pol.:** Helason; **Spain:** Lasonil†; Oto Difusor†; **Switz.:** Lido-Hyal.

Hydrangea

Hidranga; Seven Barks; Smooth Hydrangea; Wild Hydrangea.

Profile

Hydrangea, the root of *Hydrangea arborescens* (Hydrangeaceae), has diuretic and litholytic properties and is used for genitourinary disorders including renal and urinary calculi.

Homoeopathy. Hydrangea has been used in homoeopathic medicines under the following names: Hydrangea arborescens; Hydrang.

Preparations

Proprietary Preparations (details are given in Part 3)

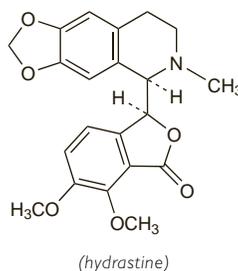
Multi-ingredient: **UK:** Antiglian; Backache.

Hydrastine Hydrochloride

Hidrastina, hidrocloruro de; Hydrastyny chlorowodorek. 6,7-Dimethoxy-3-(5,6,7,8-tetrahydro-6-methyl-1,3-dioxolo[4,5-g]isoquinolin-5-yl)isobenzofuran-1(3H)-one hydrochloride.

C₂₁H₂₁NO₆·HCl = 419.9.

CAS — 118-08-1 (hydrastine); 5936-28-7 (hydrastine hydrochloride).



Profile

Hydrastine hydrochloride, the hydrochloride of an alkaloid obtained from *Hydrastis canadensis* (Ranunculaceae) (see Hydrastis, below), has been reputed to cause uterine contractions and arrest uterine haemorrhage but it is of doubtful value. It was also formerly used in gastrointestinal disorders. Toxic doses are reported to cause strychnine-like convulsions and relaxation of the gut.

Hydrastine Hydrochloride

Idrastina Cloruro. 5,6,7,8-Tetrahydro-6-methyl-1,3-dioxolo[4,5-g]isoquinolin-5-ol hydrochloride.

C₁₁H₁₁NO₃·HCl = 225.7.

CAS — 6592-85-4 (hydrastine); 4884-68-8 (hydrastine hydrochloride).



Profile

Hydrastinine is a derivative of the alkaloid hydrastine (p.2321) and has been used similarly. It has vasoconstrictor properties and has been used as the hydrochloride as an ingredient of topical preparations for minor eye disorders.

Preparations

Proprietary Preparations (details are given in Part 3)

Multi-ingredient: **Austria:** Dacrin; Haemanal.

Hydrastis

Golden Seal; Goldenseal; Hidraste; Hidrastis; Hydrast; Hydrastidis Radix; Hydrastis rhizoma; Hydrastisjuuri; Hydrastisrot; Id-raste; Kanadinij auksašaknių šakniastiebiai; Vodilkový kořen; Yellow Root.

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

Ph. Eur. 6.2 (Goldenseal Rhizome; Goldenseal Root BP 2008). The whole or cut, dried rhizome and root of *Hydrastis canadensis* containing not less than 2.5% of hydrastine and not less than 3.0% of berberine, calculated on the dried basis. Protect from light.

USP 31 (Goldenseal). The dried roots and rhizomes of *Hydrastis canadensis* (Ranunculaceae), containing not less than 2.0% of hydrastine and not less than 2.5% of berberine, calculated on the dried basis. Store in airtight containers. Protect from light, moisture, and heat.

Profile

Hydrastis was formerly used to arrest excessive uterine haemorrhage. It is included in some herbal preparations for gastrointestinal disorders and peripheral vascular disorders. The pharmacological activity of hydrastis is attributed primarily to 2 of its constituent alkaloids, berberine (p.2264) and hydrastine (above).

Homoeopathy. Hydrastis has been used in homoeopathic medicines under the following names: Hydrastis canadensis; Hydrdr. can.

Preparations

Proprietary Preparations (details are given in Part 3)

Ger.: Gingivitol N.

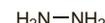
Multi-ingredient: **Austral.:** Bilberry Plus; Euphrasia Complex; Herbal Cleanse†; Hydrastis Complex†; Sambucus Complex†; Urapro†; Urmase†; **Braz.:** Bromidrastina†; **Canad.:** Echinacea Goldenseal Formula†; **Fr.:** Cili-maxol; **Spain:** Proctosor†; Solucion Schoum; **Turk.:** Ma-Ka-Ta; **UK:** Digestive; HRI Golden Seal Digestive; Wind & Dyspepsia Relief.

Hydrazine Sulfate

Hidrazina, sulfato de; Hydrazine Sulphate; Hydrazyiny siarczan.

H₈N₂O₄S = 130.1.

CAS — 302-01-2 (hydrazine); 10034-93-2 (hydrazine sulfate).



(hydrazine)

Profile

Hydrazine sulfate is employed in various industrial processes. It is used in the preparation of hydrazine hydrate which is applied after a solution of platinum chloride for corneal tattooing. It has been tried, but with little if any benefit, in the management of cancer-related anorexia and cachexia.

Adverse effects and treatment. References to adverse effects resulting from exposure to hydrazine.¹⁻⁵ Pyridoxine has been used in the management of hydrazine intoxication.⁶⁻⁸

- Albert DM, Puliafito CA. Choroidal melanoma: possible exposure to industrial toxins. *N Engl J Med* 1977; **296**: 634–5.
- Durant PJ, Harris RA. Hydrazine and lupus. *N Engl J Med* 1980; **303**: 584–5.
- WHO. Hydrazine. *Environmental Health Criteria* 68. Geneva: WHO, 1987. Available at: <http://www.inchem.org/documents/ehc/ehc/ehc68.htm> (accessed 24/07/08)
- WHO. Hydrazine health and safety guide. *IPCS Health and Safety Guide* 56. Geneva: WHO, 1991. Available at: <http://www.inchem.org/documents/hsg/hsg/hsg056.htm> (accessed 24/07/08)
- Hainer MI, et al. Fatal hepatorenal failure associated with hydrazine sulfate. *Ann Intern Med* 2000; **133**: 877–80.
- Kirklin JK, et al. Treatment of hydrazine-induced coma with pyridoxine. *N Engl J Med* 1976; **294**: 938–9.

The symbol † denotes a preparation no longer actively marketed