solution measured at 20°. A white, yellowish-white, or greyish-white powder or granules; hygroscopic after drying. Practically insoluble in hot water, in dehydrated alcohol, in acetone, and in toluene; dissolves in cold water forming a colloidal solution. A 1% w/w solution in water has a pH of 5.5 to 8.0.

USNF 26 (Hymetellose). A partly *O*-(methylated) and *O*-(2-hydroxyethylated) cellulose. Various grades are available, labelled with the viscosity of a 2% w/w solution measured at 20°. A white, yellowish-white, or greyish-white powder or granules; hygroscopic after drying. Insoluble in hot water, in alcohol, in acetone, in ether, and in toluene; dissolves in cold water forming a colloidal solution. pH of a 1% w/w solution in water is between 5.5 and 8.0.

Uses

Hymetellose is used similarly to other cellulose ethers, such as methylcellulose (p.2145), as a pharmaceutical excipient.

Preparations

Proprietary Preparations (details are given in Part 3)

Austria: Cellobexon.

Multi-ingredient: ***Fr.:*** Pharmatex.

Hyprolose *(rINN)*

E463; Hidroksipropilceliuliozė; Hidroxipropilcellulóz; Hidroxipropilcelulosa; Hydroksipropyyliselluloosa; Hydroxipropylcellulosa; Hydroxypropyl Cellulose; Hydroxypropylcellulose; Hydroxypropylcellulosum; Hydroxypropylcelulosa; Hyprolosum.

Гипролоза

CAS — 9004-64-2.

Pharmacopoeias. In *Chin.*, *Eur.* (see p.vii), *Int.*, and *Jpn*. Also in *USNF* which has two separate monographs, for Hydroxypropyl Cellulose and for Low-substituted Hydroxypropyl Cellulose.

Ph. Eur. 6.2 (Hydroxypropylcellulose). A partially substituted 2-hydroxypropyl ether of cellulose. Various grades are available and may be distinguished by appending a number indicative of the apparent viscosity in millipascal seconds of a 2% w/w solution measured at 20°. White or yellowish-white, granules or powder; hygroscopic after drying. Soluble in cold water, in dehydrated alcohol, in glacial acetic acid, in methyl alcohol, in propylene glycol, and in a mixture of 10 parts methyl alcohol and 90 parts dichloromethane, forming colloidal solutions; practically insoluble in hot water, in ethylene glycol, and in toluene; sparingly soluble or slightly soluble in acetone. A 1% w/w solution in water has a pH of 5.0 to 8.5.

USNF 26 (Hydroxypropyl Cellulose). A partially substituted poly(hydroxypropyl) ether of cellulose. When dried at 105° for 1 hour, it contains not more than 80.5% of hydroxypropoxy groups. It may contain not more than 0.60% of silica or other suitable anticaking agent. A white to cream-coloured, practically odourless, granular solid or powder, hygroscopic after drying. Soluble in cold water, in alcohol, in chloroform, and in propylene glycol, giving a colloidal solution; insoluble in hot water. pH of a 1% solution in water is between 5.0 and 8.0.

USNF 26 (Low-Substituted Hydroxypropyl Cellulose). It contains not less than 5.0% and not more than 16.0% of hydroxypropoxy groups. A white to yellowish-white, practically odourless, hygroscopic, fibrous or granular powder. Practically insoluble in dehydrated alcohol and in ether; dissolves in a solution of sodium hydroxide (1 in 10) and produces a viscous solution; swells in water, in sodium carbonate, and in 2N hydrochloric acid. pH of the suspension obtained by shaking 1.0 g with 100 mL of water is between 5.0 and 7.5. Store in airtight containers.

Adverse Effects

Hyprolose used as a solid ocular insert may result in blurred vision and ocular discomfort or irritation including hypersensitivity and oedema of the eyelids.

Hypersensitivity. Allergic contact dermatitis was reported in a patient, associated with the hyprolose present in the reservoir layer of a transdermal estradiol patch.[1]

1. Schwartz BK, Clendenning WE. Allergic contact dermatitis from hydroxypropyl cellulose in a transdermal estradiol patch. *Contact Dermatitis* 1988; **18:** 106–7.

Uses and Administration

Hyprolose is used in pharmaceutical manufacturing in the film coating of tablets, as a tablet excipient, as a thickener, and in microencapsulation. It is used as an emulsifier and stabiliser in the food industry.

Hyprolose is also used as a modified-release solid ophthalmic insert in the management of dry eye (p.2140).

Preparations

USP 31: Hydroxypropyl Cellulose Ocular System.

Proprietary Preparations (details are given in Part 3)

Austral.: Lacrisert†; ***Canad.:*** Lacrisert; ***Fin.:*** Lacrisert; ***Fr.:*** Lacrisert; ***Neth.:*** Lacrisert; ***Norw.:*** Lacrisert†; ***Swed.:*** Lacrisert; ***USA:*** Lacrisert.

Hypromellose *(BAN, rINN)*

E464; Hipromeliozė; Hipromellóz; Hipromelosa; Hipromeloz; Hydroxypropyl Methylcellulose; Hydroxypropylmethylcellulose; Hypromelloosi; Hypromellos; Hypromellosum; Hypromelosa; Hypromeloza; Methyl Hydroxypropyl Cellulose; Methylcellulose Propylene Glycol Ether; Methylhydroxypropylcellulose; Methylhydroxypropylcellulosum.

Гипромеллоза

CAS — 8063-82-9; 9004-65-3.
ATC — S01KA02.
ATC Vet — QS01KA02.

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

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

Ph. Eur. 6.2 (Hypromellose). A mixed ether of cellulose containing a variable proportion of methoxy and 2-hydroxypropoxy groups. Various grades are available (see Labelling, below). A white, yellowish-white, or greyish-white powder or granules; hygroscopic after drying. Dissolves in cold water, forming a colloidal solution; practically insoluble in hot water, in dehydrated alcohol, in acetone, and in toluene. A 1% w/w solution in water has a pH of 5.0 to 8.0.

USP 31 (Hypromellose). A methyl and hydroxypropyl mixed ether of cellulose It contains methoxy and hydroxypropoxy groups conforming to the limits for the types 1828, 2208, 2906, and 2910, calculated on the dried basis (see Labelling, below). A white to slightly off-white fibrous or granular powder. Swells in water and produces a clear to opalescent, viscous, colloidal mixture; insoluble in dehydrated alcohol, in chloroform, and in ether.

Labelling. In Europe, grades of hypromellose are distinguished by appending a number indicative of the apparent viscosity in millipascal seconds of a 2% w/w solution measured at 20° (e.g. hypromellose 4500). In the USA, they are distinguished by appending a number in which the first 2 digits represent the approximate percentage content of methoxy groups, and the third and fourth digits the approximate percentage content of hydroxypropoxy groups.

Hypromellose Phthalate *(BANM, rINNM)*

Ftalát hypromelosy; Ftalato de hipromelosa; Hipromeliozės ftalatas; Hipromellóz-ftalát; Hydroxypropyl Methylcellulose Phthalate; Hypromelloosiftalaatti; Hypromellose, phtalate d'; Hypromellosftalat; Hypromellosi phthalas; Methylhydroxypropylcellulose Phthalate; Methylhydroxypropylcellulosi Phthalas.

Гипромеллозы Фталат

Pharmacopoeias. In *Eur.* (see p.vii) and *Jpn.* Also in *USNF*.

Ph. Eur. 6.2 (Hypromellose Phthalate). A monophthalic acid ester of hypromellose containing methoxy, 2-hydroxypropoxy, and phthalyl groups, calculated with reference to the anhydrous substance. White or slightly off-white, free-flowing flakes or a granular powder. Practically insoluble in water and in dehydrated alcohol; very slightly soluble in acetone and in toluene; soluble in a mixture of equal volumes of acetone and methyl alcohol, and of dichloromethane and methyl alcohol. Store in airtight containers.

USNF 26 (Hypromellose Phthalate). A monophthalic acid ester of hypromellose. It contains methoxy, hydroxypropoxy, and phthalyl groups. It contains 21.0 to 35.0% of phthalyl groups, calculated on the anhydrous basis. Store in airtight containers. A white, odourless, powder or granules. Practically insoluble in water, in dehydrated alcohol, and in hexane; produces a viscous solution in a mixture of dehydrated alcohol and acetone (1:1), or in a mixture of methyl alcohol and dichloromethane (1:1); dissolves in 1N sodium hydroxide. Store in airtight containers.

Labelling. Different grades of hypromellose phthalate in the USA are distinguished by appending a number in which the first 2 digits represent the approximate percentage content of the methoxy groups, the next 2 digits the approximate percentage content of hydroxypropoxy groups, and the last 2 digits the approximate percentage content of the phthalyl groups. Another system of nomenclature involves appending a number which indicates the pH value (× 10) at which the polymer dissolves in aqueous buffer solutions; letters such as S or F may also be used to indicate grades of high molecular-weight or small particle size respectively.

Uses and Administration

Hypromellose has properties similar to those of methylcellulose (below). It is used in pharmaceutical manufacturing for film-coating tablets, as a tablet binder, as a modified-release matrix, and as an emulsifier, suspending agent, and stabiliser in topical gels and ointments. Hypromellose may also be used as an emulsifier and stabiliser in the food industry.

Hypromellose phthalate is used to provide enteric coating for tablets and granules, for the preparation of modified-release granules, and as a coating to mask the unpleasant taste of some tablets.

Hypromellose is widely used clinically in ophthalmic solutions; it is preferred to methylcellulose since mucilages of hypromellose have greater clarity and usually contain fewer undispersed fibres. Hypromellose is used to prolong the action of medicated eye drops and, either alone or with other viscosity-increasing agents, in artificial tears preparations for the management of dry eye (p.2140); solutions containing 0.3 to 1% of hypromellose are commonly used. Solutions for contact lens care (p.1622) and for lubricating artificial eyes contain similar concentrations. Hypromellose is also used intra-ocularly, usually as a 2% solution, as an adjunct in ophthalmic surgery (below) and concentrations of up to 2.5% may be used topically to protect the cornea during gonioscopy procedures.

Hypromellose has been included in artificial saliva preparations used in the management of dry mouth (p.2140), but other drugs are usually preferred.

Ophthalmic surgery. Intra-ocular hypromellose may be used as a visco-elastic agent to protect the eye during surgery. In cataract extraction it is used to maintain the anterior chamber and to coat the intra-ocular lens to facilitate its implantation. Although intra-ocular hypromellose is generally considered to be well tolerated, some[1] have reported an increased incidence of pupil abnormalities (non-reactive semi-dilated pupils) after such use; others[2] did not confirm this. There has also been a report[3] of corneal opacities in a number of patients after use of intra-ocular hypromellose.

1. Tan AKK, Humphry RC. The fixed dilated pupil after cataract surgery—is it related to intraocular use of hypromellose? *Br J Ophthalmol* 1993; **77:** 639–41.
2. Eason J, Seward HC. Pupil size and reactivity following hydroxypropyl methylcellulose and sodium hyaluronate. *Br J Ophthalmol* 1995; **79:** 541–3.
3. Newton JN, *et al*. Corneal opacities after cataract surgery with hypromellose. *Lancet* 2000; **355:** 290.

Preparations

BP 2008: Hypromellose Eye Drops;
USP 31: Hypromellose Ophthalmic Solution.

Proprietary Preparations (details are given in Part 3)

Arg.: Artelac; Cool Tears; Genteal; Lacrisifi†; Lagrima Dorf; Natura Lagrimas; Oftalook Plus; ***Austral.:*** Genteal Lubricant; Isopto Tears†; Methopt†; ***Austria:*** Artelac; Okuzell; Prosicca; ***Belg.:*** Artelac; Isopto Tears; ***Braz.:*** Artelac†; Filmcel; Genteal; Lubrik†; ***Canad.:*** Eyelube; Genteal; Isopto Tears; Lacril; Visine Advance True Tears; Visine Contact Lens; ***Chile:*** Genteal; ***Cz.:*** Isopto Tears†; Lacrisyn†; ***Denm.:*** Artelac; ***Fin.:*** Artelac; Isopto Alkaline; Isopto Plain; ***Fr.:*** Artelac; ***Ger.:*** Artelac; Berberil Dry Eye; Cellugel; Celoftal; Genteal; HPMC-Ophtal†; Methocel; Sic-Ophtal; Sicca-Stulln; ***Gr.:*** Lubrilac; Vidilac; ***Hong Kong:*** Blueye; Eye Glo Moist; Genteal; Isopto Tears; Lac-Oph; Methocel†; ***Hung.:*** Artelac†; Humalac B; Lacrisyn†; ***India:*** Hyprosol; Moisol; Nova Vizol; Occu System†; Sanvisc; ***Indon.:*** Genteal; ***Irl.:*** Artelac; Isopto Alkaline; Isopto Plain; ***Israel:*** Adato-Cel†; Genteal; Ocucoat; ***Ital.:*** Gel 4000; Genteal; Lacrimill†; Lacrisifi; Lacrisol; Methocel; ***Malaysia:*** Cellugel; Eye Glo Moist; ***Mex.:*** Artelac; Celulose; Filmexil†; Genteal; Luvistar; Meticel; ***Norw.:*** Artelac; ***NZ:*** Genteal; Methopt; ***Philipp.:*** Artelac; Genteal; Methopt; ***Pol.:*** Artelac; ***Port.:*** Artelac; Davilose; Hidrocil†; ***Rus.:*** Defislez (Дефислёз); Lacrisifi (Лакрисифи); Lacrisyn (Лакрисин); ***S.Afr.:*** Cellugel; Methocel; Spersatear; Viscotraan; ***Singapore:*** Eye Mo Moist†; Genteal; Lacrisifi†; Methocel†; ***Spain:*** Acuolens; Artific; ***Swed.:*** Artelac; Isopto Plain; ***Switz.:*** Isopto Tears; Methocel; ***Thai.:*** Genteal; Isopto Tears; Lac-Oph; Natear; Opsil Tears; Simoph Tears†; ***Turk.:*** Lacrisifi; ***UK:*** Artelac; Brolene Cool Eyes; Isopto Alkaline; Isopto Plain; ***USA:*** Artificial Tears; Entrocel; Genteal; Gonak; Goniosoft; Goniosol; Isopto Plain; Isopto Tears; Lacril; Ocucoat; Tearisol; Tears Again MC; Ultra Tears; ***Venez.:*** Celoftal†; Genteal.

Multi-ingredient: ***Arg.:*** Alcon Lagrimas; Irix Lagrimas; Kalopsis Lagrimas; Oxysept Comfort; Phoenix Lagrimas; Solucion Oral; Tears Naturale; Visine Lagrimas; ***Austral.:*** Bion Tears; Blink-N-Clean; Genteal Moisturising; Opti-Free Comfort†; Poly-Tears; Tears Naturale; Visine True Tears†; ***Austria:*** Lacrisic; ***Belg.:*** Alcon Adequad; Lacrystat; Tears Naturale; ***Braz.:*** Lacribell; Lacrima Plus; Lacrima†; Opti-Tears; Trisorb; ***Canad.:*** Artificial Tears; Bion Tears; Moisture Drops†; Tears Naturale; Tears Naturale Forte; ***Chile:*** Lagrimas Artificiales; Nico Drops; Nicotears; Novo-Tears; Tears Naturale; ***Cz.:*** Tears Naturale; ***Denm.:*** Dacriosol; ***Ger.:*** Gelipur; Isopto Naturale; Lacrisic; Oculotect; ***Gr.:*** Tears Naturale; ***Hong Kong:*** Bion Tears; Tears Naturale Forte; Visine for Contacts; ***Hung.:*** Dacrolux; Tears Naturale; ***Indon.:*** Genteal; Isotic Tearin; Tears; Tears Naturale II; ***Irl.:*** Ilube; Tears Naturale; ***Israel:*** Tears Naturale; ***Ital.:*** Dacriosol; Hamamilla†; Ipragocce†; Tirs; ***Malaysia:*** Bion Tears; Dacrolux; Tears Naturale; ***Mex.:*** Lacrima Plus; Naphacel; Naphtears; Naturalag; Tears Naturale; ***Neth.:*** Duratears; ***Norw.:*** Tears Naturale; ***NZ:*** Poly-Tears; Tears Naturale; ***Philipp.:*** Gentle Tears; Tears Naturale; Visine Refresh; ***Pol.:*** Tears Naturale; ***Port.:*** Tears Naturale†; ***Rus.:*** Tears Naturale (Слеза Натуральная); ***S.Afr.:*** Moisture Drops†; Tears Naturale; ***Singapore:*** Bion Tears; Dacrolux†; Tears Naturale; ***Spain:*** Dacrolux; Humectante; Tears Humectante; ***Swed.:*** Bion Tears; ***Switz.:*** Tears Naturale; ***Thai.:*** Bion Tears; Tears Naturale; ***Turk.:*** Dacrolux; Tears Naturale; ***UK:*** Ilube; Tears Naturale; Uvistat Eye Drops; ***USA:*** Bion Tears; Clear Eyes CLR; Lacri-Tears; LubriTears; Maximum Strength Allergy Drops; Moisture Drops; Nature's Tears; Ocucoat; Tears Naturale; Tears Renewed; Visine Pure Tears; Visine Tears; ***Venez.:*** Genteal; Optifresh.

Magnesium Silicate

E553(a); Silicato de magnesio.

CAS — 1343-88-0.
ATC — A02AA05.
ATC Vet — QA02AA05.

NOTE. The code E553(a) has also been applied to magnesium trisilicate.

Pharmacopoeias. In *Jpn.* Also in *USNF*.

USNF 26 (Magnesium Silicate). A compound of magnesium oxide and silicon dioxide. It contains not less than 15.0% of magnesium oxide and not less than 67.0% of silicon dioxide, calculated on the ignited basis. It is a fine, white, odourless powder, free from grittiness. Insoluble in water and in alcohol. It is readily decomposed by mineral acids. pH of a well-mixed 10% suspension in water is between 7.0 and 10.8.