

The BP 2008 gives Refined Starflower Oil as an approved synonym.

Profile

Borage oil is a source of essential fatty acids, principally gamolenic acid (p.2308). It is included in dietary supplements, often in combination with fish oils or other sources of omega-3 fatty acids (see p.1362).

Eczema. For the effects of borage oil on eczema, see under Gamolenic Acid, p.2308.

Rheumatoid arthritis. For the use of borage oil as a source of gamolenic acid for the management of rheumatoid arthritis, see under Gamolenic Acid, p.2309.

Preparations

Proprietary Preparations (details are given in Part 3)

Braz.: Tilyl L; **Fr.:** Gamatol†; Omegaline; **Malaysia:** Primolin GLA MAX†; **Pol.:** Biogal†; Neoglandyna; **Switz.:** Boracaps; **UK:** Floresse.

Multi-ingredient: **Arg.:** Ureadin Facial; **Braz.:** Borag; Gamaline-V; Livten Vit; **Canad.:** Primanol Borage Oil; **Chile:** Pruriced; Ureadin Facial; **Fr.:** Efadiane relipandantes; Elteans; Omegaline Solaire; Phytophanere; Phytosolaire; Pruriced; Topialyse; Topialyse Fluide; Topialyse Plus; **Ital.:** Topialyse; **Pol.:** Dehalid†; **Port.:** Antiestrias; Bioclin Sebo Care†; Hidratante VV; Nutraisdin; Rilastil Dermo Solar; **Turk.:** Arheumacare.

Borax

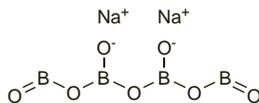
Booraks; Boraksas; Bórax; Disodium Tetraborate; Disodu tetraboran; E285; Natrii Tetraboras; Natrii Tetraboras Decahydricus; Natrium Boricum; Nátrium-tetraborát; Purified Borax; Sodium Baborate; Sodium Borate; Sodium Pyroborate; Sodium Tetraborate; Soda tetraboran; Tetraboritan syrobný dekahydrát.

$\text{Na}_2\text{B}_4\text{O}_7 \cdot 10\text{H}_2\text{O} = 381.4$.

CAS — 1330-43-4 (anhydrous borax); 61028-24-8 (anhydrous borax); 1303-96-4 (borax decahydrate).

ATC — S01AX07.

ATC Vet — QS01AX07.



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

Ph. Eur. 6.2 (Borax). Colourless crystals or crystalline masses, or white or almost white, crystalline powder. It effloresces. Soluble in water; very soluble in boiling water; freely soluble in glycerol. A 4% solution in water has a pH of 9.0 to 9.6.

The BP 2008 gives Sodium Borate and Sodium Tetraborate as official synonyms.

USNF 26 (Sodium Borate). Odourless transparent colourless crystals or white crystalline powder. Its solutions are alkaline to phenolphthalein. It effloresces in warm dry air. Soluble 1 in 16 of water, 1 in 1 of boiling water, and 1 in 1 of glycerol; insoluble in alcohol. Store in airtight containers.

Boric Acid

Acide borique; Ácido bórico; Acidum boricum; Boorihappo; Boracic Acid; Borato rügštis; Borsäure; Bórsav; Borsyra; E284; Kwas borowy; Kyselina boritá; Orthoboric Acid; Sal Sedativa de Homberg.

$\text{H}_3\text{BO}_3 = 61.83$.

CAS — 10043-35-3.

ATC — S02AA03.

ATC Vet — QS02AA03.



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

Ph. Eur. 6.2 (Boric Acid). Colourless shiny plates greasy to the touch, or white or almost white crystals, or white or almost white crystalline powder. Soluble in water and in alcohol; freely soluble in boiling water and in glycerol (85%). A 3.3% solution in water has a pH of 3.8 to 4.8.

USNF 26 (Boric Acid). Odourless, colourless, somewhat pearly lustrous scales, or crystals, or white powder, slightly unctuous to the touch. Soluble 1 in 18 of water, 1 in 4 of boiling water, 1 in 18 of alcohol, 1 in 6 of boiling alcohol, and 1 in 4 of glycerol.

Stability. Boric acid volatilises in steam. It forms a complex with glycerol which is a stronger acid than boric acid.

Adverse Effects, Treatment, and Precautions

The main symptoms of acute boric acid poisoning are vomiting

and diarrhoea, abdominal pain, an erythematous rash involving both skin and mucous membranes, followed by desquamation, and stimulation or depression of the CNS. There may be convulsions and hyperpyrexia. There may also be renal tubular damage. Abnormal liver function and jaundice have been reported rarely. Death, resulting from circulatory collapse and shock, may occur within several days.

The slow excretion of boric acid can lead to cumulative toxicity during repeated use. Symptoms of chronic intoxication include anorexia, gastrointestinal disturbances, debility, confusion, dermatitis, menstrual disorders, anaemia, convulsions, and alopecia. Fatalities have occurred most frequently in young children after the accidental ingestion of solutions of boric acid or after the application of boric acid powder to abraded skin.

In the UK the use of boric acid, borates, and tetraborates in cosmetics is controlled: the concentration is limited to 5% in talcs, to 0.1% in products for oral hygiene, and to 3% in other cosmetic products; tetraborates are limited to 18% in bath products. Such cosmetic products should not be used in children under 3 years of age; preparations used for oral hygiene should not be swallowed; and topical preparations containing greater than the equivalent of 1.5% of boric acid should not be applied to peeling or irritated skin.

Deaths have resulted from absorption after lavage of body cavities with solutions of boric acid, and this practice is no longer recommended.

Inhaled boric acid and borax are pulmonary irritants.

Treatment of poisoning is symptomatic. The stomach should be emptied if the patient presents within 1 hour of ingesting a large amount of boric acid; activated charcoal is not effective. Haemodialysis may be of value in severe cases.

◇ In Great Britain pharmacists have been advised not to sell boric acid as such for use as a dusting powder (see also above). Pharmacists have also been advised not to supply Borax Glycerin or Honey of Borax, even with an appropriate warning, because of the hazards associated with the use of these preparations in infants.

Pharmacokinetics

Boric acid is absorbed from the gastrointestinal tract, from damaged skin, from wounds, and from mucous membranes. It does not readily penetrate intact skin. About 50% of the amount absorbed is excreted in the urine within 24 hours and most of the remainder is excreted within 96 hours of ingestion.

Uses and Administration

Boric acid possesses weak bacteriostatic and fungistatic properties; it has generally been superseded by more effective and less toxic disinfectants. It is used as a pesticide against ants and cockroaches.

Boric acid is used, usually with borax, as a buffer and antimicrobial in eye drops, and was formerly used as a soluble lubricant in solution-tablets. It is also used as a preservative for urine samples. Boric acid and borax are not used internally.

In the UK, the use of boric acid in cosmetics and toiletries is restricted (see above).

Borax is used similarly to boric acid and has also been used externally as a mild astringent and as an emulsifier in creams. Preparations of borax in glycerol or in honey (Borax Glycerin; Honey of Borax) were formerly used as paints for the throat, tongue, and mouth, but should not be used because of the risk of toxicity.

Other salts of boric acid, including potassium and zinc salts, have been used.

Homoeopathy. Boric acid has been used in homoeopathic medicines under the following names: Acidum boricum; Acidum Boracicum; Ac. boric.

Borax has been used in homoeopathic medicines under the following names: Natrium tetraboracicum.

Antimicrobial activity. Evaluation of the antimicrobial activity of 1.22% borate buffer.¹

- Houlsby RD, et al. Antimicrobial activity of borate-buffered solutions. *Antimicrob Agents Chemother* 1986; **29**: 803–6.

Urine preservation. Boric acid in concentrations of about 2% may be a suitable preservative for urine samples in transit requiring bacteriological examination.^{1,2} However, overnight storage of specimens preserved with boric acid may significantly alter culture results.³

- Porter IA, Brodie J. Boric acid preservation of urine samples. *BMJ* 1969; **2**: 353–5.
- Lum KT, Meers PD. Boric acid converts urine into an effective bacteriostatic transport medium. *J Infect* 1989; **18**: 51–8.
- Gillespie T, et al. The effect of specimen processing delay on borate urine preservation. *J Clin Pathol* 1999; **52**: 95–8.

Vaginitis. Vaginal candidiasis (p.518) caused by *Candida glabrata* and other non-*albicans* species frequently responds to topical boric acid.^{1,2} Satisfactory clinical and mycological responses to topical boric acid were reported in 2 patients with *Candida glabrata* vaginitis who had not responded to repeated courses ofazole antifungals.³ Treatment with boric acid effected clinical and mycological cure in 4 of 6 patients with refractory vaginitis caused by *C. krusei*.⁴ Long-term boric acid treatment showed

promise in the treatment and prevention of relapses of vulvovaginal candidiasis, but its efficacy ended when treatment was stopped.⁵

- Sobel JD, Chaim W. Treatment of *Torulopsis glabrata* vaginitis: retrospective review of boric acid therapy. *Clin Infect Dis* 1997; **24**: 649–52.
- Pappas PG, et al. Infectious Diseases Society of America. Guidelines for treatment of candidiasis. *Clin Infect Dis* 2004; **38**: 161–89. Also available at: <http://www.journals.uchicago.edu/doi/pdf/10.1086/380796> (accessed 24/07/08).
- Redondo-Lopez V, et al. *Torulopsis glabrata* vaginitis: clinical aspects and susceptibility of antifungal agents. *Obstet Gynecol* 1990; **76**: 651–5.
- Singh S, et al. Vaginitis due to *Candida krusei*: epidemiology, clinical aspects, and therapy. *Clin Infect Dis* 2002; **35**: 1066–70.
- Guaschino S, et al. Efficacy of maintenance therapy with topical boric acid in comparison with oral itraconazole in the treatment of recurrent vulvovaginal candidiasis. *Am J Obstet Gynecol* 2001; **184**: 598–602.

Preparations

BP 2008: Kaolin Poultrice;
BPC 1973: Magenta Paint; Surgical Chlorinated Soda Solution;
USP 31: Rose Water Ointment.

Proprietary Preparations (details are given in Part 3)

Canad.: Eye Wash; **Fr.:** Dacryum; Hydralin; Optrex; **Pol.:** Aphthin; Borasol; Gemiderma; **Turk.:** Biora; **Venez.:** Sax.

Multi-ingredient: **Arg.:** Anusol; Baby-Tex; Banofal†; Bentophyto; Calcsan Bebe; Fungocop; Ginesepina†; Griseopius; Hipoglos Cicatrizante; Hipoglos con Hidrocortisona; Histidanol†; Hyaluron; Ingal; Lagrimas de Santa Lucia†; Lemil; Parancias†; Perfungand†; Phylarm; Plusederm†; Prusedan; Sebulex; **Austral.:** Gold Cross BOZ Ointment†; **Austria:** Coldophthal; Ophthalguttal; **Belg.:** Alcasol; Boradine; Borostroyl; Ocal; Sedemol; Sulfia-Sedemol; **Braz.:** Adeglos†; Antiphlogistine†; Bluderm†; Candem†; Cloraseptic; Colpaxen†; Dermosed†; Dinil; Gynax-N; Gyrol†; Hicicler; Hipodermon; Laviloh†; Leucocida†; Lucretin; Malvona†; Oto-Biotic†; Oturga; Po Antiseptico; Polivilho Antiseptico†; Pomaderme; Senophile†; Talco Alivio†; Vagtrin-N; Visiplex; Visual†; **Canad.:** British Army Foot Powder†; Thunus Eye Drops†; **Chile:** Dexam; Frescansol; Hipoglos; Homeoplasmina†; Perfungol; **Cz.:** Aphlox†; Herbadent; Ophthal; Ophthalm-Septonex; Pityol; **Fin.:** OtiBoron; **Fr.:** Borostroyl; Dacryoboroline; Dacryoserum; Dacudoses; Eau Precieuse; Homeoplasmine; Hydralin; Ophtadair; Ophthalmine; Paps; Pate a l'Eau Roche-Posay†; Phylarm†; Sophtal; **Ger.:** Emsinger Schiller-Quelle Heilwasser†; **Gr.:** Oulogram; Septobore; Vaseline Bonique; **Hong Kong:** Eye Glo Plus; Eye Glo Regular; Eye Wash; Gly Thymol; Hydralin; **India:** Andre; Feel Chill; New Eye Lotion; Proto-Boric; **Indon.:** Skintex; Verile; **Irl.:** Phytex; **Israel:** Gargol; **Ital.:** Aquasalina†; Bagno Oculare†; Bergacil; Boma; Fotofit; Fucsina Fenica; **Mex.:** Clarex; Forcremol; Hipoglos; Lav Ofteno; Lowila; Oftaboril; Tokolino; **Mon.:** Boroclarine; **Philipp.:** Soothing Eye Wash; United Home Burn Ointment; **Pol.:** Acifungin; Afronis; Dentosept A; Gargarin; Hemolecta; Neo-Tormentil; Pigmentum Castellani; Tormentile Forte; Tormentol; **Rus.:** Contrareptin T (Контрацептин Т); Lysoplac (Лизоплак); Osarbon (Осарбон); **S.Afr.:** Anugesc; Caloplast; Prep; Universal Eye Drops; Vagorol; **Singapore:** Eye Mo†; New Daigaku†; **Spain:** Banofal; Cloran Hemidex; Coliocolina Adren Astr; Dermomyose Liquido; Fungusol; Lamnotyl†; Milrosina; Natusan; Oftalmol Ocular; Pomada Infantil Vera†; Topico Dention Vera†; Vaseline Boricada; Zolina; **Swed.:** Antasten-Prvin; **Thai.:** Eye Mo; Eye-Genie; Eye-Genie Soft; Mano; Opliplin; Opsil†; Optal; Optic; Quinradon-N; Visotone; **Turk.:** Antidito; Dermikolin; Undo-Talk; **UK:** Oxy Clean Facial Scrub; Phytex; **USA:** BFI; Castademe; Collyrium for Fresh Eyes; Columbia Antiseptic Powder; Dri/Ear; Ear-Dry; Paladin; Phylorinol; RA Lotion; Saratoga; Seale's Lotion; Star-Otic; Trimo-San; **Venez.:** Ademina; Boramint†; Bori-Zinc†; Borocanfor; Borogin; Diodonato†; Hipoglos†; Micofeet; Polifix†; Sebaxyl.

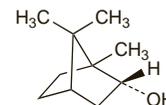
Borneol

Baros Camphor; Bhimsaim Camphor; British Camphor; Borneokampfer; Bormyl Alcohol; Camphol; Dryobalanops Camphor; Malayan Camphor; Sumatra Camphor. endo-1,7,7-Tri-methylbicyclo[2.2.1]heptan-2-ol.

Борнеол

$\text{C}_{10}\text{H}_{18}\text{O} = 154.2$.

CAS — 507-70-0.



Pharmacopoeias. In *Chin* as synthetic borneol (Borneolum Syntheticum).

Profile

Borneol is a constituent of several essential oils. It has antiseptic and antispasmodic actions and is included in preparations for the treatment of biliary- and urinary-tract disorders.

Preparations

Proprietary Preparations (details are given in Part 3)

Multi-ingredient: **Austria:** Rowachol; Rowatnex; **Chile:** Rowatnex; **Cz.:** Rowachol; Rowatnex; **Fr.:** Biolar; **Ger.:** Rowachol; Rowachol comp†; Rowachol-Digestiv†; Rowatnex; **Hong Kong:** Neo-Rowachol; Neo-Rowatnex; Rowachol; Rowatnex; **Hung.:** Rowachol; Rowatnex; **Irl.:** Rowachol; Rowatnex; **Israel:** Rowachol; Rowatnex; **Malaysia:** Rowachol; Rowatnex; **Mex.:** Cholex; **Philipp.:** Mentopas; Rowachol; Rowatnex; **Pol.:** Rowachol; Rowatnex; Terpichol; **Singapore:** New Daigaku†; **Spain:** Rowachol; Rowanefrin; **Switz.:** Rowachol; **Thai.:** Rowachol; Rowatnex; **UK:** Rowachol; **Venez.:** Rowachol; Rowatnex.