

Ferrum Hausmann; Unifer†; **Malaysia:** Venofer; **Mex.:** Venoferrum; **Neth.:** Venofer; **Norw.:** Venofer; **NZ:** Venofer; **Port.:** Venofer; **S.Afr.:** Venofer; **Singapore:** Venofer; **Spain:** Feriv; Venofer; **Swed.:** Venofer; **Switz.:** Venofer; **Thai.:** Venofer; **Turk.:** Venofer; **UK:** Venofer; **USA:** Venofer; **Venez.:** Venofer.

**Multi-ingredient:** Ger.: Hicoton†; Junisana†; Selectafer N†.

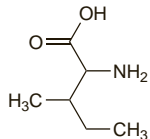
### Isoleucine (USAN, INN)

I; Ile; Isoleucin; Isoleucina; L-Isoleucine; Isoleucinum; Isoleusiini; Izoleucin; Izoleucinas. L-2-Amino-3-methylvaleric acid.

Изолейцин

$C_6H_{13}NO_2 = 131.2$ .

CAS — 73-32-5.



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

**Ph. Eur. 6.2** (Isoleucine). A white or almost white, crystalline powder or flakes. Sparingly soluble in water; slightly soluble in alcohol. It dissolves in dilute mineral acids and in dilute solutions of alkali hydroxides. Protect from light.

**USP 31** (Isoleucine). White, practically odourless crystals. Soluble in water; slightly soluble in hot alcohol; insoluble in ether. pH of a 1% solution in water is between 5.5 and 7.0.

### Profile

Isoleucine is a branched-chain aliphatic amino acid that is an essential constituent of the diet. It is used as a dietary supplement. It is also an ingredient of several preparations that have been promoted for disorders of the liver.

### Preparations

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

**Multi-ingredient:** Ger.: Bramin-hepa†; Falkamin; **Ital.:** Falkamin†; Iso-branch; Isoram.

### Isomalt (BAN)

Bay-i-3930; E953; Isomalta; Isomalti; Isomaltitol; Isomaltum; Izomalt; Izomaltas; Palatinit.

CAS — 64519-82-0.

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

**Ph. Eur. 6.2** (Isomalt). A mixture of 6-O- $\alpha$ -D-glucopyranosyl-D-glucitol ( $C_{12}H_{24}O_{11} = 344.3$ ) and 1-O- $\alpha$ -D-glucopyranosyl-D-mannitol dihydrate ( $C_{12}H_{24}O_{11} \cdot 2H_2O = 380.3$ ) and neither of the two components is less than 3%, calculated with reference to the anhydrous substance. A white or almost white powder or granules. Freely soluble in water; practically insoluble in dehydrated alcohol.

**USNF 26** (Isomalt). 6-O- $\alpha$ -D-Glucopyranosyl-D-glucitol (1,6-GPS) and 1-O- $\alpha$ -D-glucopyranosyl-D-mannitol (1,1-GPM), and neither of the two components is less than 3.0% of the mixture, calculated on the anhydrous basis.

### Profile

Isomalt is a sugar alcohol (polyol) used as a bulk sweetener in foods. The ingestion of large quantities may produce flatulence and have a laxative effect.

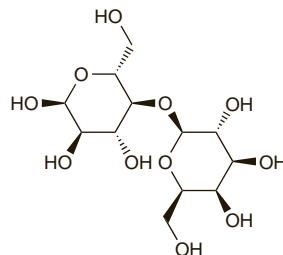
**Metabolism.** Isomalt is partly metabolised in the small intestine to glucose, mannitol, and sorbitol and the remaining isomalt is completely metabolised by the flora of the large intestine.<sup>1</sup> The Australian manufacturers have commented that the hydrolysis and absorption is minimal and does not significantly affect blood-sugar or insulin concentrations; they consider isomalt to be suitable for use by diabetic patients.<sup>2</sup>

1. FAO/WHO. Evaluation of certain food additives and contaminants: twenty-ninth report of the joint FAO/WHO expert committee on food additives. *WHO Tech Rep Ser* 733 1986.
2. Barnes JA. Martindale and isomalt. *Aust J Pharm* 1994; **75**: 183.

## Lactose

Lactosa; Lactosum; Laktoosi; Laktos; Laktosa; Laktóz; Laktoza; Laktozë; Lattosio; Milk Sugar; Saccharum Lactis; Saccharum Lactis.

CAS — 63-42-3 (anhydrous lactose); 5989-81-1 (lactose monohydrate); 10039-26-6 (lactose monohydrate, cyclic); 64044-51-5 (lactose monohydrate, open form).



(anhydrous lactose)

**Description.** Lactose is a disaccharide obtained from the whey of milk. It may exist in a number of distinct forms depending upon the crystallisation and drying processes employed. The forms can vary in the contents of crystalline and amorphous lactose, the amounts of  $\alpha$ -lactose (O- $\beta$ -D-galactopyranosyl-(1 $\rightarrow$ 4)- $\alpha$ -D-glucopyranose) and  $\beta$ -lactose (O- $\beta$ -D-galactopyranosyl-(1 $\rightarrow$ 4)- $\beta$ -D-glucopyranose), and in their hydration states. The  $\alpha$ -form of lactose exists in either the anhydrous ( $C_{12}H_{22}O_{11} = 342.3$ ) or monohydrate ( $C_{12}H_{22}O_{11} \cdot H_2O = 360.3$ ) state whereas the  $\beta$ -form exists only in the anhydrous state. Commercial lactose is mainly the  $\alpha$ -monohydrate.

**Pharmacopoeias.** In *Chin., Eur.* (see p.vii), *Int., Jpn.*, and *Viet.* Also in *USNF*. Some pharmacopoeias include separate monographs for anhydrous lactose and lactose monohydrate.

**Ph. Eur. 6.2** (Lactose, Anhydrous). It is  $\beta$ -lactose or a mixture of  $\alpha$ -lactose and  $\beta$ -lactose. A white or almost white, crystalline powder. Freely but slowly soluble in water; practically insoluble in alcohol.

**Ph. Eur. 6.2** (Lactose Monohydrate; Lactose BP 2008). It is the monohydrate of  $\alpha$ -lactose. It may be modified as to its physical characteristics and may contain varying proportions of amorphous lactose. A white or almost white, crystalline powder. Freely but slowly soluble in water; practically insoluble in alcohol. Store in airtight containers.

**USNF 26** (Anhydrous Lactose). It is  $\beta$ -lactose or a mixture of  $\alpha$ - and  $\beta$ -lactose. It is a white or almost white powder. Freely soluble in water; practically insoluble in alcohol. Store in airtight containers.

**USNF 26** (Lactose Monohydrate). It is a natural disaccharide, obtained from milk, which consists of one glucose and one galactose moiety. It may be modified as to its physical characteristics, and may contain varying proportions of amorphous lactose. It is a white, free-flowing powder. Freely, but slowly soluble in water; practically insoluble in alcohol. Store in airtight containers.

### Adverse Effects and Precautions

Lactose intolerance occurs due to a deficiency of the intestinal enzyme lactase. Ingestion of lactose by patients with lactase deficiency leads to a clinical syndrome of abdominal pain, diarrhoea, distension, and flatulence; symptoms may also occur in persons without such a deficiency who have ingested excessive amounts of lactose.

Lactose is contra-indicated in patients with galactosaemia, the glucose-galactose malabsorption syndrome, or lactase deficiency.

**Lactose intolerance.** Reviews of lactose intolerance.<sup>1-3</sup> The capacity of the infant intestine to produce lactase, the enzyme responsible for digesting lactose, is retained into adulthood only by a minority of the world's population, mostly in those of north European descent; in Africa and Asia more than 90% of the population are lactase deficient. Because of the ubiquity of lactose in the diet and the consequent frequency of abdominal symptoms, attempts have been made to treat lactose intolerance by dietary exclusion (which need not be complete since lactase deficiency is rarely absolute). An alternative is enzyme replacement therapy with  $\beta$ -galactosidase from micro-organisms (see Tilactase, p.2402), but the role of such therapy has yet to be fully determined. The findings of one study<sup>4</sup> suggested that, in adults with lactose intolerance, the use of lactose-digestive aids is unnecessary if lactose intake is limited to the equivalent of 240 mL of milk or less daily.

There has been concern that lactose might be contaminated with protein from milk, and it has been recommended that children with cow's milk allergy avoid lactose-containing foods. However, a small study<sup>5</sup> found that children allergic to cow's milk could still tolerate lactose.

For the use of soya in infants intolerant to cow's milk, see Food Intolerance, p.1967.

1. Anonymous. Lactose intolerance. *Lancet* 1991; **338**: 663-4.
2. Vesa TH, et al. Lactose intolerance. *J Am Coll Nutr* 2000; **19** (suppl): 165S-175S.

3. Heyman MB. Committee on Nutrition. Lactose intolerance in infants, children, and adolescents. *Pediatrics* 2006; **118**: 1279-86.
4. Suarez FL, et al. A comparison of symptoms after the consumption of milk or lactose-hydrolysed milk by people with self-reported severe lactose intolerance. *N Engl J Med* 1995; **333**: 1-4.
5. Fioocchi A, et al. Clinical tolerance to lactose in children with cows' milk allergy. *Pediatrics* 2003; **112**: 359-62.

### Pharmacokinetics

Lactose is hydrolysed by lactase in the small intestine to glucose and galactose, which are then absorbed.

### Uses and Administration

Lactose, the carbohydrate component of milk, is less sweet than sucrose.

Lactose is widely used as an excipient in pharmaceutical manufacturing. In the production of capsules or tablets it may be used as a diluent, bulking agent, or filler, and in powders as a bulking agent. Lactose is also used as a carrier for drugs in dry powder inhalers. Characteristics such as particle size or flow characteristics make different grades of lactose suitable for different applications.

### Preparations

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

**Multi-ingredient:** **Austria:** Idthh-Oestren; **Fr.:** Tavag.

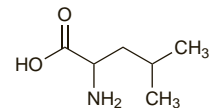
### Leucine (USAN, INN)

$\alpha$ -Aminoisocaproic Acid; L; Leu; Leucin; Leucina; Leucinas; L-Leucine; Leucinum; Leucyna; Leusiini. L-2-Amino-4-methylvaleric acid.

Лейцин

$C_6H_{13}NO_2 = 131.2$ .

CAS — 61-90-5.



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

**Ph. Eur. 6.2** (Leucine). A white or almost white, crystalline powder or shiny flakes. Sparingly soluble in water; practically insoluble in alcohol. It dissolves in dilute mineral acids and in dilute solutions of alkali hydroxides. Protect from light.

**USP 31** (Leucine). White, practically odourless crystals. Sparingly soluble in water; insoluble in ether. pH of a 1% solution in water is between 5.5 and 7.0.

### Profile

Leucine is a branched-chain aliphatic amino acid that is an essential constituent of the diet. It is used as a dietary supplement. It is also an ingredient of several preparations that have been promoted for disorders of the liver.

### Preparations

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

**Multi-ingredient:** **Fr.:** Revitalose; **Ger.:** Bramin-hepa†; Falkamin; **Ital.:** Falkamin†; Isobranch; Isoram.

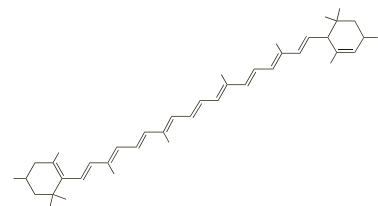
### Lutein

E161 (b); Xanthophyll. (3R,3'R,6'R)- $\beta$ , $\epsilon$ -Carotene-3,3'-diol.

Лютеин

$C_{40}H_{56}O_2 = 568.9$ .

CAS — 127-40-2.



**Pharmacopoeias.** In *US*.

**US** also includes Lutein Preparation.

**USP 31** (Lutein). A red crystalline powder. Soluble in dehydrated alcohol, in dichloromethane, and in ethyl acetate; partially soluble in hexane. Store at 8° to 15° in tightly-sealed, airtight containers. Protect from light and oxygen.