DESCRIPTION

ORAL NUTRITIOUS COMPOSITION

TECHNICAL FIELD

The invention relates to an oral nutritious composition, especially an oral nutritious composition with a suppressed bitterness.

BACKGROUND ART

Oral nutritious compositions are used to improve the nutritional condition of patients or healthy persons and widely employed in the medical field and the like. The oral nutritious composition is usually taken in a dissolved or suspended form in solvents such as water.

However, the solution or the suspension of the oral nutritious composition tastes bitter, placing a burden on patients and the like when taken.

As an oral nutritious composition whose bitterness at the time of ingestion is suppressed, the granule preparation disclosed in Japanese granted patent publication No. 3,211,824 is known. The granted patent publication teaches a method for producing a pharmaceutical granule preparation by granulating materials mainly containing three kinds of branched chain

amino acid particles, i.e., isoleucine, leucine and valine particles, wherein the particle size of each isoleucine and leucine is adjusted to 20 to 700 μm. It is described in paragraph 0002 of the above-mentioned publication that the flavor of the preparation is too disagreeable to take when the particle size of branched chain amino acids is small. Moreover, it is described in paragraph 0005 of the above-mentioned publication that granule preparation in which bitterness at the time of ingestion is suppressed can be obtained by adjusting the size of the branched chain amino acid material particles in the granulation process to be larger than that of usual material particles.

However, as described in paragraph 0034 of the above patent publication, the granules are placed in the mouth and swallowed together with water as the means of ingestion. Then, the bitterness and the aftertaste immediately after ingestion are examined. According to a study by the present inventor, the bitterness of a solution or a suspension obtained by dissolving or suspending the granule preparation described in the above publication in water is not suppressed.

Moreover, in order to produce the granule preparation described in the above publication, a plant for granulation and a granulation process are necessary, which raises the production cost.

DISCLOSURE OF THE INVENTION

An object of the present invention is to provide an oral nutritious composition comprising a branched amino acid and a simple production method thereof, wherein the bitterness tasted at the time of taking a solution or a suspension obtained by partly dissolving or suspending the composition is suppressed.

The present inventor conducted extensive research to attain the above object and found that an oral nutritious composition having a suppressed bitterness at the time of ingestion can be attained by an easy process of adjusting the particle size of three kinds of branched chain amino acid, i.e., valine, leucine and isoleucine, within a specific range. Moreover, the inventor also found that an oral nutritious composition that has further suppressed bitterness at the time of ingestion can be attained without losing its easy-to-swallow attribute by adjusting the particle size of each branched chain amino acid, i.e., valine, leucine and isoleucine, within a specific range.

The present invention has been accomplished based on the above findings, and provides the following oral nutritious composition, the production method thereof, and the like.

Item 1. An oral nutritious composition comprising: (a) three branched chain amino acids, the branched chain amino acids being valine, leucine and isoleucine; or (b) a mixture of unbranched chain amino acids and the three branched chain amino acids of valine, leucine and isoleucine; wherein the branched chain amino acids are not granulated and have particle sizes such that 10 wt% or less thereof pass through a sieving mesh having 106-μm(preferably 105-μm) openings.

Item 2. The oral nutritious composition according to the item 1, wherein the particle sizes of the branched chain amino acids that remain in the sieving mesh having 106-μm(preferably 105-μm) openings after being sifted are 106(preferably 105) to 710 μm.

Item 3. The oral nutritious composition according to the item 2, wherein the particle sizes of the valine that remains in the sieving mesh having 106-μm(preferably 105-μm) openings after being sifted are 180 to 500 μm, the particle sizes of the leucine that remains in the sieving mesh having 106-μm(preferably 105-μm) openings after being sifted are 180 to 500 μm, and the particle sizes of the isoleucine that remains in the sieving mesh having 106-μm(preferably 105-μm) openings after being sifted are 180 to 500 μm.

Item 4. The oral nutritious composition according to the

item 1, 2 or 3 comprising the mixture of unbranched amino acids and the three branched chain amino acids of valine, leucine and isoleucine, wherein the branched chain amino acids are not granulated and have particle sizes such that 10 wt% or less thereof pass through a sieving mesh having 106-μm(preferably 105-μm) openings.

Item 5. The oral nutritious composition according to the item 4, comprising 10 to 25 weight parts of the unbranched amino acids based on 100 weight parts of the branched chain amino acids.

Item 6. The oral nutritious composition according to the item 5, wherein the composition comprises 2 to 5 wt% of valine, 3 to 6 wt% of leucine, 3 to 6 wt% of isoleucine, 0.3 to 0.7 wt% of lysine hydrochloride, 0.1 to 0.4 wt% of threonine, 0.4 to 0.8 wt% of arginine hydrochloride, 0.2 to 0.5 wt% of histidine hydrochloride and 0.05 to 0.2 wt% of tryptophan.

Item 7. The oral nutritious composition according to the item 6, wherein 50 g of the composition comprises 1.2 to 2 g of *L*-valine, 1.6 to 2.2 g of *L*-leucine, 1.6 to 2.2 g of *L*-isoleucine, 0.1 to 0.3 g of lysine hydrochloride, 0.1 to 0.2 g of *L*-threonine, 0.2 to 0.4 g of *L*-arginine hydrochloride, 0.1 to 0.3 g of *L*-histidine hydrochloride, 50 to 90 mg of *L*-tryptophan, 5 to 8 g of gelatin hydrolysate, 2 to 5 g of rice oil, 25 to 40 g of dextrin,

300 to 600 I.U. of retinol palmitate, 30 to 60 I.U. of ergocalciferol, 0.1 to 0.2 mg of bisbenthiamine, 0.1 to 0.2 mg riboflavin, 0.1 to 0.3 mg of pyridoxine hydrochloride, 0.3 to 0.7 μg of cyanocobalamin, 30 to 70 μg of folic acid, 5 to 9 mg sodium *L*-ascorbate, 7 to 12 mg of tocopherol acetate, 4 to 7 μg of phytonadione, 1 to 1.5 mg of calcium pantothenate, 1 to 2 mg of nicotinic acid amide, 15 to 40 μg of biotin, 9 to 16 mg of choline bitartrate, 0.15 to 0.25 g of magnesium sulfate, 0.25 to 0.35 g of calcium glycerophosphate, 0.15 to 0.25 g of crystal sodium dihydrogen phosphate, 10 to 15 mg of sodium ferrous citrate, 0.3 to 0.7 mg of copper sulfate, 3 to 4.5 mg of zinc sulfate, 10 to 15 μg of potassium iodide, 0.6 to 1 mg of manganese sulfate, and 0.15 to 0.23 g of potassium chloride.

Item 8. The oral nutritious composition according to the item 7, wherein 50 g of the composition comprises 1.602 g of *L*-valine, 2.037 g of *L*-leucine, 1.9225 g of *L*-isoleucine, 0.2425 g of lysine hydrochloride, 0.133 g of *L*-threonine, 0.302 g of *L*-arginine hydrochloride, 0.1875 g of *L*-histidine hydrochloride, 73.5 mg of *L*-tryptophan, 6.5 g of gelatin hydrolysate, 3.5 g of rice oil, 31.05 g of dextrin, 466 I.U. of retinol palmitate, 46.6 I.U. of ergocalciferol, 0.145 mg of bisbenthiamine, 0.155 mg of riboflavin, 0.245 mg of pyridoxine hydrochloride, 0.5 μg

of cyanocobalamin, 50 μg of folic acid, 6.9 mg of sodium *L*-ascorbate, 9.3 mg of tocopherol acetate, 5.5 μg of phytonadione, 1.19 mg of calcium pantothenate, 1.515 mg of nicotinic acid amide, 25 μg of biotin, 12.3 mg of choline bitartrate, 0.205 g of magnesium sulfate, 0.305 g of calcium glycerophosphate, 0.195 g of crystal sodium dihydrogen phosphate, 12.5 mg of sodium ferrous citrate, 0.515 mg of copper sulfate, 3.755 mg of zinc sulfate, 12.5 μg of potassium iodide, 0.815 mg of manganese sulfate, and 0.1875 g of potassium chloride.

Item 9. A method for suppressing a bitterness of a composition comprising: (a) three branched chain amino acids, the branched chain amino acids being valine, leucine and isoleucine; or (b) a mixture of unbranched chain amino acids and the three branched chain amino acids of valine, leucine and isoleucine; wherein the branched chain amino acids are not granulated and have particle sizes such that 10 wt% or less thereof pass through a sieving mesh having 106-μm(preferably 105-μm) openings.

Item 10. A method for producing an oral nutritious composition comprising: mixing valine, leucine and isoleucine, each of which is nongranulated and has particle sizes such that 10 wt% or less thereof pass through a sieving mesh having 106-μm(preferably 105-μm) openings; and additionally mixing unbranched chain amino

acids as necessary.

Item 11. An oral nutritious composition comprising: (a) three branched chain amino acids, the branched chain amino acids being valine, leucine and isoleucine; or (b) a mixture of unbranched chain amino acids and the three branched chain amino acids of valine, leucine and isoleucine; wherein the branched chain amino acids are not granulated and have particle sizes such that 10 wt% or less thereof pass through a sieving mesh having 105-μm openings.

The present invention provides an oral nutritious composition wherein the bitterness tasted at the time of taking a solution or a suspension obtained by partly dissolving or suspending the composition in water or like solvent is suppressed. The oral nutritious composition of the invention does not affect the absorptivity to the body.

The invention provides a method for producing the above oral nutritious composition by a simple production process at low cost without requiring special operations such as granulation, coating and the like.

DETAILED DESCRIPTION OF THE INVENTION

The invention will be described below in detail.

(1) Oral nutritious composition of the invention

1-1) Oral nutritious composition

Fundamental constitution

The oral nutritious composition according to the invention contains: (a) three kinds of branched amino acids, i.e. valine, leucine and isoleucine; or (b) a mixture of unbranched chain amino acids and three branched amino acids (i.e. valine, leucine and isoleucine); wherein the branched amino acids are not granulated and have particle sizes such that 10 wt% or less thereof pass through a sieving mesh having 106-μm openings.

The present composition is usually a solid composition (e.g. composition in the form of powders).

Branched chain amino acid

In the invention, "nongranulated branched chain amino acid" refers to a branched chain amino acid that is produced by, for example, fermentation method or synthesis method and not shaped into granules using an excipient or a binder. Examples of the excipient or binder include cellulose derivatives, starches, synthesized polymers, natural polymers and the like. Even if a nongranulated branched chain amino acid in the present composition contains the above excipient or binder, the branched chain amino acid is included in "nongranulated branched chain amino acid" as long as the excipient or binder is in such amount that it would not be involved in the granule

formation.

The nongranulated branched chain amino acids used in the invention have particle sizes such that normally 10 wt% or less, preferably 5 wt% or less, and more preferably 3 wt% or less thereof pass through a sieving mesh having 106-μm openings.

When the nongranulated branched chain amino acids are sifted through a sieving mesh having 106-μm openings, the particle sizes of the branched chain amino acids remaining on the sieving mesh may be preferably about 106 to about 710 μm, more preferably about 125 to about 600 μm, and further more preferably about 180 to about 500 μm. If the particle sizes are within the above range, the bitterness is sufficiently suppressed and the following are not likely to occur: precipitation during preparation of the solution or suspension, unnatural sensation in the mouth at the time of ingestion, lodging between the teeth, adhering to false teeth, or being separated from other ingredients during production of the oral nutritious composition.

It is important for the present oral nutritious composition that each branched chain amino acid, valine, leucine or isoleucine remaining on the sieving mesh having 106-μm openings has particle sizes within a specific range. In such cases, the bitterness can be suppressed more.

Specifically, when valine, leucine or isoleucine is respectively sifted through the sieving mesh having 106-μm openings, the particle sizes of valine, leucine or isoleucine remaining on the sieving mesh may be preferably about 106 to about 710 μm, more preferably about 125 to about 600 μm, and further more preferably about 180 to about 500 μm.

These branched chain amino acids may either be *L*-, *D*- or *DL*-form. Preferable branched chain amino acid is *L*-form.

Unbranched chain amino acids

The amino acids contained in the present oral nutritious composition may be either only branched chain amino acids or branched chain amino acids together with unbranched chain amino acids. It is preferable to contain unbranched chain amino acids together with branched chain amino acids.

The unbranched chain amino acid refers to an amino acid other than valine, leucine and isoleucine, having no branched carbon skeleton. As the unbranched chain amino acid, the one usually contained in an oral nutritious composition can be used without limits. Examples of the unbranched chain amino acid include lysine, threonine, arginine, histidine, tryptophan and the like. These unbranched chain amino acids may either be *L*-, *D*- or

DL-form. Preferably, the unbranched chain amino acid is *L*-form. These amino acids may be in the form of acid addition salt to which an acid, such as a hydrochloric acid, is added.

Content ratio

In the case unbranched chain amino acids are contained in the present oral nutritious composition, the ratio of branched chain amino acids and unbranched chain amino acids is not particularly limited and can be suitably selected from a wide range. For example, it is preferable that about 10 to about 25 weight parts, especially about 15 to about 20 weight parts of unbranched chain amino acids are contained based on 100 weight parts of branched chain amino acids.

Preferable composition

A preferable oral nutritious composition of the present invention contains in the total weight: about 2 to about 5 wt% of valine, about 3 to about 6 wt% of leucine, about 3 to about 6 wt% of isoleucine, about 0.3 to about 0.7 wt% of lysine hydrochloride, about 0.1 to about 0.4 wt% of threonine, about 0.4 to about 0.8 wt% of arginine hydrochloride, about 0.2 to about 0.5 wt% of histidine hydrochloride and about 0.05 to about 0.2 wt% of tryptophan.

Other than branched chain amino acid and

unbranched chain amino acid, the present oral nutritious composition may contain various compounding agents usually used in the field. Examples of such compounding agent may include gelatin hydrolysate, rice oil, dextrin, retinol palmitate, ergocalciferol, bisbenthiamine, riboflavin, pyridoxine hydrochloride, cyanocobalamin, folic acid, sodium *L*-ascorbate, tocopherol acetate, phytonadione, calcium pantothenate, nicotinic acid amide, biotin, choline bitartrate, magnesium sulfate, calcium glycerophosphate, crystal sodium dihydrogen phosphate, sodium ferrous citrate, copper sulfate, zinc sulfate, potassium iodide, manganese sulfate, potassium chloride, etc.

In the concrete example of preferable chemical constituents of the present oral nutritious composition, 50 g of the composition may comprise: about 1.2 to about 2 g of *L*-valine, about 1.6 to about 2.2 g of *L*-leucine, about 1.6 to about 2.2 g of *L*-isoleucine, about 0.1 to about 0.3 g of lysine hydrochloride, about 0.1 to about 0.2 g of *L*-threonine, about 0.2 to about 0.4 g of *L*-arginine hydrochloride, about 0.1 to about 0.3 g of *L*-histidine hydrochloride, about 50 to about 90 mg of *L*-tryptophan, about 5 to about 8 g of gelatin hydrolysate, about 2 to about 5 g of rice oil, about 25 to about 40 g of dextrin, about 300 to about 600 I.U. of retinol

palmitate, about 30 to about 60 I.U. of ergocalciferol, about 0.1 to about 0.2 mg of bisbenthiamine, about 0.1 to about 0.2 mg riboflavin, about 0.1 to about 0.3 mg of pyridoxine hydrochloride, about 0.3 to about 0.7 µg of cyanocobalamin, about 30 to about 70 µg of folic acid, about 5 to about 9 mg sodium *L*-ascorbate, about 7 to about 12 mg of tocopherol acetate, about 4 to about 7 µg of phytonadione, about 1.0 to about 1.5 mg of calcium pantothenate, about 1 to about 2 mg of nicotinic acid amide, about 15 to about 40 µg of biotin, about 9 to about 16 mg of choline bitartrate, about 0.15 to about 0.25 g of magnesium sulfate, about 0.25 to about 0.35 g of calcium glycerophosphate, about 0.15 to about 0.25 g of crystal sodium dihydrogen phosphate, about 10 to about 15 mg of sodium ferrous citrate, about 0.3 to about 0.7 mg of copper sulfate, about 3 to about 4.5 mg of zinc sulfate, about 10 to about 15 µg of potassium iodide, about 0.6 to about 1 mg of manganese sulfate, and about 0.15 to about 0.23 g of potassium chloride.

In a concrete example of more preferable chemical constituents of the present oral nutritious composition, 50 g of the composition may comprise: 1.602 g of *L*-valine, 2.037 g of *L*-leucine, 1.9225 g of *L*-isoleucine, 0.2425 g of lysine hydrochloride, 0.133 g of *L*-threonine, 0.302 g of *L*-arginine hydrochloride, 0.1875 g

of *L*-histidine hydrochloride, 73.5 mg of *L*-tryptophan, 6.5 g of gelatin hydrolysate, 3.5 g of rice oil, 31.05 g of dextrin, 466 I.U. of retinol palmitate, 46.6 I.U. of ergocalciferol, 0.145 mg of bisbenthiamine, 0.155 mg of riboflavin, 0.245 mg of pyridoxine hydrochloride, 0.5 μg of cyanocobalamin, 50 μg of folic acid, 6.9 mg of sodium *L*-ascorbate, 9.3 mg of tocopherol acetate, 5.5 μg of phytonadione, 1.19 mg of calcium pantothenate, 1.515 mg of nicotinic acid amide, 25 μg of biotin, 12.3 mg of choline bitartrate, 0.205 g of magnesium sulfate, 0.305 g of calcium glycerophosphate, 0.195 g of crystal sodium dihydrogen phosphate, 12.5 mg of sodium ferrous citrate, 0.515 mg of copper sulfate, 3.755 mg of zinc sulfate, 12.5 μg of potassium iodide, 0.815 mg of manganese sulfate, and 0.1875 g of potassium chloride.

1-2) Method for producing the oral nutritious composition

The method of the present invention for producing the oral nutritious composition comprises: mixing valine that is nongranulated and has particle sizes such that 10 wt% or less thereof pass through a sieving mesh having 106-μm openings, leucine that is nongranulated and has particle sizes such that 10 wt% or less thereof pass through a sieving mesh having 106-μm openings and isoleucine that is nongranulated and has particle sizes such that 10 wt% or less thereof pass through a sieving

mesh having 106-μm openings; and mixing unbranched chain amino acids if necessary.

The way to acquire nongranulated valine, leucine and isoleucine having the above-described particle sizes is not particularly limited. For example, they can be acquired by sifting out commercially available nongranulated valine powders, leucine powders and isoleucine powders, respectively. The commercially available valine, leucine and isoleucine are generally produced by fermentation method or synthesis method.

The nongranulated branched chain amino acid particles, of which generally 10 wt% or less, preferably 5 wt% or less, more preferably 3 wt% or less pass through a sieving mesh with 106-μm openings, are used in this invention.

When the branched chain amino acids are sifted through a sieving mesh having 106-μm openings, the particle sizes of the branched chain amino acids remaining on the sieving mesh may be preferably about 106 to about 710 μm, more preferably about 125 to about 600 μm, and further more preferably about 180 to about 500 μm.

When valine, leucine or isoleucine is respectively sifted through the sieving mesh having 106-μm openings, the particle sizes of valine, leucine or isoleucine remaining on the sieving mesh may be preferably

about 106 to about 710 μm, more preferably about 125 to about 600 μm, and further more preferably about 180 to about 500 μm. This results in an oral nutritious composition with a bitterness further suppressed.

These branched chain amino acids may either be *L*-, *D*- or *DL*-form. Preferable branched chain amino acid is *L*-form.

In the present method, unbranched chain amino acids may be either contained or not contained, but preferably contained. Available unbranched chain amino acids are described above. The ratio of branched chain amino acids and unbranched chain amino acids in the case of using the unbranched chain amino acids is also described above.

1-3) Method for suppressing bitterness of an oral nutritious composition comprising branched chain amino acids

The method of the invention for suppressing a bitterness of an oral nutritious composition comprising branched chain amino acids is: a method for suppressing a bitterness of a composition comprising (a) three branched chain amino acids, the branched chain amino acids being valine, leucine and isoleucine, or (b) a mixture of unbranched chain amino acids and the three branched chain amino acids of valine, leucine and isoleucine; wherein the

branched chain amino acids are not granulated and have particle sizes such that 10 wt% or less thereof pass through a sieving mesh having 106-μm openings.

The acquisition of the nongranulated branched chain amino acids and the adjustment of particle sizes are as described above.

1-4) Method for using an oral nutritious composition

In using the oral nutritious composition of the present invention, a suspension or a solution obtained by partly dissolving or suspending the present composition in suitable amount of water or like solvents may be administered to a patient or a healthy person. The bitterness of the solution or suspension is suppressed when it is taken immediately after the preparation.

Since the oral nutritious composition of the invention contains branched chain amino acids with large particle sizes, the solution rate of the branched chain amino acids is low and the dissolved amount of them is small when suspended in a solvent. Accordingly, the concentration of the branched chain amino acids in the solution is low so that the bitterness is hardly tasted, even if a part of the branched chain amino acids are dissolved. Moreover, even if the solution or suspension is preserved at low temperature for a long period of time, there are few increases in bitterness, that is, the

bitterness is kept suppressed. Alternatively, the present oral nutritious composition can be taken as it is.

The present nutritious composition can be preferably administered to a patient of liver failures such as liver cirrhosis, thereby supplying nutrition.

EXAMPLES

Preparation Examples and Test Examples are given below to illustrate the present invention in further detail, but they are not intended to limit the scope of the invention.

Preparation Example 1

The present nutritious composition having a total amount of 50 g was prepared by mixing the components shown below.

L-valine	1.602 g
L-leucine	2.037 g
L-isoleucine	1.9225 g
lysine hydrochloride	0.2425 g
L-threonine	0.133 g
L-arginine hydrochloride	0.302 g
L-histidine hydrochloride	0.1875 g
L-tryptophan	73.5 mg
gelatin hydrolysate	6.5 g
rice oil	3.5 g

dextrin	31.05 g
retinol palmitate	466 I.U.
ergocalciferol	46.6 I.U.
bisbenthiamine	0.145 mg
riboflavin	0.155 mg
pyridoxine hydrochloride	0.245 mg
cyanocobalamin	0.5 µg
folic acid	50 µg
sodium *L*-ascorbate	6.9 mg
tocopherol acetate	9.3 mg
phytonadione	5.5 µg
calcium pantothenate	1.19 mg
nicotinic acid amide	1.515 mg
biotin	25 µg
choline bitartrate	12.3 mg
magnesium sulfate	0.205 g
calcium glycerophosphate	0.305 g
crystal sodium dihydrogen phosphate	0.195 g
sodium ferrous citrate	12.5 mg
copper sulfate	0.515 mg
zinc sulfate	3.755 mg
potassium iodide	12.5 µg
manganese sulfate	0.815 mg
potassium chloride	0.1875 g

L-valine, *L*-leucine and *L*-isoleucine after passing through a sieving mesh having 710-μm openings are employed. The *L*-valine used has a particle size distribution where 3 wt% thereof pass through a sieving mesh having 106-μm openings and the particles remaining on the sieving mesh have particle sizes of 106 to 710 μm. The *L*-leucine used has a particle size distribution where 3 wt% thereof pass through a sieving mesh having 106-μm openings and the particles remaining on the sieving mesh have particle sizes of 106 to 710 μm. The *L*-isoleucine used has a particle size distribution where 3 wt% thereof pass through a sieving mesh having 106-μm openings and the particles remaining on the sieving mesh have particle sizes of 106 to 710 μm.

Comparative Preparation Example 1

Similar composition was prepared in the same manner as in Preparation Example 1, except that the branched chain amino acids having the following particle sizes are used.

The *L*-valine used has a particle size distribution where 90 wt% thereof pass through a sieving mesh having 106-μm openings and an average particle size of 72 μm. The *L*-leucine used has a particle size distribution where 90 wt% thereof pass through a sieving mesh having 106-μm openings and an average particle size

of 66 μm. The *L*-isoleucine used has a particle size distribution where 95 wt% thereof pass through a sieving mesh having 106-μm openings and an average particle size of 58 μm. The average particle sizes were determined in accordance with an ordinary sieve analysis. The components other than *L*-valine, *L*-leucine and *L*-isoleucine were same as the ones used in Preparation Example 1.

The components having the same amount as in Preparation Example 1 were mixed to prepare 50 g of comparative nutritious composition in total.

Test Example 1

To 50 g each of the nutritious compositions produced in Preparation Example 1 and Comparative Preparation Example 1, 180 ml of water was added and mixed by shaking to prepare nutritious composition solutions or suspensions.

The two nutritious composition solutions or suspensions were subjected to a sensory evaluation by 20 panelists (adults), in order to assess the ease of swallowing and bitterness of each.

As a result of the evaluation, 19 out of 20 persons answered that it was easier to swallow the nutritious composition solution prepared in Preparation Example 1 than that prepared in Comparative Preparation Example 1, and all 20 persons answered that the nutritious

composition solution prepared in Comparative Preparation Example 1 tasted more bitter than that prepared in Preparation Example 1.

Test Example 2

To 50 g each of the nutritious compositions produced in Preparation Example 1 and Comparative Preparation Example 1, 100 ml of water was added and mixed by shaking to prepare nutritious composition solutions or suspensions.

The two nutritious composition solutions or suspensions were preserved in a refrigerator at 10 °C for 24 hours, sampled over time and subjected to a sensory evaluation to assess the ease of swallowing and bitterness by using the criteria shown below.

The criterion for evaluating the ease of intake was:

◎, very easy to swallow; ○, easy to swallow; △, somewhat easy to swallow; ×, hard to swallow.

The criterion for evaluating the bitterness was:

◎, no bitter taste; ○, slightly bitter taste; △, bitter taste; ×, very bitter taste.

The results of the sensory evaluation are shown in Table 1 below.

Table 1

Lapsed time (hours)	Preparation Example 1		Comparative Preparation Example 1	
	Ease of swallowing	Bitterness	Ease of swallowing	Bitterness
0 (immediately after preparation)	◎	◎	×	×
4	○	○	×	×
8	○	○	×	×
24	○	○	×	×

The results of Test Examples 1 and 2 show that an oral nutritious composition with suppressed bitterness and ease of swallowing can be obtained when branched chain amino acids have particle sizes such that 10 wt% or less thereof pass through a sieving mesh having 106-μm openings and the particle sizes of valine, leucine and isoleucine are each 106 to 710 μm. In addition, such properties were stably maintained even when these oral nutritious compositions were stored at low temperature.

Test Example 3

To 50 g each of the nutritious compositions produced in Preparation Example 1 and Comparative Preparation Example 1, 180 ml of water was added and mixed by shaking to prepare nutritious composition solutions.

The two nutritious composition solutions or suspensions were preserved in a refrigerator at 10 °C,

sampled over time and subjected to a sensory evaluation to assess the ease of swallowing and bitterness by using the criteria shown below. The sampling and the intake were performed 4 and 8 hours after the preparation of solutions or suspensions. The time indicates: 4 hours from breakfast to lunch assuming that the nutritious composition solution was prepared at breakfast hour; and 8 hours from breakfast to dinner assuming that the nutritious composition was prepared at breakfast hour.

The criterion for evaluating the ease of swallowing was: ◎, very easy to swallow; ○, easy to swallow; △, somewhat easy to swallow; ×, hard to swallow.

The criterion for evaluating the bitterness was: ◎, no bitter taste; ○, slightly bitter taste; △, bitter taste; ×, very bitter taste.

The results of the sensory evaluation are shown in Table 2 below. The values in Table 2 indicate the number of panelists.

Table 2

	Preparation Example 1								Comparative Preparation Example 1							
	Ease of swallowing				Bitterness				Ease of swallowing				Bitterness			
	◎	○	△	×	◎	○	△	×	◎	○	△	×	◎	○	△	×
0 immediately after preparation	10	0	0	0	10	0	0	0	0	0	1	9	0	0	1	9
4 hrs	9	1	0	0	7	3	0	0	0	0	1	9	0	0	1	9
8 hrs	8	2	0	0	6	4	0	0	0	0	1	9	0	0	1	9

As a result of Test Example 3, many panelists said that the solution of the nutritious composition obtained in Comparative Preparation Example 1 tastes bitter and is hard to take immediately after the preparation, and similar responses were given as to the liquids taken 4 and 8 hours after the preparation. In contrast, all panelists said that the solution or suspension of the nutritious composition obtained in Preparation Example 1 had no bitter taste and was very easy to take. There appeared some panelists who taste slight bitterness with time, but the bitterness was negligible. All panelists said easy to take the solution or suspension even 8 hours after the preparation.

The result of Test Example 3 showed that when the solution or suspension of the present nutritious composition is prepared at breakfast time and stored in a

refrigerator, the solution or suspension can be taken without bitterness at lunch time and dinner time.

INDUSTRIAL APPLICABILITY

The oral nutritious composition according to the present invention has a suppressed bitterness tasted when taken as a solution or suspension in water and like solvents. Even if the solution or suspension is preserved at low temperature for a long period of time, there are few increases in bitterness, that is, the bitterness is kept suppressed. The present nutritious composition can be preferably administered to a patient of liver failures such as liver cirrhosis, thereby supplying nutrition.

CLAIMS

1. An oral nutritious composition comprising: (a) three branched chain amino acids, the branched chain amino acids being valine, leucine and isoleucine; or (b) a mixture of unbranched chain amino acids and the three branched chain amino acids of valine, leucine and isoleucine;

wherein the branched chain amino acids are not granulated and have particle sizes such that 10 wt% or less thereof pass through a sieving mesh having 106-μm openings.

2. The oral nutritious composition according to claim 1, wherein the particle sizes of the branched chain amino acids that remain in the sieving mesh having 106-μm openings after being sifted are 106 to 710 μm.

3. The oral nutritious composition according to claim 2, wherein the particle sizes of the valine that remains in the sieving mesh having 106-μm openings after being sifted are 180 to 500 μm, the particle sizes of the leucine that remains in the sieving mesh having 106-μm openings after being sifted are 180 to 500 μm, and the particle sizes of the isoleucine that remains in the

sieving mesh having 106-μm openings after being sifted are 180 to 500 μm.

4. The oral nutritious composition according to claim 1, 2 or 3 comprising the mixture of unbranched chain amino acids and the three branched chain amino acids of valine, leucine and isoleucine,

wherein the branched chain amino acids are not granulated and have particle sizes such that 10 wt% or less thereof pass through a sieving mesh having 106-μm openings.

5. The oral nutritious composition according to claim 4, comprising 10 to 25 weight parts of the unbranched chain amino acids based on 100 weight parts of the branched chain amino acids.

6. The oral nutritious composition according to claim 5, wherein the composition comprises 2 to 5 wt% of valine, 3 to 6 wt% of leucine, 3 to 6 wt% of isoleucine, 0.3 to 0.7 wt% of lysine hydrochloride, 0.1 to 0.4 wt% of threonine, 0.4 to 0.8 wt% of arginine hydrochloride, 0.2 to 0.5 wt% of histidine hydrochloride and 0.05 to 0.2 wt% of tryptophan.

7. The oral nutritious composition according to claim 6, wherein 50 g of the composition comprises 1.2 to 2 g of *L*-valine, 1.6 to 2.2 g of *L*-leucine, 1.6 to 2.2 g of *L*-isoleucine, 0.1 to 0.3 g of lysine hydrochloride, 0.1 to 0.2 g of *L*-threonine, 0.2 to 0.4 g of *L*-arginine hydrochloride, 0.1 to 0.3 g of *L*-histidine hydrochloride, 50 to 90 mg of *L*-tryptophan, 5 to 8 g of gelatin hydrolysate, 2 to 5 g of rice oil, 25 to 40 g of dextrin, 300 to 600 I.U. of retinol palmitate, 30 to 60 I.U. of ergocalciferol, 0.1 to 0.2 mg of bisbenthiamine, 0.1 to 0.2 mg riboflavin, 0.1 to 0.3 mg of pyridoxine hydrochloride, 0.3 to 0.7 µg of cyanocobalamin, 30 to 70 µg of folic acid, 5 to 9 mg sodium *L*-ascorbate, 7 to 12 mg of tocopherol acetate, 4 to 7 µg of phytonadione, 1 to 1.5 mg of calcium pantothenate, 1 to 2 mg of nicotinic acid amide, 15 to 40 µg of biotin, 9 to 16 mg of choline bitartrate, 0.15 to 0.25 g of magnesium sulfate, 0.25 to 0.35 g of calcium glycerophosphate, 0.15 to 0.25 g of crystal sodium dihydrogen phosphate, 10 to 15 mg of sodium ferrous citrate, 0.3 to 0.7 mg of copper sulfate, 3 to 4.5 mg of zinc sulfate, 10 to 15 µg of potassium iodide, 0.6 to 1 mg of manganese sulfate, and 0.15 to 0.23 g of potassium chloride.

8. The oral nutritious composition according to

claim 7, wherein 50 g of the composition comprises 1.602 g of *L*-valine, 2.037 g of *L*-leucine, 1.9225 g of *L*-isoleucine, 0.2425 g of lysine hydrochloride, 0.133 g of *L*-threonine, 0.302 g of *L*-arginine hydrochloride, 0.1875 g of *L*-histidine hydrochloride, 73.5 mg of *L*-tryptophan, 6.5 g of gelatin hydrolysate, 3.5 g of rice oil, 31.05 g of dextrin, 466 I.U. of retinol palmitate, 46.6 I.U. of ergocalciferol, 0.145 mg of bisbenthiamine, 0.155 mg of riboflavin, 0.245 mg of pyridoxine hydrochloride, 0.5 µg of cyanocobalamin, 50 µg of folic acid, 6.9 mg of sodium *L*-ascorbate, 9.3 mg of tocopherol acetate, 5.5 µg of phytonadione, 1.19 mg of calcium pantothenate, 1.515 mg of nicotinic acid amide, 25 µg of biotin, 12.3 mg of choline bitartrate, 0.205 g of magnesium sulfate, 0.305 g of calcium glycerophosphate, 0.195 g of crystal sodium dihydrogen phosphate, 12.5 mg of sodium ferrous citrate, 0.515 mg of copper sulfate, 3.755 mg of zinc sulfate, 12.5 µg of potassium iodide, 0.815 mg of manganese sulfate, and 0.1875 g of potassium chloride.

9. A method for suppressing a bitterness of a composition comprising: (a) three branched chain amino acids, the branched chain amino acids being valine, leucine and isoleucine; or (b) a mixture of unbranched chain amino acids and the three branched chain amino acids

of valine, leucine and isoleucine;

wherein the branched chain amino acids are not granulated and have particle sizes such that 10 wt% or less thereof pass through a sieving mesh having 106-μm openings.

10. A method for producing an oral nutritious composition comprising: mixing valine, leucine and isoleucine, each of which is nongranulated and has particle sizes such that 10 wt% or less thereof pass through a sieving mesh having 106-μm openings; and additionally mixing unbranched chain amino acids as necessary.

11. An oral nutritious composition comprising: (a) three branched chain amino acids, the branched chain amino acids being valine, leucine and isoleucine; or (b) a mixture of unbranched chain amino acids and the three branched chain amino acids of valine, leucine and isoleucine;

wherein the branched chain amino acids are not granulated and have particle sizes such that 10 wt% or less thereof pass through a sieving mesh having 105-μm openings.