

PATENT SPECIFICATION

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 (72) Inventors SVEN INGMAR WALTON BOSUND and BENGT LENNART BENGTTSSON



(54) PROTEIN COMPOSITION

(71) We, NESTLE S.A., of La Tour-de-Peilz, Switzerland, a Swiss company, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention is concerned with a replacement for skimmed milk.

10 Numerous attempts have been made to prepare a food product equivalent to skimmed milk. The main reason for this has been the ever increasing price of dairy products. Nearly always the products have been based upon vegetable proteins, such as soy beans, processed according to various methods. Such products are however inferior to skimmed milk as regards flavour, functional properties and nutritional value.

20 In particular, the lower biological value of the protein, which is basically unavoidable when a vegetable raw material is used, is a handicap as such products are intended as replacements for skimmed milk solids in formulated foods to which the skimmed milk solids are added for the primary purposes of conferring desirable functional properties and increasing the nutritional value.

30 It has now been found that a highly satisfactory replacement for skimmed milk may be prepared from a fish protein isolate having specific characteristics. It has further been found that products having very good functional and nutritional properties are obtained by combining the fish protein isolate with whey solids in certain proportions.

40 The invention thus provides a protein composition, suitable as a replacement for skimmed milk, comprising, on a dry solids by weight basis, 15 to 30% of a fish protein isolate containing at least 90% protein, less than 0.5% of lipids and 1 to 10% of minerals, and having a Nitrogen Solubility Index (NSI) of 80 to 100, and 70 to 85% of whey solids. The NSI is determined by the American Oil Chemists' Society Official Method Ba 11-65. A particularly preferred

composition, by reason of its excellent functional properties, contains 26% fish protein isolate and 74% whey solids.

Protein isolates having the specified properties may be obtained from various fish raw materials, for example by alkali extraction or enzymatic digestion. Particularly preferred are isolates prepared as described in our copending applications Nos. 23933/72 and 23934/72 of even date herewith (Serial Nos. 1,384,241 and 1,383,223 respectively).

Whey is obtained as a by-product from dairy operations, such as production of cheese. Since the fish protein isolate contains only small amounts of salts, the high salts content in ordinary whey is not a disadvantage, and the whey may be used directly without further modification of the chemical composition. The whey may be used in the form of a dry powder, as a concentrate or in the natural condition as it is obtained in dairy operations. The preferred form will depend upon the physical state of the fish protein isolate.

The protein composition is conveniently prepared, in accordance with the present invention, by forming an aqueous blend the solids content of which comprises 15 to 30% by weight of a fish protein isolate containing at least 90% protein, less than 0.5% lipids and 1 to 10% of minerals, and having a Nitrogen Solubility Index (NSI) of 80 to 100 and 70 to 85% by weight of whey solids, and subjecting the blend to homogenisation at a total pressure of at least 100 kg/cm². The term "total" refers to the sum of the homogenisation pressures when this operation is effected in two or more stages. The homogenisation blend may be used directly or it may be dried.

When the fish protein isolate is available as a dry powder, the preferred state of the whey ingredient is as a solution with a dry matter content in the range 6 to 50% by weight. Since preconcentration at the whey production facility, such as a cheese factory, is advantageous considering transportation costs, a dry matter content of 30 to 50% is particularly preferred. Dry fish pro-

tein isolate may be added to the liquid whey, together with optional ingredients such as minerals and vitamins. Thereafter the blend is preferably heated to about 60 to 70° and stirred to ensure complete dissolution of the ingredients.

Normally the pH of the blended material is about 6.6, which is in the preferred range, from the flavour standpoint, of 6.2 to 7.0. Any adjustments may be made with food grade reagents, e.g. sodium or calcium hydroxide, or phosphoric or citric acid. When the ingredients have been dissolved, the solution is homogenised in about 5 minutes, preferably at a total pressure of 100 to 150 kg/cm². The temperature during homogenisation is preferably about 60 to 70°C, for example 65°C.

Alternatively, if a solution of fish protein isolate is available, it may be mixed with liquid or dried whey, in appropriate proportion to give a total dry matter content having the composition defined previously, and the solution processed as described. In either of the two process variants, the dry matter content of the solution will be selected depending on whether the final product is a powder or a liquid, at for example 10 to 60% solids. For dried products, solutions containing 40 to 60% by weight of dry matter are preferred, as the drying load is reduced, whereas the solids contents of liquid compositions will be a function of their intended uses.

Drying is preferably effected under relatively mild condition so as not to impair the nutritional and functional properties of the product. Freeze-drying may be used, or spray-drying, preferably at temperatures not exceeding about 80°C (outlet). The dried products preferably have a moisture content not exceeding 7% by weight.

Compositions according to the invention may also be prepared by dry-blending powdered fish protein isolate and whey solids in the specified proportions, with incorporation of optional additives in dry form. Such dry-blending compositions are advantageously agglomerated or granulated to give products with improved reconstruction properties.

The protein composition according to the invention has a bland, sweetish flavour similar to skimmed milk, which it may with advantage replace in various formulations. In liquid form, at the appropriate solids level, it may be used instead of liquid skimmed milk.

The invention is illustrated by the following examples.

Example 1

27 kg of dried fish protein isolate (protein: 97%, lipids 0.2%, minerals 2.8%, NSI: 95, moisture 4%) are dispersed in 200

litres of whey concentrated to 37% dry matter. The mixture is heated to 65°C and homogenised at 150 kg/cm². The mix is then spray-dried, at air inlet and outlet temperatures of 170 and 80°C respectively.

The resulting powder has a moisture content of 5%. Reconstituted with water at a 10% solids level it provides a product which is an excellent substitute for skimmed milk with respect to texture, flavour and functional properties.

Example 2

60 kg of dried whey (5% moisture) are dispersed in 100 litres of a 20% solution of fish protein isolate (protein: 91%, lipids: 0.4%, minerals: 8.6%, NSI=90). The suspension is then homogenised at 150 kg/cm² and freeze-dried.

The resulting powder has the same properties as the product of Example 1.

Example 3

80 kg of whey powder (moisture 5%) and 20 kg of the fish protein isolate used in Example 1 are dry-blended and the blend is agglomerated with steam.

The resulting agglomerates disperse rapidly in water to provide an excellent substitute for liquid skimmed milk.

Example 4

A liquid protein product is prepared as follows: 40 kg of whey powder are dispersed in 100 litres of a 10% solution of fish protein isolate (protein: 97%, lipids: 0.2%, minerals: 2.8%, NSI=95) and 350 litres of water are added. The mix is then homogenised at 120 kg/cm², sterilised and canned aseptically.

WHAT WE CLAIM IS:—

1. A protein composition comprising, on a dry solids by weight basis, 15 to 30% of a fish protein isolate containing at least 90% protein, less than 0.5% of lipids and 1 to 10% of minerals, and having a Nitrogen Solubility Index (NSI) of 80 to 100, and 70 to 85% of whey solids.

2. A composition according to claim 1 comprising substantially 26% of the fish protein isolate and 74% whey solids.

3. A composition according to claim 1 or claim 2 in which the fish protein isolate and whey solids are agglomerated together.

4. A protein composition according to claim 1 or claim 2 in liquid form containing 10 to 60% by weight dry solids, the balance to 100% being substantially water.

5. A composition according to claim 4 having a pH of 6.2 to 7.0.

6. A protein composition substantially as herein described with reference to any one of the Examples.

7. A process for preparing a protein composition which comprises forming an



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tein isolate may be added to the liquid whey, together with optional ingredients such as minerals and vitamins. Thereafter the blend is preferably heated to about 60 to 70° and stirred to ensure complete dissolution of the ingredients.

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Compositions according to the invention may also be prepared by dry-blending powdered fish protein isolate and whey solids in the specified proportions, with incorporation of optional additives in dry form. Such dry-blending compositions are advantageously agglomerated or granulated to give products with improved reconstruction properties.

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2. A composition according to claim 1 comprising substantially 26% of the fish protein isolate and 74% whey solids.

3. A composition according to claim 1 or claim 2 in which the fish protein isolate and whey solids are agglomerated together.

4. A protein composition according to claim 1 or claim 2 in liquid form containing 10 to 60% by weight dry solids, the balance to 100% being substantially water.

5. A composition according to claim 4 having a pH of 6.2 to 7.0.

6. A protein composition substantially as herein described with reference to any one of the Examples.

7. A process for preparing a protein composition which comprises forming an

- aqueous blend the solids content of which comprises 15 to 30% by weight of a fish protein isolate containing at least 90% protein, less than 0.5% lipids and 1 to 10% of minerals, and having a Nitrogen Solubility Index (NSI) of 80 to 100 and 70 to 85% by weight of whey solids, and subjecting the blend to homogenisation at a total pressure of at least 100 kg/cm².
- 5 8. A process according to claim 7 in which the aqueous blend has a solids content of 10 to 60% by weight.
9. A process according to claim 7 or claim 8 in which the aqueous blend has a pH of 6.2 to 7.0.
- 15 10. A process according to any one of claims 7 to 9 in which after homogenisation the aqueous blend is concentrated to a solids content of 40 to 60% by weight and dried.
- 20 11. A process for preparing a protein composition which comprises agglomerating a substantially dry blend comprising 15 to 30% by weight of a fish protein isolate containing at least 90% protein, less than 0.5% lipids and 1 to 10% of minerals, and having a Nitrogen Solubility Index (NSI) of 80 to 100 and 70 to 85% by weight of whey solids.
- 25 12. A process according to any one of claims 7 to 11 in which the aqueous or dry blend comprises substantially 26% by weight of the fish protein isolate and substantially 74% by weight of whey solids.
- 30 13. A process for preparing a protein composition substantially as herein described with reference to any one of the Examples.
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ELKINGTON AND FIFE
Chartered Patent Agents,
High Holborn House,
52/54 High Holborn,
London, WC1V 6SH.
Agents for the Applicants.

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