

PATENT SPECIFICATION

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(54) BEVERAGE PRODUCT

(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 protein beverage composition.

Throughout the world, milk from cows and a few other mammals has an important position as a highly nutritious and healthy food for both infants and adults. However, aside from its relatively high production costs, animal milk does have a drawback in that certain individuals cannot tolerate milk as a normal ingredient of their diet. These individuals fall into two main categories:

(1) infants, who react against ordinary milk which causes certain allergic reactions against milk proteins or gastro-intestinal disorders, and

(2) adults who have insufficient amounts of the enzyme lactase in their digestive tract, the result of which is diarrhoea and similar reactions due to the presence of high amounts of undigested lactose in the lower intestine.

Whilst the first category constitutes a relatively small percentage of all infants, it is nevertheless a sensitive group which relies on milk or milk formulae as the main protein ingredient of their diet.

Vegetable proteins, particularly soy, represent an alternative protein source, but these inherently have a lower biological value than protein from animal sources, e.g. milk and fish. Additionally, a substantial part of the carbohydrates in soy is in the form of trisaccharides, which are not easily digested and may thus cause serious digestive troubles, even in adults. Removal of these constituents necessitates complicated fractionation and supplementation procedures in order to produce a completely acceptable soy milk. Furthermore, soy milk products frequently retain the particular taste of soy, which makes them less acceptable than milk. Attempts have also been made to produce a dairy milk

replacement based on fish protein, but these have not been particularly successful because of the lack of functional properties especially water-solubility, in fish protein concentrates.

The second category is quantitatively very large. Recent investigations have revealed that not only the majority of populations in Asia and Africa, but also a substantial percentage of European and American population groups may belong to this category. The reaction to milk within these groups varies from complete intolerance to mild digestive troubles, and it is evident that lactose intolerance prevents a substantial part of the world population from taking milk as a highly nutritive staple food. Likewise for this category, substitutes based on vegetable protein exist but have the same drawbacks as described above for the infant products.

The primary object of this invention is therefore to provide a simulated whole dairy milk beverage either in a liquid form or in the form of a dry powder to be reconstituted with water.

Another object is to provide a protein beverage product having the organoleptic properties of whole milk, notably taste, appearance, texture and the characteristic mouth-feel.

It has been found that a fish protein isolate having certain specific properties provides an excellent basis for various protein beverage products, especially products which may be used as replacements for whole milk. More particularly, it has been found that the protein isolate profoundly influences the characteristics of the final products and that unsatisfactory results are obtained when protein materials not meeting the specifications set out herein are used.

The present invention thus provides a protein beverage composition comprising, on a dry matter by weight basis:

(i) 15 to 30% 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,

- (ii) 15 to 30% of fat,
- (iii) 40 to 60% of edible carbohydrate and
- (iv) 0 to 10% minerals.

The NSI is determined by the American Oil Chemists' Society Official Method Ba 11-65.

The dry matter content of preferred compositions according to the invention comprises: fish protein isolate 25 to 30% by weight, fat 25 to 30% by weight, carbohydrate 40 to 45% by weight and minerals 5 to 8% by weight.

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 (Serial No. 1,348,241) and 23934/72 (Serial No. 1,383,223) of even date herewith.

The fat present in the composition may be a vegetable or animal fat, or a mixture of both. Vegetable fats which may be used include soybean oil, cottonseed oil, peanut oil, corn oil and the like, whereas fish oil is preferred among animal fats. The fats may be partly hydrogenated, and the fat or fat mixture used should preferably have a melting point of 25 to 40°C.

Edible carbohydrates which may be included in the compositions comprise various sugars, such as sucrose, invert sugar, glucose, as well as mixtures of sugars, for example corn syrup solids. For certain dietetic purposes addition of lactose is preferably avoided, but it may be present in other products. The terms "fat" and "carbohydrate" are used herein to designate both individual substances and mixtures.

Apart from the principal ingredients, protein isolate, fat and carbohydrate, the composition may also contain nutrient substances such as minerals, which also have a favourable effect on flavour, and vitamins.

The compositions may be either in solid or liquid form, depending on their desired uses, and they may be prepared by various methods.

A preferred procedure according to the invention comprises a process for preparing a protein beverage composition which comprises forming an aqueous blend on (i) 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, (ii) a fat and (iii) a carbohydrate, the dry matter content of the aqueous blend comprising 15 to 30% by weight of the fish protein isolate, 15 to 30% by weight of fat, 40 to 60% by weight of carbohydrate and 0 to 10% by weight of minerals and homogenising the blend at a total pressure of at least 150 kg/cm². The term "total" refers to the sum of the homogenisation pressures when this operation is effected in two or more stages. The aqueous

blend may contain 10 to 60% total dry matter. It is generally pasteurised and may be dried, or preferably sterilised if the final product is desired in liquid form.

When the fish protein isolate starting material is in dry form, a particularly advantageous procedure comprises dispersing the isolate in the fat, which has been melted and to which optional fat-soluble ingredients such as vitamins (fat-soluble) and emulsifiers have been added. To the fat dispersion is then added an aqueous solution of the carbohydrate, also containing any water-soluble additives, for example water-soluble vitamins, minerals, thickening agents and/or colourings and flavours. The solids content of the resulting mixture is preferably between 20 and 60% by weight, and this will be chosen having regard to whether the final product is to be solid or liquid. Solids contents of around 50% are preferred for materials which are to be dried.

After blending of the fat and water phase the mixture is homogenised, preferably in two stages so as to avoid fat separation. The first stage may be carried out at about 150 kg/cm² and the second at about 30 kg/cm². The homogenised solution is desirably pasteurised, the preferred conditions being 70 to 72°C for about 5 minutes, and the product may then be dried, as by spray-drying, or sterilised according to known methods.

When the fish protein isolate starting material is in the form of a more or less concentrated solution, the normal solids range being 3.5 to 30% by weight, the preferred procedure for preparing the compositions comprises blending the fat, containing any of the optional fat-soluble additives, with the fish protein solution in which any desired water-soluble additives such as water-soluble vitamins, minerals, thickeners, colouring and/or flavours have been dissolved. The melted fat and the aqueous phase are mixed at a temperature above the melting point of the fat, and the carbohydrate is added. After complete dissolution of carbohydrate, the mix is homogenised, preferably in two stages, pasteurised and either dried or sterilised. The solids content of the blend preferably lies within the range indicated for the first variant.

The final product, as previously stated, may be in solid or liquid form, depending on its intended uses. By suitable selection of the proportions of the ingredients a product having the compositions of milk may be obtained, which may be used as a whole milk replacement, having the flavour and texture characteristics of milk. It is also possible to prepare high fat products which may be used as replacements for cream. Additives such as stabilisers, emulsifiers (e.g. lecithin) and thickening agents are generally unnecessary, but for specific applications one or more of these substances may be incorporated in the products if desired.

The invention is illustrated by the following examples, in which the percentages are by weight.

Example 1

- 5 27 kg of fish protein isolate (91% protein, 0.4% lipids, 8.6% minerals: NSI=90) are dispersed in 27 kg of a vegetable fat blend (melting point: 33°C) melted by heating to 50°C. Separately, 40 kg of sucrose are dissolved in 100 litres of water and the solution is mixed with the fat/protein blend. The mix is then homogenised in two stages, at 150 and 30 kg/cm², the homogenised solution is pasteurised at 70°C for 5 minutes and is then spray-dried to a moisture content of 3%.

- 10 The spray-dried material is a white, odourless powder. 15 g of powder dispersed in 85 g of water give a beverage which is very close in appearance, flavour and texture to whole milk.

Example 2

An infant food is prepared as follows:—

- 15 150 g of a solution containing 21.3% of fish protein isolate (97.0% protein, 0.2% lipids, 2.8% minerals: NSI=95) are heated to 50°C. 35 kg of hydrogenated fish oils (melting point 35°C) melted by heating to 50°C are blended with the protein solution and 50 kg of sucrose are then added. The mix is homogenised in two stages as described in Example 1, pasteurised and spray-dried.

Example 3

- A liquid milk substitute is prepared by the basic procedure of Example 2, but using the following ingredients:

	Fish protein isolate (solution at 21.3% protein)	117 kg of solution
	Fat	24.5 kg
	Sugar	45 kg
40	Water	475 kg

Furthermore, the following additional ingredients are used:—

a) Added to the melted fat:—

	Vitamin A	0.80 g
45	Vitamin D	0.29 g
	Vitamin E	5.2 g
	Lecithin	300 g

b) Added to the protein/fat blend, with sufficient of the water for dissolution:—

50	Vitamin B ₁	0.6 g
	Vitamin B ₂	1.5 g
	Vitamin B ₆	0.6 g
	Vitamin C	130 g
	Niacin	4.6 g
55	Pantothenic acid	2.5 g
	Dicalcium phosphate	1.3 kg
	Calcium citrate	1.2 kg

Sodium citrate	0.29 kg
Ferrous sulphate	60 g
Carrageenan	15 g

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After homogenisation, the mix is sterilised and filled aseptically into suitable containers (e.g. bottles).

WHAT WE CLAIM IS:—

1. A protein beverage composition comprising, on a dry matter by weight basis, (i) 15 to 30% 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, (ii) 15 to 30% of fat, (iii) 40 to 60% of edible carbohydrate and (iv) 0 to 10% minerals. 65
2. A composition according to claim 1 comprising, on a dry matter by weight basis, 25 to 30% of fish protein isolate, 25 to 30% of fat, 40 to 45% of carbohydrate and 5 to 8% of minerals. 75
3. A composition according to claim 1 or claim 2 in which the fat has a melting point of 25 to 40°C. 80
4. A composition according to any one of the preceding claims in which the fat comprises soybean oil, cottonseed oil, peanut oil, corn oil and/or fish oil. 85
5. A composition according to any one of the preceding claims in which the carbohydrate comprises a sugar.
6. A composition according to claim 5 in which the sugar comprises sucrose, glucose, invert sugar, lactose and/or corn syrup solids. 90
7. A composition according to any one of the preceding claims containing 10 to 60% of dry matter, the balance to 100% being substantially water. 95
8. A protein beverage composition substantially as herein described with reference to any one of the Examples.
9. A process for preparing a protein beverage composition which comprises forming an aqueous blend of (i) 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, (ii) a fat and (iii) a carbohydrate, the dry matter content of the aqueous blend comprising 15 to 30% by weight of the fish protein isolate, 15 to 30% by weight of fat, 40 to 60% by weight of carbohydrate and 0 to 10% by weight of minerals and homogenising the blend at a total pressure of at least 150 kg/cm². 100
10. A process according to claim 9 in which the dry matter content of the aqueous blend comprises 25 to 30% by weight of the protein isolate, 25 to 30% by weight of fat and 40 to 45% by weight of carbohydrate and 5 to 8% minerals. 105
11. A process according to claim 9 or



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	Niacin	4.6 g
55	Pantothenic acid	2.5 g
	Dicalcium phosphate	1.3 kg
	Calcium citrate	1.2 kg

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Carrageenan	15 g	60

After homogenisation, the mix is sterilised and filled aseptically into suitable containers (e.g. bottles).

WHAT WE CLAIM IS:—

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2. A composition according to claim 1 comprising, on a dry matter by weight basis, 25 to 30% of fish protein isolate, 25 to 30% of fat, 40 to 45% of carbohydrate and 5 to 8% of minerals. 75
3. A composition according to claim 1 or claim 2 in which the fat has a melting point of 25 to 40°C. 80
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9. A process for preparing a protein beverage composition which comprises forming an aqueous blend of (i) 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, (ii) a fat and (iii) a carbohydrate, the dry matter content of the aqueous blend comprising 15 to 30% by weight of the fish protein isolate, 15 to 30% by weight of fat, 40 to 60% by weight of carbohydrate and 0 to 10% by weight of minerals and homogenising the blend at a total pressure of at least 150 kg/cm². 110
10. A process according to claim 9 in which the dry matter content of the aqueous blend comprises 25 to 30% by weight of the protein isolate, 25 to 30% by weight of fat and 40 to 45% by weight of carbohydrate and 5 to 8% minerals. 115
11. A process according to claim 9 or



claim 10 in which the fat has a melting point of 25 to 40°C.

- 5 12. A process according to any one of claims 9 to 11 in which the fat comprises soybean oil, cottonseed oil, peanut oil, corn oil and/or fish oil.

13. A process according to any one of claims 9 to 12 in which the carbohydrate comprises a sugar.

- 10 14. A process according to claim 13 in which the sugar comprises sucrose, glucose, invert sugar, lactose and/or corn syrup solids.

15. A process according to any one of claims 9 to 14 in which the aqueous blend contains

- 15 10 to 60% by weight of dry matter.

16. A process according to any one of

claims 9 to 15 in which after homogenisation the aqueous blend is dried.

17. A process for preparing a protein beverage composition substantially as herein 20 described with reference to any one of the Examples.

18. A protein beverage composition prepared by a process according to any one of claims 9 to 17. 25

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