having a Dextrose Equivalent of about 10 or less, in a weight ratio of the maltodextrin to the polyunsaturated fatty acid of at least about 1:2; and (D) homogenizing, and then cooling the combination below the melt point of the emulsifying agent to form a nutritional emulsion comprising from about 0.01% to about 5% by weight of process-encapsulated polyunsaturated fatty acid.

In one embodiment, there is provided a nutritional emulsion comprising fat, protein, and carbohydrate, including:
(A) from 0.01 % to 5% by weight of an oil having hydrophobic off-notes that is encapsulated during formulation of the nutritional emulsion by an emulsifying agent having a melt point above 25°C, and
(B) maltodextrin with a DE of 10 or less,
wherein the weight ratio of the emulsifying agent to the oil having hydrophobic off-notes is at least 1:15 and the weight ratio of the maltodextrin to the oil having hydrophobic off-notes is at least 1:2.

It has been discovered herein that these oil-in-water emulsions effectively mask the flavor of oils having hydrophobic off-notes (e.g., polyunsaturated fatty acids). This is accomplished by combining process-encapsulated oils having hydrophobic off-notes (encapsulated in selected emulsifying agents) with certain maltodextrins.

It has been discovered herein that to effectively mask the hydrophobic off-notes in these emulsions, the process encapsulated oils (encapsulated during formulation with a high melting point emulsifier) must be used in combination with those maltodextrins defined by a DE value of about 10 or less.

DETAILED DESCRIPTION OF THE INVENTION

The nutritional compositions of the present invention are oil-in-water emulsions that comprise as essential elements fat, protein, and carbohydrate, including an oil having hydrophobic off-notes (e.g., polyunsaturated fatty acids), selected emulsifying agents, and selected maltodextrins. These and other essential or optional elements or limitations of the compositions of the present invention are described in detail hereinafter.

The term "nutritional emulsion" as used herein, unless otherwise specified, refers to oral liquids in the form of oil-in-water emulsions comprising fat, protein, and carbohydrates, which may be formulated as meal replacement products, nutritional supplements, or continuous (or intermittent) enteral feedings.

The terms "polyunsaturated fatty acid" or "PUFA" as used herein, unless otherwise specified, refer to any polyunsaturated fatty acid or source thereof, including short chain (less than about 6 carbon atoms per chain), medium chain (from about 6 to 18 carbon atoms per chain) and long chain (having at least about 20 carbon atoms per chain) fatty acids having two or more carbon:carbon double bonds, including n-3 (omega-3) and n-6 (omega-6) polyunsaturated fatty acids.

The term "process-encapsulated" as used herein refers to the combination of a oil having hydrophobic off-notes and a high melting point emulsifier, wherein the two are combined to form a liquid intermediate during processing but prior to incorporation into the nutritional emulsion, and are added in liquid form to one or more of fat, protein, and carbohydrate intermediate ingredients, to thereafter effectively result in solid

REPLACEMENT
14

PCT
10491WO01

WHAT IS CLAIMED IS:

1. A nutritional emulsion comprising fat, protein, and carbohydrate, including:

(A) from 0.01 % to 5% by weight of an oil having hydrophobic off-notes that is process-encapsulated by an emulsifying agent having a melt point above 25°C, and

(B) maltodextrin with a DE of 10 or less,

wherein the weight ratio of the emulsifying agent to the oil having hydrophobic off-notes is at least 1:15 and the weight ratio of the maltodextrin to oil having hydrophobic off-notes is at least 1:2.

2. A nutritional emulsion according to claim 1 wherein the oil having hydrophobic off-notes is selected from the group consisting of polyunsaturated fatty acids, soy oil, beta-hydroxy-beta-methylbutyrate containing oil, and combinations thereof.

3. A nutritional emulsion according to claim 1 wherein the oil having hydrophobic off-notes is a polyunsaturated fatty acid.

4. A nutritional emulsion according to claim 3 wherein the weight ratio of emulsifying agent to the process-encapsulated polyunsaturated fatty acid is from 1:9 to 1:2 and the weight ratio of maltodextrin to process-encapsulated polyunsaturated fatty acid is from 1:1 to 20:1.

5. A nutritional emulsion according to claim 3 wherein the weight ratio of emulsifying agent to the process-encapsulated polyunsaturated fatty acid is from 1:5 to 1:2 and the weight ratio of maltodextrin to process-encapsulated polyunsaturated fatty acid is from 2.5:1 to 4:1.

6. A nutritional emulsion according to claim 3 wherein the emulsion comprises from 0.3% to 3% by weight of the process-encapsulated polyunsaturated fatty acid.

7. A nutritional emulsion according to claim 3 wherein the emulsion is substantially free of polyunsaturated fatty acids other than the process-encapsulated polyunsaturated fatty acid.

8. A nutritional emulsion according to claim 3 wherein the emulsifying agent has a melt point of from 45°C to 70°C.

9. A nutritional emulsion according to claim 3 wherein the emulsifying agent is a monoglyceride.

10. A nutritional emulsion according to claim 3 wherein the polyunsaturated fatty acid includes eicosapentaenoic acid, docosahexaenoic acid, or both.

11. A nutritional emulsion according to 3 wherein the emulsion comprises from 0.1 to 20% of the maltodextrin and the maltodextrin has a DE of from 1 to 5.

12. A nutritional emulsion according to claim 3 wherein the maltodextrin has a DE value of 3.

REPLACEMENT
15

PCT
10491WO01

13. A nutritional emulsion according to claim 3 wherein the emulsion comprises, as a percentage of total calories, from 10% to 85% carbohydrate, from 10% to 85% fat, and from 5% to 80% protein.

Claims

1. A nutritional emulsion comprising fat, protein, and carbohydrate, including:

(A) from 0.01 % to 5% by weight of an oil having hydrophobic off-notes that is encapsulated during formulation of the nutritional emulsion by an emulsifying agent having a melt point above 25°C, and

(B) maltodextrin with a DE of 10 or less, wherein the weight ratio of the emulsifying agent to the oil having hydrophobic off-notes is at least 1:15 and the weight ratio of the maltodextrin to the oil having hydrophobic off-notes is at least 1:2.

2. The nutritional emulsion according to claim 1 wherein the oil having hydrophobic off-notes is selected from the group consisting of polyunsaturated fatty acids, soy oil, beta-hydroxy-beta-methylbutyrate containing oil, and combinations thereof.

3. The nutritional emulsion according to claim 1 wherein the oil having hydrophobic off-notes is a polyunsaturated fatty acid.

4. The nutritional emulsion according to claim 3 wherein the weight ratio of the emulsifying agent to the encapsulated polyunsaturated fatty acid is from 1:9 to 1:2 and the weight ratio of the maltodextrin to the encapsulated polyunsaturated fatty acid is from 1:1 to 20:1.

5. The nutritional emulsion according to claim 3 wherein the weight ratio of the emulsifying agent to the encapsulated polyunsaturated fatty acid is from 1:5 to 1:2 and the weight ratio of the maltodextrin to the encapsulated polyunsaturated fatty acid is from 2.5:1 to 4:1.

6. The nutritional emulsion according to claim 3 wherein the emulsion comprises from 0.3% to 3% by weight of the encapsulated polyunsaturated fatty acid.

7. The nutritional emulsion according to claim 3 wherein the emulsion is substantially free of polyunsaturated fatty acids other than the encapsulated polyunsaturated fatty acid.

8. The nutritional emulsion according to claim 3 wherein the emulsifying agent has a melt point of from 45°C to 70°C.

9. The nutritional emulsion according to claim 3 wherein the emulsifying agent is a monoglyceride.

10. The nutritional emulsion according to claim 3 wherein the polyunsaturated fatty acid includes eicosapentaenoic acid, docosahexaenoic acid, or both.

11. The nutritional emulsion according to 3 wherein the emulsion comprises from 0.1 % to 20% by weight of the maltodextrin and the maltodextrin has a DE of from 1 to 5.

12. The nutritional emulsion according to claim 3 wherein the maltodextrin has a DE value of 3.

13. The nutritional emulsion according to claim 3 wherein the emulsion comprises, as a percentage of total calories, from 10% to 85% carbohydrate, from 10% to 85% fat, and from 5% to 80% protein.