CLAIMS

1. A method of preparing a liquid nutritional composition, the method comprising
   a) heat-treating a liquid composition having a pH of between 4 and 6 and comprising about 2% to about 25% by weight of non-hydrolysed whey protein, wherein the whey protein comprises or is provided by an ingredient that comprises at least about 55% of the heat-denaturable protein present in a denatured state, and wherein the heat treatment has an Fo-value of at least equivalent to 90°C for 40s, and
   b) recovering the liquid composition,

   wherein the recovered liquid composition has
   c) a viscosity of less than 200 cP when measured at 20°C and shear rate of 100 s-1, or
   d) an average particle size of less than 20 μm as categorised by the volume weighted average particle size parameter D[4,3], or
   e) exhibits essentially no observable gelation or aggregation, or
   f) any combination of two or more of (c) to (e) above.

2. A liquid nutritional composition comprising
   a) from about 2% to about 25% by weight of non-hydrolysed whey protein, wherein the whey protein comprises or is provided by an ingredient that comprises at least about 55% of the heat-denaturable protein present in a denatured state,
   b) from 0 to about 30% by weight fat
   c) from about 0% to about 45% by weight carbohydrate

   and wherein the nutritional composition has when at a pH of between 4 and 6 undergone a heat treatment with an F_o-value of at least equivalent to 90°C for 40s, and has
   d) a viscosity of less than 200 cP when measured at 20°C and shear rate of 100 s-1, or
   e) an average particle size of less than 20 μm as categorised by the volume weighted average particle size parameter D[4,3], or
   f) exhibits essentially no observable gelation or aggregation, or
   g) any combination of two or more of (d) to (f) above.

3. The liquid nutritional composition of claim 2 wherein the nutritional composition has a pH of between about 4 to about 6, and a viscosity of less than 200 cP at a temperature of 20°C and a shear rate of 100 s^{-1} and exhibits essentially no gelation or aggregation.

4. The method of claim 1 or the liquid nutritional composition of claim 2 or 3 wherein the heat treatment is at least equivalent to 121°C for 10 minutes.

5. The method of claim 4 or the liquid nutritional composition of claim 4 wherein the heat treatment is at least equivalent to 140°C for 5s.

6. The method or liquid nutritional composition of any of the preceding claims wherein the liquid nutritional composition exhibits no observable gelation, or no observable aggregation, or both, after storage for at least 3 months at room temperature.

7. The method or liquid nutritional composition of any of the preceding claims wherein the liquid nutritional composition comprises at least about

a) 30 mg sodium,
b) 80 mg potassium,
c) 30 mg chloride,
d) 35 mg calcium,
e) 30 mg phosphorus, and
f) 7.5 mg magnesium

per 100 kcal of the liquid nutritional composition.

8. The method or liquid nutritional composition of any of the preceding claims wherein the liquid nutritional composition has when undergoing the heat treatment

g) a pH of between about 4.7 to about 6.0, or
h) a pH of between about 4.8 to about 6.0, or
i) a pH of between about 4.9 to about 6.0, or
j) a pH of between about 5.0 to about 6.0, or
k) a pH of between about 4.5 to about 5.7, or
l) a pH of between about 4.5 to about 5.5, or
m) a pH of between about 4.5 to about 5.3, or
n) a pH of between about 4.5 to about 5.2, or
o) a pH of between about 4.7 to about 5.5, or
p) a pH of between about 4.7 to about 5.3, or
q) a pH of between about 4.7 to about 5.2, or
r) a pH of between about 4.8 to about 5.3, or
s) a pH of between about 4.8 to about 5.2, or
t) a pH of about 5, or
u) a pH of between about 4.2 to about 5.8, or
v) a pH of between about 4.4 to about 5.8, or
w) a pH of between about 4.6 to about 5.6, or
x) a pH of between about 4.8 to about 5.4, or
y) a pH of between about 4.9 to about 5.3, or
z) a pH of between about 5.0 to about 5.2, or
aa) a pH of about 5.1, or

bb) a pH of between about 4.3 to about 5.1, or

cc) a pH of between about 4.6 to about 5.1, or

dd) a pH of between about 4.8 to about 5.1, or

ee) a pH of between about 5.1 to about 6.0, or

ff) a pH of between about 5.1 to about 5.8, or

gg) a pH of between about 5.1 to about 5.6, or

hh) a pH of between about 5.1 to about 5.4.

9. The method or liquid nutritional composition of any of the preceding claims wherein the liquid nutritional composition has when undergoing the heat treatment

a) a pH of between about 4.1 to about 5.1, or

b) a pH of between about 4.3 to about 5.1, or

c) a pH of between about 4.5 to about 5.1, or

d) a pH of between about 4.7 to about 5.1, or

e) a pH of between about 4.9 to about 5.1, or

f) a pH of between about 5.1 to about 6.0, or

g) a pH of between about 5.1 to about 5.8, or

h) a pH of between about 5.1 to about 5.6, or

i) a pH of between about 5.1 to about 5.4, or

j) a pH of between about 5.1 to about 5.2, or

k) a pH of about 5.1

10. The method or liquid nutritional composition of any of the preceding claims wherein the liquid nutritional composition has when undergoing the heat treatment a pH of about 5.4.

11. The method or liquid nutritional composition of any of the preceding claims wherein the liquid nutritional composition has when undergoing the heat treatment a pH of about 5.1.

12. The liquid nutritional composition of any of the preceding claims wherein the liquid nutritional composition has a viscosity of less than 150 cP at a temperature of 20°C and a shear rate of 100 s^{-1}.

13. The liquid nutritional composition of any of the preceding claims wherein the liquid nutritional composition has a viscosity of less than 50 cP at a temperature of 20°C and a shear rate of 100 s^{-1}.

14. The method or liquid nutritional composition of any of the preceding claims wherein the liquid nutritional composition has when undergoing the heat treatment a pH of within about 0.5 of the average pI of the protein, or

a) a pH of within about 0.3 of the average pI of the protein, or

b) a pH of within about 0.1 of the average pI of the protein, or

c) a pH at about the average pI of the protein.

15. The liquid nutritional composition of any of the preceding claims having
    a) a pH of within about 0.5 of the average pI of the protein, or
    b) a pH of within about 0.3 of the average pI of the protein, or
    c) a pH of within about 0.1 of the average pI of the protein, or
    d) a pH at about the average pI of the protein.

16. The method or liquid nutritional composition of any of the preceding claims wherein the non-hydrolysed whey protein is provided by a dry ingredient that comprises a protein content of 35% to 95% by weight of the dry matter of the ingredient.

17. A powdered nutritional composition dispersible in water to form a liquid nutritional composition of any one of claims 2 to 16.

18. A method of preparing a liquid nutritional composition, the method comprising
    a) providing a liquid composition having a pH of between 4 and 6 and comprising about 2% to about 25% by weight of non-hydrolysed whey protein wherein the whey protein is provided by a dry ingredient that comprises at least about 55% of the heat-denaturable protein present in a denatured state,
    b) heat-treating the liquid composition with a heat treatment having an Fo-value of at least equivalent to 90°C for 40s, and
    c) recovering the liquid composition,

    wherein the liquid composition has
    d) a viscosity of less than 200 cP when measured at 20°C and shear rate of 100 s-1, or
    e) an average particle size of less than 20 μm as categorised by the volume weighted average particle size parameter D[4,3], or
    f) exhibits essentially no observable gelation or aggregation, or
    g) any combination of two or more of (d) to (f) above.

19. A method of providing nutrition to a person in need thereof, the method comprising the steps of administering to the person a nutritional composition of any one of claims 2 to 17.

20. A food or food product comprising, consisting essentially of, or consisting of a liquid nutritional composition of any one of claims 2 to 16.

21. Use of a liquid composition according to any one of claims 2 to 16 in the preparation of a medicament for providing nutrition to a subject in need thereof.

CLAIMS

1. A method of preparing a liquid nutritional composition, the method comprising

a) heat-treating a liquid composition having a pH of between 4 and 6 and comprising about 2% to about 25% by weight of non-hydrolysed whey protein, wherein the whey protein comprises or is provided by an ingredient that comprises at least about 55% of the heat-denaturable protein present in a denatured state, and wherein the heat treatment has an Fo-value of at least equivalent to 90°C for 40s, and

b) recovering the liquid composition,

wherein the recovered liquid composition has

c) a viscosity of less than 200 cP when measured at 20°C and shear rate of 100 s-1, or

d) an average particle size of less than 20 μm as categorised by the volume weighted average particle size parameter D[4,3], or

e) exhibits essentially no observable gelation or aggregation, or

f) any combination of two or more of (c) to (e) above.

2. A liquid nutritional composition comprising

a) from about 2% to about 25% by weight of non-hydrolysed whey protein, wherein the whey protein comprises or is provided by an ingredient that comprises at least about 55% of the heat-denaturable protein present in a denatured state,

b) from 0 to about 30% by weight fat

c) from about 0% to about 45% by weight carbohydrate

and wherein the nutritional composition has when at a pH of between 4 and 6 undergone a heat treatment with an F_o-value of at least equivalent to 90°C for 40s, and has

d) a viscosity of less than 200 cP when measured at 20°C and shear rate of 100 s-1, or

e) an average particle size of less than 20 μm as categorised by the volume weighted average particle size parameter D[4,3], or

f) exhibits essentially no observable gelation or aggregation, or

g) any combination of two or more of (d) to (f) above.

3. The liquid nutritional composition of claim 2 wherein the nutritional composition has a pH of between about 4 to about 6, and a viscosity of less than 200 cP at a temperature of 20°C and a shear rate of 100 s^{-1} and exhibits essentially no gelation or aggregation.

4. The method of claim 1 or the liquid nutritional composition of claim 2 or 3 wherein the heat treatment is at least equivalent to 121°C for 10 minutes.

5. The method of claim 4 or the liquid nutritional composition of claim 4 wherein the heat treatment is at least equivalent to 140°C for 5s.

6. The method or liquid nutritional composition of any of the preceding claims wherein the liquid nutritional composition exhibits no observable gelation, or no observable aggregation, or both, after storage for at least 3 months at room temperature.

7. The method or liquid nutritional composition of any of the preceding claims wherein the liquid nutritional composition comprises at least the amount of minerals as recommended by the European Commission Food for Special Medical Purposes (FSMP) directive.

8. The method or liquid nutritional composition of any of the preceding claims wherein the liquid nutritional composition has when undergoing the heat treatment

a) a pH of between about 4.7 to about 6.0, or
b) a pH of between about 4.8 to about 6.0, or
c) a pH of between about 4.9 to about 6.0, or
d) a pH of between about 5.0 to about 6.0, or
e) a pH of between about 4.5 to about 5.7, or
f) a pH of between about 4.5 to about 5.5, or
g) a pH of between about 4.5 to about 5.3, or
h) a pH of between about 4.5 to about 5.2, or
i) a pH of between about 4.7 to about 5.5, or
j) a pH of between about 4.7 to about 5.3, or
k) a pH of between about 4.7 to about 5.2, or
l) a pH of between about 4.8 to about 5.3, or
m) a pH of between about 4.8 to about 5.2, or
n) a pH of about 5, or
o) a pH of between about 4.2 to about 5.8, or

p) a pH of between about 4.4 to about 5.8, or

q) a pH of between about 4.6 to about 5.6, or

r) a pH of between about 4.8 to about 5.4, or

s) a pH of between about 4.9 to about 5.3, or

t) a pH of between about 5.0 to about 5.2, or

u) a pH of about 5.1, or

v) a pH of between about 4.3 to about 5.1, or

w) a pH of between about 4.6 to about 5.1, or

x) a pH of between about 4.8 to about 5.1, or

y) a pH of between about 5.1 to about 6.0, or

z) a pH of between about 5.1 to about 5.8, or

aa) a pH of between about 5.1 to about 5.6, or

bb) a pH of between about 5.1 to about 5.4.

9. The method or liquid nutritional composition of any of the preceding claims wherein the liquid nutritional composition has when undergoing the heat treatment

a) a pH of between about 4.1 to about 5.1, or

b) a pH of between about 4.3 to about 5.1, or

c) a pH of between about 4.5 to about 5.1, or

d) a pH of between about 4.7 to about 5.1, or

e) a pH of between about 4.9 to about 5.1, or

f) a pH of between about 5.1 to about 6.0, or

g) a pH of between about 5.1 to about 5.8, or

h) a pH of between about 5.1 to about 5.6, or

i) a pH of between about 5.1 to about 5.4, or

j) a pH of between about 5.1 to about 5.2, or

k) a pH of about 5.1

10. The method or liquid nutritional composition of any of the preceding claims wherein the liquid nutritional composition has when undergoing the heat treatment a pH of about 5.4.

11. The method or liquid nutritional composition of any of the preceding claims wherein the liquid nutritional composition has when undergoing the heat treatment a pH of about 5.1.

12. The liquid nutritional composition of any of the preceding claims wherein the liquid nutritional composition has a viscosity of less than 150 cP at a temperature of 20°C and a shear rate of 100 s^{-1}.

13. The liquid nutritional composition of any of the preceding claims wherein the liquid nutritional composition has a viscosity of less than 50 cP at a temperature of 20°C and a shear rate of 100 s^{-1}.

14. The method or liquid nutritional composition of any of the preceding claims wherein the liquid nutritional composition has when undergoing the heat treatment a pH of within about 0.5 of the average pI of the protein, or
    a) a pH of within about 0.3 of the average pI of the protein, or
    b) a pH of within about 0.1 of the average pI of the protein, or
    c) a pH at about the average pI of the protein.

15. The liquid nutritional composition of any of the preceding claims having
    a) a pH of within about 0.5 of the average pI of the protein, or
    b) a pH of within about 0.3 of the average pI of the protein, or
    c) a pH of within about 0.1 of the average pI of the protein, or
    d) a pH at about the average pI of the protein.

16. The method or liquid nutritional composition of any of the preceding claims wherein the non-hydrolysed whey protein is provided by a dry ingredient that comprises a protein content of 35% to 95% by weight of the dry matter of the ingredient.

17. A powdered nutritional composition dispersible in water to form a liquid nutritional composition of any one of claims 2 to 16.

18. A method of preparing a liquid nutritional composition, the method comprising
    a) providing a liquid composition having a pH of between 4 and 6 and comprising about 2% to about 25% by weight of non-hydrolysed whey protein wherein the whey protein is provided by a dry ingredient that comprises at least about 55% of the heat-denaturable protein present in a denatured state,
    b) heat-treating the liquid composition with a heat treatment having an Fo-value of at least equivalent to 90°C for 40s, and
    c) recovering the liquid composition,

    wherein the liquid composition has

d) a viscosity of less than 200 cP when measured at 20°C and shear rate of 100 s-1, or

e) an average particle size of less than 20 μm as categorised by the volume weighted average particle size parameter D[4,3], or

f) exhibits essentially no observable gelation or aggregation, or

g) any combination of two or more of (d) to (f) above.

19. A nutritional composition of any one of claims 2 to 17 for use in providing nutrition to a person in need thereof.

20. A food or food product comprising, consisting essentially of, or consisting of a liquid nutritional composition of any one of claims 2 to 16.

21. Use of a liquid composition according to any one of claims 2 to 16 in the preparation of a medicament for providing nutrition to a subject in need thereof.

22. A nutritional composition of any one of claims 2 to 17 for use in therapy.