CLAIMS

1. An omega-3 fatty acid emulsion comprising at least the following components:
   a) omega-3 fatty acids,
   b) carotenoids,
   c) tocopherols,
   d) tocotrienols,
   e) zinc,
   f) selenium, and
   g) manganese

2. The omega-3 fatty acid emulsion according to claim 1, wherein the source of the omega-3 fatty acid is refined fish oil.

3. The omega-3 fatty acid emulsion according to claim 2, wherein the fish oil comprises at least 18 weight% eicosapentaenoic acid (EPA) and 12 weight% docosahexaenoic acid (DHA).

4. The omega-3 fatty acid emulsion according to claim 2, wherein the fish oil is present in the form of glycerides, ethyl esters or phospholipids.

5. The omega-3 fatty acid emulsion according to any one of claims 2 to 4, comprising from about 1 mg to about 4000 mg of fish oil, from about 0.1mg to about 15 mg of carotenoids, from about 0.1 mg to about 200 mg of tocopherol, from about 0.1 mg to about 200 mg of tocotrienol, from about 1.1 mg to about 40 mg of zinc, from about 5.5 mcg to about 400 mcg of selenium and from about 0.23 mg to about 11 mg of manganese per 5 ml of emulsion, the balance being water.

6. The omega-3 fatty acid emulsion according to claim 5, wherein the fish oil provides for about 445 mg omega-3 marine fatty acids

consisting of 267 mg Eicosapentaenoic acid (EPA) and 178 mg Docosahaenoic acid (DHA) per 5 ml of emulsion.

7. The omega-3 fatty acid emulsion according to any one of the preceding claims, wherein the carotenoids, tocopherol and tocotrienol are obtained from a palm fruit oil mixed concentrate.

8. The omega-3 fatty acid emulsion according to claim 7, wherein the concentrate comprises about 3 % of carotenoids, about 2% of tocopherols, about 8% of tocotrienols and about 79% of glycerides per 100 mg of concentrate, the balance being made up of other phytonutrients.

9. The omega-3 fatty acid emulsion according to claim 8, wherein the carotenoids are carotenes, including alpha-carotene, beta-carotene and gamma-carotene.

10. The omega-3 fatty acid emulsion according to claim 8, wherein the tocopherols and tocotrienols are selected from alpha-tocopherol, alpha-tocotrienol, beta-tocotrienol, gamma-tocotrienol and delta-tocotrienol.

11. The omega-3 fatty acid emulsion according to claim 9, wherein the concentrate comprises about 1.91 mg of alpha-carotene, about 2.72 mg of beta-carotene, about 63mcg of lycopene and about 160 mcg of other carotenes, per 100mg of concentrate.

12. The omega-3 fatty acid emulsion according to claim 7, wherein the concentrate comprises about 3.21 mg of tocopherols and about 12.99 mg of tocotrienols, per 100 mg of concentrate.

13. The omega-3 fatty acid emulsion according to any one of claims 7 to 12, wherein the concentrate further comprises lycopene, glycerides, phytosterols, Co-Enzyme Q 10 and squalene.

14. The omega-3 fatty acid emulsion of claim 13, wherein the concentrate comprises about 234mcg phytosterol, about 66mcg squalene-, about 12mcg co-enzyme Q10 and about 79mg glyceride, per 100 mg of concentrate.

15. The omega-3 fatty acid emulsion according to any one of claims 7 to 14, wherein the concentrate is substantially free of toxic elements, including lead, mercury and arsenic.

16. The omega-3 fatty acid emulsion according to claim 15, wherein the concentrate comprises less than 0.6 ppm of lead, less than 0.05 ppm of mercury and less than 0.1 ppm of arsenic.

17. The omega-3 fatty acid emulsion according to any one of claims 7 to 16, wherein the concentrate comprises microorganisms in an amount of less than 10 cfu/g total plate count for bacteria, yeast and mould.

18. The omega-3 fatty acid emulsion according to any one of the preceding claims, further comprising any one or more of soy lecithin, glycerol, puratex (invert sugar) and/or artificial sweeteners, citric acid, stabilizers, flavourants, and preservatives.

19. The omega-3 fatty acid emulsion according to claim 18, wherein the preservative is potassium sorbate.

20. The omega-3 fatty acid emulsion according to any one of the preceding claims, wherein the selenium is in the form of selenium

yeast, selenium amino acid chelate, selenium oxide, , selenium sulphide, sodium selenite or sodium selenate.

21. The omega-3 fatty acid emulsion according to any one of the preceding claims, wherein the zinc is in the form of zinc amino acid chelate, zinc gluconate, zinc oxide, zinc sulphate, zinc undecylenate, zinc chloride, zinc stearate or zinc acetate.

22. The omega-3 fatty acid emulsion according to any one of the preceding claims, wherein the manganese is in the form of manganese amino acid complexes, manganese gluconate, manganese glycerophosphate or manganese sulphate.

23. The omega-3 fatty acid emulsion according to any one of the preceding claims, wherein the selenium, zinc and manganese are present as amino acid complexes.

24. The omega-3 fatty acid emulsion according to any one of the preceding claims having the composition as provided in Table 5.

25. A method of producing an omega-3 fatty acid emulsion, the method comprising the steps of:
    a) providing a source of fish oil containing at least 18% EPA and 12% DHA;
    b) providing a source of a concentrate comprising carotenoids, tocophenols, tocotrienols and glycerides;
    c) providing a source of zinc, manganese and selenium,
    d) optionally providing a source of additives,
    e) blending together the fish oil, concentrate, zinc, manganese, selenium and the optional additives with water and homogenizing the resultant solution until a stable omega-3 fatty acid emulsion is formed.

26. The method according to claim 25, wherein step e) further comprises the following steps:
    f) blending together the fish oil and the concentrate until a homogenous mixture A is obtained;
    g) blending together the water, and the source of zinc, selenium and manganese until a homogenous mixture B is obtained;
    h) blending together mixtures A and B until a homogenous mixture C is obtained, thereby forming a stabilized omega-3 fatty acid emulsion.

27. The method according to claim 25 or 26, wherein the concentrate comprises about 3 % of carotenoids, about 2% of tocopherols, about 8% of tocotrienols and about 79% of glycerides per 100 mg of concentrate, the balance being other phytonutrients.

28. The method according to any one of claims 25 to 27, wherein the zinc, selenium and manganese are added as amino acid complexes.

29. The method according to any one of claims 25 to 28, wherein soy lecithin is first added to the fish oil and warmed in a water bath at 40℃ and mixed until a homogenous mixture is obtained.

30. The method according to claim 29, wherein the concentrate is then added to the soy lecithin and fish oil homogenous mixture and mixed until a homogenous mixture is obtained.

31. The method according to any one of claims 25 to 31, wherein the additives are selected from a stabilizer, citric acid, glycerol, puratex and/or artificialsweeteners, and potassium sorbate.

32. The method according to claim 32, wherein the stabilizer is selected from lecithin, sodium algenate, guar gum, xanthan gum, cognac glue and polyglycerol.

33. The method according to any one of claims 29 to 33, wherein the additives are first added to the water until a homogenous mixture is obtained.

34. The method according to claim 33, wherein the water and additive mixture is warmed to a temperature of 40°C and then mixed with the fish oil, lecithin and concentrate mixture, and homogenized until a stable emulsion is obtained.

35. An omega-3 fatty acid emulsion according to any one of claims 1 to 24, for use in the treatment or prevention of a micronutrient deficiency selected from: vitamin A, vitamin E, , iron, zinc, copper, manganese or selenium and/or in the enhancement of the immune system of a subject.

36. Use of an omega-3 fatty acid emulsion according to any one of claims 1 to 24, in the manufacture of a medicament for use in the treatment or prevention of a micronutrient deficiency selected from: vitamin A, vitamin E, , iron, zinc, copper, manganese or selenium and/or in the enhancement of the immune system of a subject.

CLAIMS

1. An omega-3 fatty acid emulsion comprising at least the following components:
    a) omega-3 fatty acids,
    b) carotenoids,
    c) tocopherols,
    d) tocotrienols,
    e) zinc,
    f) selenium, and
    g) manganese

wherein the carotenoids, tocopherols and tocotrienols are obtained from a palm fruit oil mixed concentrate, and wherein the concentrate comprises about 3% of carotenoids, about 2% of tocopherols, about 8% of tocotrienols and about 79% of glycerides per 100 mg of concentrate, the balance being made up of other phytonutrients.

2. The omega-3 fatty acid emulsion according to claim 1, wherein the source of the omega-3 fatty acid is refined fish oil.

3. The omega-3 fatty acid emulsion according to claim 2, wherein the fish oil comprises at least 18 weight% eicosapentaenoic acid (EPA) and 12 weight% docosahexaenoic acid (DHA).

4. The omega-3 fatty acid emulsion according to claim 2, wherein the fish oil is present in the form of glycerides, ethyl esters or phospholipids.

5. The omega-3 fatty acid emulsion according to any one of claims 2 to 4, comprising from about 1 mg to about 4000 mg of fish oil, from about 0.1mg to about 15 mg of carotenoids, from about 0.1 mg to about 200 mg of tocopherol, from about 0.1 mg to about 200 mg of tocotrienol, from about 1.1 mg to about 40 mg of zinc, from about 5.5

mcg to about 400 mcg of selenium and from about 0.23 mg to about 11 mg of manganese per 5 ml of emulsion, the balance being water.

6. The omega-3 fatty acid emulsion according to claim 5, wherein the fish oil provides for about 445 mg omega-3 marine fatty acids consisting of 267 mg Eicosapentaenoic acid (EPA) and 178 mg Docosahaenoic acid (DHA) per 5 ml of emulsion.

7. The omega-3 fatty acid emulsion according to claim 1, wherein the carotenoids are selected from alpha-carotene, beta-carotene and gamma-carotene.

8. The omega-3 fatty acid emulsion according to claim 1, wherein the tocopherols and tocotrienols are selected from alpha-tocopherol, alpha-tocotrienol, beta-tocotrienol, gamma-tocotrienol and delta-tocotrienols.

9. The omega-3 fatty acid emulsion according to claim 7, wherein the concentrate comprises about 1.91 mg of alpha-carotene, about 2.72 mg of beta-carotene, about 63 mcg of lycopene and about 160 mcg of other carotenes, per 100mg of concentrate.

10. The omega-3 fatty acid emulsion according to claim 1, wherein the concentrate comprises about 3.21 mg of tocopherols and about 12.99 mg of tocotrienols, per 100mg of concentrate.

11. The omega-3 fatty acid emulsion according to any one of claims 1 to 10, wherein the concentrate further comprises lycopene, glycerides, phytosterols, Co-Enzyme Q 10 and squalene.

12. The omega-3 fatty acid emulsion of claim 11, wherein the concentrate comprises about 234mcg phytosterol, about 66mcg squalene, about

12mcg co-enzyme Q10 and about 79mg glyceride, per 100 mg of concentrate.

13. The omega-3 fatty acid emulsion according to any one of claims 1 to 12, wherein the concentrate is free of toxic elements, selected from lead, mercury and arsenic.

14. The omega-3 fatty acid emulsion according to claim 13, wherein the concentrate comprises less than 0.6 ppm of lead, less than 0.05 ppm of mercury and less than 0.1 ppm of arsenic.

15. The omega-3 fatty acid emulsion according to any one of claims 1 to 14, wherein the concentrate comprises microorganisms in an amount of less than 10 cfu/g total plate count for bacteria, yeast and mould.

16. The omega-3 fatty acid emulsion according to any one of claims 1 to 15, further comprising any one or more of soy lecithin, glycerol, puratex (invert sugar) and/or artificial sweeteners, citric acid, stabilizers, flavourants, and preservatives.

17. The omega-3 fatty acid emulsion according to claim 16, wherein the preservative is potassium sorbate.

18. The omega-3 fatty acid emulsion according to any one of claims 1 to 17, wherein the selenium is in the form of selenium yeast, selenium amino acid chelate, selenium oxide, selenium sulphide, sodium selenite or sodium selenate.

19. The omega-3 fatty acid emulsion according to any one of claims 1 to 18, wherein the zinc is in the form of zinc amino acid chelate, zinc gluconate, zinc oxide, zinc sulphate, zinc undecylenate, zinc chloride, zinc stearate or zinc acetate.

20. The omega-3 fatty acid emulsion according to any one of claims 1 to 19, wherein the manganese is in the form of manganese amino acid complexes, manganese gluconate, manganese glycerophosphate or manganese sulphate.

21. The omega-3 fatty acid emulsion according to any one of claims 1 to 20, wherein the selenium, zinc and manganese are present as amino acid complexes.

22. The omega-3 fatty acid emulsion according to any one of claims 1 to 21 having the composition comprising:

a) Marine fish oil in the range of 1 mg – 4,000 mg;
b) Carotenes in the range of 0.1 mg – 15 mg comprising:
    a. Alpha-carotene in the range of 30 mcg – 1200 mg
    b. Beta-carotene in the range of 45 mcg – 1200 mg
    c. Other carotenes in the range of 7 mcg – 160 mg
c) Vitamin E in the range of 0.1mg – 200 mg comprising:
    a. Tocopherol in the range of 15 mcg – 50 mg
    b. Tocotrienol in the range of 20 mcg – 960 mg
d) Other micronutrients comprising:
    a. Zine amino acid complex in the range of 1.1 mg – 240 mg
    b. Selenium amino acid complex in the range of 5.5 mcg – 8000 mcg
    c. Manganese amino acid complex in the range of 0.23 mg – 110 mg
e) Omega-3 fatty acids in the range of 195 mcg – 800 mg comprising:
    a. Eicosapentaenoic acid (EPA) in the range of 100 mcg – 800 mg
    b. Docosahexaenoic acid (DHA) in the range of 95 mcg – 400 mg

and further comprising ingredients from the group consisting of:

f) Other ingredients comprising:
    a. Soy lecithin
    b. Distilled water
    c. Stabilizer
    d. Citric acid
    e. Invert sugar and/or artificial sweetener
    f. Glycerides
    g. Potassium sorbate
    h. Oil based flavouring.

23. A method of producing an omega-3 fatty acid emulsion, the method comprising the steps of:
    a) providing a source of fish oil containing at least 18% EPA and 12% DHA;
    b) providing a source of palm fruit oil mixed concentrate, wherein the concentrate comprises about 3% of carotenoids, about 2% of tocopherols, about 8% of tocotrienols and about 79% of glycerides per 100 mg of concentrate, the balance being made up of other phytonutrients;
    c) providing a source of zinc, manganese and selenium,
    d) optionally providing a source of additives,
    e) blending together the fish oil, concentrate, zinc, manganese, selenium and the optional additives with water and homogenizing the resultant solution until a stable omega-3 fatty acid emulsion is formed.

24. The method according to claim 23, wherein step e) further comprises the following steps:
    a) blending together the fish oil and the concentrate until a homogenous mixture A is obtained;
    b) blending together the water, and the source of zinc, selenium and manganese until a homogenous mixture B is obtained;

c) blending together mixtures A and B until a homogenous mixture C is obtained, thereby forming a stabilized omega-3 fatty acid emulsion.

25. The method according to claims 23 or 24, wherein the zinc, selenium and manganese are added as amino acid complexes.

26. The method according to any one of claims 23 to 25, wherein soy lecithin is first added to the fish oil and warmed in a water bath at 40℃ and mixed until a homogenous mixture is obtained.

27. The method according to claim 26, wherein the concentrate is then added to the soy lecithin and fish oil homogenous mixture and mixed until a homogenous mixture is obtained.

28. The method according to any one of claims 23 to 27, wherein the additives are selected from a stabilizer, citric acid, glycerol, puratex and/or artificial sweeteners, and potassium sorbate.

29. The method according to claim 28, wherein the stabilizer is selected from lecithin, sodium algenate, guar gum, xanthan gum, cognac glue and polyglycerol.

30. The method according to any one of claims 26 to 29, wherein the additives are first added to the water until a homogenous mixture is obtained.

31. The method according to claim 30, wherein the water and additive mixture is warmed to a temperature of 40°C and then mixed with the fish oil, lecithin and concentrate mixture, and homogenized until a stable emulsion is obtained.

32. An omega-3 fatty acid emulsion according to any one of claims 1 to 22, for use in the treatment or prevention of a micronutrient deficiency selected from: vitamin A, vitamin E, , iron, zinc, copper, manganese or selenium and/or in the enhancement of the immune system of a subject.

33. Use of an omega-3 fatty acid emulsion according to any one of claims 1 to 22, in the manufacture of a medicament for use in the treatment or prevention of a micronutrient deficiency selected from: vitamin A, vitamin E, , iron, zinc, copper, manganese or selenium and/or in the enhancement of the immune system of a subject.

34. The omega-3 fatty acid emulsion according to any one of claims 1 to 21 having the composition comprising:
    a) Marine fish oil in the amount of about 1486 mg;
    b) Carotenes in the amount of about 4.86 mg comprising:
        a. Alpha-carotene in the amount of about 1.91 mg
        b. Beta-carotene in the amount of about 2.76 mg
        c. Other carotenes in the amount of about 0.190 mg
    c) Vitamin E in the amount of about 16.2 mg comprising:
        a. Tocopherol in the amount of about 3.21 mg
        b. Tocotrienol in the amount of about 12.99 mg
    d) Other micronutrients comprising:
        a. Zine amino acid complex in the amount of about 60 mg
        b. Selenium amino acid complex in the amount of about 13.5 mg
        c. Manganese amino acid complex in the amount of about 12.0 mg
    e) Omega-3 fatty acids in the amount of about 1486 mg comprising:
        a. Eicosapentaenoic acid (EPA) in the amount of about 267 mg

b. Docosahexaenoic acid (DHA) in the amount of about 178 mg

and further comprising ingredients from the group consisting of:

f) Other ingredients comprising:

a. Soy lecithin in the amount of about 0.35 g
b. Distilled water in the amount of about 2.17 g
c. Stabilizer in the amount of about 5.4 mg
d. Citric acid in the amount of about 5.4 mg
e. Invert sugar and/or artificial sweetener in the amount of about 0.41 g
f. Glycerides in the amount of about 0.41 g
g. Potassium sorbate in the amount of about 0.54 mg
h. Oil based flavouring in the amount of about 8.2 mg