CLAIMS

What is claimed is:

1. A capsule, food, beverage, energy bar, or nutritional supplement comprising an EPA composition comprising from about 15 wt. % to about 90 wt. % eicosapentaenoic acid (EPA) and about 13 wt. % to about 70 wt. % polar lipids, wherein:

the polar lipids comprise phospholipid conjugates and glycolipid conjugates;

about 3 wt. % to about 50 wt. % of the EPA in the composition is a phospholipid conjugate;

about 5 wt. % to about 50 wt. % of the EPA in the composition is a glycolipid conjugate;

about 0 wt. % to about 5 wt. % of the EPA is a triglyceride conjugate or a diglyceride conjugate;

about 25 wt. % to about 85 wt. % of the EPA in the composition is in free fatty acid form;

the composition comprises between about 0.1 wt. % and about 3.0 wt. % mannitol; and

the composition does not comprise docosahexaenoic acid (DHA) or esterified EPA, and the composition is suitable for human consumption.

2. A capsule, food, beverage, energy bar, or nutritional supplement comprising EPA composition comprising the following distribution of EPA by lipid class:

about 3 wt. % to about 50 wt. % of the EPA is a phospholipid conjugate;

about 5 wt. % to about 50 wt. % of the EPA is a glycolipid conjugate;

about 0 wt. % to about 5 wt. % of the EPA is a triglyceride conjugate or a diglyceride conjugate; and

about 25 wt. % to about 85 wt. % of the EPA is in free fatty acid form, wherein the composition comprises between about 0.1 wt. % and about 3.0 wt. % mannitol and the composition is suitable for human consumption.

3. The capsule, food, beverage, energy bar, or nutritional supplement of claim 1, wherein the EPA to total omega-3 fatty acids ratio is greater than 90%.

4. The capsule, food, beverage, energy bar, or nutritional supplement of claim 1, wherein the EPA composition comprises about 15 wt. % to about 75 wt. % EPA.

5. The capsule, food, beverage, energy bar, or nutritional supplement of claim 1, wherein the EPA composition comprises about 20 wt. % to about 50 wt. % EPA.

6. The capsule, food, beverage, energy bar, or nutritional supplement of claim 1, wherein the EPA composition comprises at least about 13 wt. % polar lipids.

7. A capsule, food, beverage, energy bar, or nutritional supplement comprising an EPA composition comprising from about 15 wt. % to about 90 wt. % eicosapentaenoic acid (EPA) and about 13 wt. % to about 70 wt. % polar lipids, wherein:

the polar lipids comprise phospholipid conjugates and glycolipid conjugates,

the composition comprises less than about 5 wt. % glyceride conjugates and at least about 30 wt. % free fatty acids;

about 25 wt. % to about 85 wt. % of the EPA in the composition is in free fatty acid form;

the composition comprises between about 0.1 wt. % and about 3.0 wt. % mannitol;

the composition does not comprise docosahexaenoic acid (DHA) or esterified EPA, and

the composition is suitable for human consumption.

8. The capsule, food, beverage, energy bar, or nutritional supplement of claim 1, wherein the polar lipids are comprised of phospholipid conjugates and glycolipid conjugates at a wt. % ratio in the range of about 3:1 to about 1:3.

9. The capsule, food, beverage, energy bar, or nutritional supplement of claim 8, wherein the glycolipid conjugates comprise one or more of digalactosyldiacylglycerol and monogalactosyldiacylglycerol.

10. The capsule, food, beverage, energy bar, or nutritional supplement of claim 8, wherein the phospholipid conjugates comprise one or more of phosphatidylcholine, lyso-phosphatidylcholine, phosphatidylinositol, phosphatidylethanolamine and phosphatidylglycerol.

11. The capsule, food, beverage, energy bar, or nutritional supplement of claim 10, wherein the phospholipid conjugates comprise one or more of phosphatidylcholine and phosphatidylglycerol.

12. The capsule, food, beverage, energy bar, or nutritional supplement of claim 1, wherein the composition comprises:

i) 0 to 5 wt. % C:18 fatty acids;

ii) 0 to 20 wt. % C:16 fatty acids;

iii) 0 to 5 wt. % C:14 fatty acids;

iv) 0 to 0.5 wt. % C:12 fatty acids; and/or

v) 0 to 0.5 wt. % C:10 fatty acids.

13. The capsule, food, beverage, energy bar, or nutritional supplement of claim 1, wherein the EPA composition further comprises chlorophyll a.

14. The capsule, food, beverage, energy bar, or nutritional supplement of claim 1, wherein the EPA composition comprises less than about 10.0 wt. % arachidonic acid.

15. The capsule, food, beverage, energy bar, or nutritional supplement of claim 1, wherein the EPA composition is substantially free of intact cells, cellular components, polynucleotides, and polypeptides.

16. The capsule, food, beverage, energy bar, or nutritional supplement of claim 1, wherein the EPA composition comprises coenzyme Q9 (CoQ9) and/or coenzyme Q10 (CoQ10).

17. A capsule, food, beverage, energy bar, or nutritional supplement comprising an EPA composition comprising from about 15 wt. % to about 90 wt. % eicosapentaenoic acid (EPA) and about 13 wt. % to about 70 wt. % polar lipids, wherein:

the polar lipids comprise phospholipid conjugates and glycolipid conjugates,

the composition comprises less than about 1 wt. % phytosterols,

about 0 wt. % to about 5 wt. % of the EPA is a triglyceride conjugate or a diglyceride conjugate;

about 25 wt. % to about 85 wt. % of the EPA in the composition is in free fatty acid form;

the composition comprises between about 0.1 wt. % and about 3.0 wt. % mannitol;

the composition does not comprise docosahexaenoic acid (DHA) or esterified EPA, and wherein the composition is suitable for human consumption.

18. A capsule, food, beverage, energy bar, or nutritional supplement comprising an EPA composition comprising from about 15 wt. % to about 90 wt. % eicosapentaenoic acid (EPA) and about 13 wt. % to about 70 wt. % polar lipids, wherein:

the polar lipids comprise phospholipid conjugates and glycolipid conjugates,

the composition comprises less than about 2 wt. % carotenoids,

about 0 wt. % to about 5 wt. % of the EPA is a triglyceride conjugate or a diglyceride conjugate;

about 25 wt. % to about 85 wt. % of the EPA in the composition is in free fatty acid form;

the composition comprises between about 0.1 wt. % and about 3.0 wt. % mannitol;

the composition does not comprise docosahexaenoic acid (DHA) or esterified EPA, and wherein the composition is suitable for human consumption.

19. The capsule, food, beverage, energy bar, or nutritional supplement of claim 1, wherein the EPA composition does not comprise fatty acids selected from the group consisting of octadecatetraenoic acid or stearidonic acid (SDA=C18:4ω3), eicosatrienoic acid (ETE=C20:3ω3), eicosatetraenoic acid (ETA=C20:4ω3), heneicosapentaenoic acid or uncosapentaenoic acid (HPA=C21:5ω3), and docapentaenoic acid (DPA=C22:5ω3).

20. The capsule, food, beverage, energy bar, or nutritional supplement of claim 1, wherein the EPA composition does not comprise one or more carotenoids selected from the group consisting of astaxanthin, cis-lutein, trans-lutein, cis-zeaxanthin, trans-alpha-crytoxanthin, trans-alpha-carotene, cis-alpha-carotene, cis-lycopene, and trans-lycopene.

21. The capsule, food, beverage, energy bar, or nutritional supplement of claim 1, wherein the EPA composition does not comprise chlorophyll c.

22. The capsule, food, beverage, energy bar, or nutritional supplement of claim 1, wherein the EPA composition does not comprise one or more phospholipids selected from the group consisting of N-acyl-phosphatidylethanolamine, lyso-phosphatidylcholine, phosphatidylinositol and phosphatidylethanolamine.

23. The capsule, food, beverage, energy bar, or nutritional supplement of claim 1, wherein the EPA composition does not comprise sphingolipids.

24. The capsule, food, beverage, energy bar, or nutritional supplement of claim 1, wherein the EPA composition comprises about 20-50 wt. % EPA, about 10-25 wt. % glycolipids, and about 5-25 wt. % phospholipids.

25. The capsule, food, beverage, energy bar, or nutritional supplement of claim 1, wherein the EPA composition comprises:

Component	wt. %
Fatty Acids	
Capric (10:0)	0.1-0.2
Lauric (12:0)	0.1-0.2
Myristic (14:0)	1.0
Palmitic (16:0)	5.3-6.5
Palmitoleic (16:1)	7.0-8.0
Hexadecadienoic (16:2)	0.2-0.3
Stearic (18:0)	0.2-0.3
Oleic (18:1ω9)	2.0
Oleic (18:1ω7)	0.3-0.4
Linoleic (18:2ω6)	1.2-2.0
Alpha-Linolenic (ALA) (18:3ω3)	0.2
Arachidonic (20:4ω6)	1.0-8.0
Eicosapentaenoic (EPA) (20:5ω3)	19-30
Total Fatty Acid	40-55
Total Omega-3	20-30
EPA/Omega-3	>93
Total Omega-6	2-10
Phospholipids	
Phosphatidylcholine	4.7-7.4
Lyso-Phosphatidylcholine	0.3-0.4
Phosphatidylinositol	0.8-1.3

Component	wt. %
Phosphatidylethanolamine	0.5-0.8
Phosphatidylglycerol	1.8-2.8
Glycolipids	
Digalactosyldiacylglycerol	10-17
Monogalactosyldiacylglycerol	3-5
Phytonutrients	
Phytosterols	1.5
Chlorophyll	4-5
Total Phospholipids (PL) (wt %)	9-14
Total Glycolipids (GL) (wt %)	13-21
Total PoL (PL + GL) (wt %)	22-35.

26. The capsule of claim 1, wherein the capsule is a gelatin capsule or a soft capsule.

27. A method of producing a capsule, food, beverage, energy bar, or nutritional supplement comprising an EPA composition as recited in claim 1, the method comprising:

a) providing an algal paste;

b) extracting lipids from the algal paste with an organic solvent, thereby substantially isolating a crude algae extract (CAE) comprising neutral lipids and polar lipids from the water-soluble components of the paste;

c) substantially removing the remaining water-soluble components from the CAE, thereby yielding a crude algae oil (CAO);

d) contacting the CAO with supercritical CO_2, wherein the supercritical CO_2 selectively extracts the neutral lipids, thereby splitting the CAO into a neutral lipid fraction comprising free fatty acids and a polar lipid fraction comprising glycolipids and phospholipids;

e) isolating C20 free fatty acids from the neutral lipid fraction, thereby yielding a concentrated EPA free fatty acid fraction;

f) combining the concentrated EPA free fatty acid fraction produced in step e) and the polar lipid fraction produced in step d), thereby yielding an EPA composition; and

g) formulating the EPA composition yielded in step f) in a capsule, food, beverage, energy bar, or nutritional supplement.

28. A method of producing a capsule, food, beverage, energy bar, or nutritional supplement comprising an EPA composition as recited in claim 1, the method comprising:

a) providing an algal paste;

b) extracting lipids from the algal paste with an organic solvent, thereby isolating a crude algae extract (CAE) comprising neutral lipids and polar lipids from the water-soluble components of the paste;

c) substantially removing the remaining water-soluble components from the CAE, thereby yielding a crude algae oil (CAO);

d) hydrolyzing a first portion of the CAO, thereby releasing free fatty acids in the portion of CAO;

e) fractionating the released free fatty acids according to chain length, thereby isolating C20 free fatty acids and yielding a concentrated EPA free fatty acid fraction;

f) combining the concentrated EPA free fatty acid fraction produced in step e) and a second portion of the CAO produced in step c), thereby yielding an EPA composition; and

g) formulating the EPA composition yielded in step f) in a capsule, food, beverage, energy bar, or nutritional supplement.

29. A capsule, food, beverage, energy bar, or nutritional supplement comprising an EPA composition comprising from about 15 wt. % to about 75 wt. % eicosapentaenoic acid (EPA), wherein

about 25 wt. % to about 85 wt. % of the EPA is in a free fatty acid form;

about 3 wt. % to about 30 wt. % of the EPA is a phospholipid conjugate;

about 8 wt. % to about 50 wt. % of the EPA is a glycolipid conjugate;

the composition comprises between about 0.1 wt. % and about 3.0 wt. % mannitol; and

the EPA to total omega-3 fatty acids ratio is greater than about 97%;

wherein the composition comprises from about 0 wt. % to less than about 0.2 wt. % triglyceride conjugate or diglyceride conjugate, does not comprise docosahexaenoic acid (DHA) or esterified EPA, and wherein the composition is suitable for human consumption.

30. A capsule, food, beverage, energy bar, or nutritional supplement comprising an EPA composition comprising from about 20 wt. % to about 50 wt. % eicosapentaenoic acid (EPA) and from about 13 wt. % to about 50 wt. % polar lipids, wherein:

about 3 wt. % to about 50 wt. % of the EPA in the composition is a phospholipid conjugate;

about 5 wt. % to about 50 wt. % of the EPA in the composition is a glycolipid conjugate;

about 0 wt. % to about 5 wt. % of the EPA is a triglyceride conjugate or a diglyceride conjugate;

about 25 wt. % to about 85 wt. % of the EPA in the composition is in free fatty acid form;

the composition comprises between about 0.1 wt. % and about 3.0 wt. % mannitol;

the EPA to total omega-3 fatty acids ratio is greater than 95%;

the composition does not comprise docosahexaenoic acid (DHA) or esterified EPA, and the composition is suitable for human consumption.

31. The capsule, food, beverage, energy bar, or nutritional supplement of claim 1, wherein the EPA composition further comprises chlorophyll at a concentration in the range of about 4-5 wt. %.