[4] Thus, there is an urgent need for palm oil alternatives that do not rely upon utilization of oil palms and incur the associated negative environmental costs.

BRIEF SUMMARY

[4a] In an aspect of the present disclosure, there is provided an edible microbial oil produced by an oleaginous yeast, wherein the edible oil comprises a fatty acid profile comprising:

at least 30% w/w saturated fatty acids;

at least 30% w/w unsaturated fatty acids; and

less than 30% w/w total polyunsaturated fatty acids.

[4b] In another aspect of the present disclosure, there is provided a derivative of the oil disclosed herein, wherein the derivative is a fraction, and wherein the fraction is microbial stearin, microbial olein, microbial soft mid-fraction, microbial super olein, microbial hard mid-fraction, microbial olein, and/or microbial top olein.

[4c] In a further aspect of the present disclosure, there is provided a food product comprising the microbial olein disclosed herein.

[4d] In another aspect of the present disclosure, there is provided a blended fat composition, wherein said composition comprises a vegetable oil lipid source, and at least 1% of the edible microbial oil and/or a derivative thereof disclosed herein.

[4e] In a further aspect of the present disclosure, there is provided a palm oil substitute comprising the edible microbial oil disclosed herein, the derivative disclosed herein, or the blended fat composition disclosed herein.

[4f] In another aspect of the present disclosure, there is provided a food product comprising the derivative disclosed herein.

[4g] In a further aspect of the present disclosure, there is provided a method for producing a food product comprising an edible microbial oil and/or a derivative thereof comprising:

obtaining an edible microbial oil, and/or a derivative thereof, wherein said oil is produced from an oleaginous yeast;

using the microbial oil and/or derivative thereof as an ingredient in a food product; and

producing a food product.

[5] The present disclosure relates to microbial oils and/or derivative thereof, wherein the microbial oil is produced by an oleaginous yeast. In some ~~embodiment~~example**s**, the microbial oil and/or derivative thereof further comprises ergosterol, β-carotene, torulene, and/or torularhodin. In some ~~embodiment~~example**s**, the microbial oil and/or derivative thereof comprises at least 50 ppm ergosterol. In some ~~embodiment~~example**s**, the microbial oil and/or derivative thereof of is produced by *Rhodosporidium toruloides*.

[6] In some ~~embodiment~~example**s**, the microbial oil comprises a fatty acid profile comprising greater than 30% saturated fatty acids; greater than 30% mono-unsaturated fatty acids; and less than 30% poly-unsaturated fatty acids. In some ~~embodiment~~example**s**, the microbial oil comprises a saturated fatty acid composition of at least 40%. In some ~~embodiment~~example**s**, the microbial oil comprises an unsaturated fatty acid composition of at least 40%. In some ~~embodiment~~example**s**, the microbial oil comprises a triglyceride composition wherein at least 40% of the triglycerides have one unsaturated sidechain; and at least 30% of the triglycerides have two unsaturated sidechains. In some ~~embodiment~~example**s**, the triglyceride molecules comprise between 10% and 15% of palmitic and/or stearic fatty acids at the sn-2 position.

[7] In some ~~embodiment~~example**s**, the microbial oil derivative is a fraction, and the fraction is microbial stearin, microbial olein, microbial soft mid-fraction, microbial super olein, microbial hard mid-fraction, microbial olein, and/or microbial top olein.

[8] In another ~~embodiment~~example, the present disclosure relates to a food product comprising an edible microbial oil and/or derivative thereof. In some ~~embodiment~~example**s**, the food product comprises between 0.1% and 30% edible microbial oil and/or derivative thereof. In some ~~embodiment~~example**s**, the food product is a nut butter or spread. In some ~~embodiment~~example**s**, the food product is a chocolate product or a chocolate countline product. In some ~~embodiment~~example**s**, the food product is a baked good. In some ~~embodiment~~example**s**, the food product is a meat substitute, and the edible microbial oil is used as a substitute for animal fat. In some ~~embodiment~~example**s**, the meat substitute is a ground-beef-like product. In some ~~embodiment~~example**s**, the food product is a cheese-like substance. In some

~~embodiment~~examples, the food product is a milk-like product. In some ~~embodiment~~examples, the food product is an infant formula. In some ~~embodiment~~examples, the food product does not comprise palm oil or palm kernel oil. In some ~~embodiment~~examples, the food product does not comprise animal fat.

[9] In another ~~embodiment~~example, the present disclosure relates to a blended fat composition, wherein the composition comprises a vegetable oil lipid source, and at least 1% edible microbial oil and/or derivative thereof. In some ~~embodiment~~examples, the vegetable oil lipid is soybean oil, corn oil, rapeseed oil, canola oil, sunflower oil, safflower oil, coconut oil, rice bran oil, olive oil, sesame oil, flaxseed oil, hemp oil, or cottonseed oil. In some ~~embodiment~~examples, the vegetable oil lipid is peanut oil, almond oil, beech nut oil, brazil nut oil, cashew oil, hazelnut oil, macadamia oil, mongongo nut oil, pecan oil, pine nut oil, pistachio oil, walnut oil, or pumpkin seed oil. In some ~~embodiment~~examples, the vegetable oil lipid is grapefruit seed oil, lemon oil, apricot oil, apple seed oil, argan oil, avocado oil, or orange oil. In some ~~embodiment~~examples, the blended fat composition is a cooking oil, frying oil, shortening, margarine, or butter-like product. In some ~~embodiment~~examples, the blended fat composition does not comprise palm oil or palm kernel oil.

[10] In another ~~embodiment~~example, the present disclosure relates to a palm oil substitute comprising an edible microbial oil and/or derivative thereof or a blended fat composition comprising a vegetable oil lipid source, and at least 1% edible microbial oil and/or derivative thereof. In some ~~embodiment~~examples, the palm oil substitute has one or more characteristics similar to plant-derived palm oil selected from the group consisting of: apparent density, refractive index, oxidative stability, saponification value, unsaponifiable matter, iodine value, slip melting point, fatty acid composition, triglyceride content, overall saturation level, and level of mono- and poly-unsaturated fatty acids. In some ~~embodiment~~examples, the palm oil substitute comprises a slip melting point of 30°C-40°C. In some ~~embodiment~~examples, the palm oil substitute is stearin, and the stearin has a slip melting point of greater than 25°C.

[11] In another ~~embodiment~~example, the present disclosure relates to a meat fat substitute comprising an edible microbial oil and/or derivative thereof or a blended fat composition comprising a vegetable oil lipid source, and at least 1% edible microbial oil and/or derivative thereof. In some ~~embodiment~~examples, the meat fat substitute further comprises at least one of an edible gum, a starch, and a gelling agent.

[12] In another ~~embodiment~~example, the present disclosure teaches a method for producing an edible microbial oil comprising obtaining a whole cell or lysed microbial biomass; and extracting crude microbial oil from the whole cell or lysed microbial biomass, wherein said extraction process removes toxins and produces a microbial oil safe for human consumption. In some ~~embodiment~~examples, the method further comprises processing the microbial oil, wherein the processing comprises physical refining, chemical refining, deodorizing, bleaching, and combinations thereof. In some ~~embodiment~~examples, the method further comprises modifying the microbial oil, wherein the modifying comprises fractionation, interesterification, transesterification, hydrogenation, steam hydrolysis, distillation, saponification, or combinations thereof. In some ~~embodiment~~examples, the derivative is a triglyceride, diglyceride, monoglyceride, free fatty acid, fatty acid salt, glycerin, ester, fatty alcohol, derivative thereof, or combination thereof.

[13] In some ~~embodiment~~examples, the disclosure teaches a method for producing a food product comprising: obtaining an edible microbial oil, and/or a derivative thereof, wherein said oil is produced from an oleaginous yeast; using the microbial oil and/or derivative thereof as an ingredient in a food product; and producing a food product. . In some ~~embodiment~~examples, the food product is a nut butter or spread, a chocolate product, a baked good, a meat substitute, a cheese-like product, a milk-like product, an infant formula, a cooking oil, shortening, margarine, or butter-like product.

BRIEF DESCRIPTION OF THE DRAWINGS

[14] The accompanying figures, which are incorporated herein and form a part of the specification, illustrate some, but not the only or exclusive, example embodiments and/or features. It is intended that the embodiments and figures disclosed herein are to be considered illustrative rather than limiting.

[15] **FIG. 1** is a flow diagram illustrating examples of various methods of processing the microbial oil and the resulting derivatives (oleochemicals) which may be used in the food industry.

[16] **FIG. 2A** shows a chromatogram of the triglyceride composition analysis of exemplary crude microbial oil; **FIG. 2B** shows a chromatogram of the triglyceride composition analysis of exemplary crude palm oil; and **FIG. 2C** shows a chromatogram of the triglyceride composition analysis of exemplary crude hybrid palm oil.

CLAIMS

What is claimed is:

~~1. A refined, bleached, and/or deodorized (RBD) microbial oil produced by an oleaginous yeast.~~

~~2. A refined, bleached, and/or deodorized (RBD) microbial oil produced by an oleaginous yeast, wherein the microbial oil comprises ergosterol and does not comprise campesterol, β-sitosterol, or stigmasterol.~~

~~3. The microbial oil of claim 1, wherein a measurable amount of the pigment remains.~~

~~4. The microbial oil of claim 3, wherein the oil comprises at least one pigment selected from the group consisting of carotene, torulene and torulorhodin and does not comprise chlorophyll.~~

~~5. The microbial oil of claim 1, wherein the oil is fractionable into two fractions, wherein the two fractions are microbial olein and microbial stearin, wherein each fraction comprises at least 10% of the microbial oil's original mass, and wherein the iodine value (IV) of the fractions differs by at least 10.~~

~~6. The microbial oil of claim 1, wherein the oil has one or more characteristics similar to plant-derived palm oil selected from the group consisting of: apparent density, refractive index, saponification value, unsaponifiable matter, iodine value, slip melting point, and fatty acid composition.~~

~~7.~~1. An edible microbial oil produced by an oleaginous yeast, wherein the edible oil comprises a fatty acid profile comprising:

at least 30% w/w saturated fatty acids;

at least 30% w/w unsaturated fatty acids; and

less than 30% w/w total polyunsaturated fatty acids.

~~8. The microbial oil of claim 7, wherein the fatty acid profile comprises:~~

~~greater than 40% w/w saturated fatty acids;~~

~~greater than 40% w/w mono-unsaturated fatty acids; and~~

less than 20% w/w polyunsaturated fatty acids.

9. The microbial oil of claim 7, wherein the saturated fatty acids have chain lengths between 16 and 18 carbons long.

10. The microbial oil of claim 7, wherein the unsaturated fatty acids have a chain length of 18 carbons.

11. The microbial oil of claim 7, wherein the oil comprises ergosterol, at least 50 ppm ergosterol, or at least 100 ppm ergosterol.

12. The microbial oil of claim 7, wherein the oil does not contain a phytosterol or chlorophyll.

13. The microbial oil of claim 7, wherein the oil has one or more characteristics similar to plant-derived palm oil selected from the group consisting of iodine value, slip melting point, and overall saturation level.

14. The microbial oil of claim 7, wherein the oil comprises 10-45% C16 saturated fatty acid.

15. The microbial oil of claim 7, wherein the oil comprises 10-70% C18 unsaturated fatty acid.

16. The microbial oil of claim 7, wherein the oil comprises 3-30% C18 saturated fatty acid.

17. The microbial oil of claim 7, wherein the oil comprises a saponification value similar to that of plant-derived palm oil.

18. The microbial oil of claim 7, wherein the oil comprises a saponification value of 150-210.

19. The microbial oil of claim 7, wherein the oil comprises an iodine value similar to that of plant-derived palm oil.

20. The microbial oil of claim 7, wherein the oil comprises an iodine value of 50-65.

21. The microbial oil of claim 7, wherein the oil comprises a slip melting point similar to that of plant-derived palm oil.

22. The microbial oil of claim 7, wherein the oil comprises a slip melting point of 20°C-40°C.

23. The microbial oil of claim 7, wherein the oil comprises a saturated fatty acid composition similar to that of plant-derived palm oil.

24. The microbial oil of claim 7, wherein the oil comprises a saturated fatty acid composition of at most 70%.

25. The microbial oil of claim 7, wherein the oil comprises an unsaturated fatty acid composition similar to that of plant-derived palm oil.

26. The microbial oil of claim 7, wherein the oil comprises an unsaturated fatty acid composition of at most 70%.

27. The microbial oil of claim 7, wherein the oil comprises less than 100 ppm of, comprises less than 50 ppm of, or does not comprise a phytosterol.

28. The microbial oil of claim 27, wherein the phytosterol is selected from the group consisting of campesterol, β-sitosterol, stigmasterol.

29. The microbial oil of claim 7, wherein the oil comprises less than 100 ppm of, comprises less than 50 ppm of, or does not comprise cholesterol.

30. The microbial oil of claim 7, wherein the oil comprises less than 100 ppm of, comprises less than 50 ppm of, or does not comprise prototheca sterol.

31. The microbial oil of claim 7, wherein the oil does not comprise a pigment.

32. The microbial oil of claim 7, wherein the oil comprises at least one pigment selected from the group consisting of β-carotene, torulene and torulorhodin.

33. The microbial oil of claim 32, wherein the oil comprises each of β-carotene, torulene and torulorhodin.

34. The microbial oil of claim 7, wherein the oleaginous yeast is a recombinant yeast.

35. The microbial oil of claim 7, wherein the oleaginous yeast is of the genus *Yarrowia, Candida, Rhodotorula, Rhodosporidium, Metschnikowia, Cryptococcus, Trichosporon*, or *Lipomyces*.

36. The microbial oil of claim 7, wherein the oleaginous yeast is of the genus *Rhodosporidium*.

37. The microbial oil of claim 7, wherein the oleaginous yeast is of the species *Rhodosporidium toruloides*.

38. The microbial oil of claim 7, wherein the oil is fractionable.

39. The microbial oil of claim 7, wherein the oil may be fractionated into microbial olein and microbial stearin.

40. The microbial oil of claim 7, wherein the oil may be fractionated into microbial olein and microbial stearin, and wherein each fraction comprises at least 10% of the composition's starting mass.

41. The microbial oil of claim 7, wherein the oil may be fractionated into microbial olein and microbial stearin, and wherein the iodine value (IV) of the fractions differs by at least 10.

42. The microbial oil of claim 7, wherein the oil may be fractionated into microbial olein and microbial stearin, and wherein the IV of the fractions differs by at least 20.

43. The microbial oil of claim 7, wherein the oil may be fractionated into microbial olein and microbial stearin, and wherein the IV of the fractions differs by at least 30.

44. The microbial oil of claim 7, wherein the oil comprises at least 10% w/w C16 saturated fatty acid.

45. The microbial oil of claim 7, wherein the oil comprises at least 10% w/w C18 unsaturated fatty acid.

46. The microbial oil of claim 7, wherein the oil comprises at least 20% w/w C18 unsaturated fatty acid.

47. The microbial oil of claim 7, wherein the oil comprises less than 5% combined C8, C10, C12, C14, and C15 saturated fatty acids.

48. The microbial oil of claim 7, wherein the oil comprises:

less than 10% w/w palmitic-palmitic-palmitic triglycerides;

~~greater than 15% w/w palmitic-palmitic-oleic triglycerides; and~~

~~greater than 15% w/w oleic-oleic-palmitic triglycerides.~~

~~49. The microbial oil of claim 48, wherein said palmitic-palmitic-palmitic triglyceride content is between about 0.8% and 1.3% w/w.~~

~~50. The microbial oil of claim 48, wherein said palmitic-palmitic-oleic triglyceride content is between about 16.9% and 28.2% w/w.~~

~~51. The microbial oil of claim 48, wherein said oleic-oleic-palmitic triglyceride content is between about 15.7% and 26.0% w/w.~~

~~52. The microbial oil of claim 48, further comprising a stearic-stearic-oleic triglyceride content of less than 10% w/w and a stearic-oleic-oleic triglyceride content of less than 10% w/w.~~

~~53. The microbial oil of claim 52, wherein said stearic-stearic-oleic triglyceride content is between about 1.2% and 1.9% w/w.~~

~~54. The microbial oil of claim 52, wherein said stearic-oleic-oleic triglyceride content is between about 3.2% and 5.4% w/w.~~

~~55. The microbial oil of claim 48, wherein greater than 40% of said triglycerides have one unsaturated sidechain, and wherein greater than 30% of said triglycerides have two unsaturated sidechains.~~

~~56. The microbial oil of claim 48, wherein between 10% and 15% of palmitic and/or stearic fatty acids are located at the sn-2 position of triglyceride molecules.~~

~~57. The microbial oil of claim 7 or 48, wherein the oil comprises the following amounts of fatty acids relative to the total fatty acids:~~

~~between about 7.0% and 35% stearic acid;~~

~~between about 10% and 50% oleic acid; and~~

~~between about 8% and 20% linoleic acid.~~

~~58. The microbial oil of claim 7, wherein the oil has been refined.~~

~~59. The microbial oil of claim 58, wherein the oil has been chemically and/or physically refined.~~

~~60. The microbial oil of claim 58 or 59, wherein the oil is deodorized.~~

~~61. The microbial oil of claim 58 or 59, wherein the oil is bleached.~~

~~62.~~2. A derivative of the oil of claim ~~7~~1, wherein the derivative is a fraction, and wherein the fraction is microbial stearin, microbial olein, microbial soft mid-fraction, microbial super olein, microbial hard mid-fraction, microbial olein, and/or microbial top olein.

~~63.~~3. The microbial stearin of claim ~~62~~2, wherein the stearin has a slip melting point of greater than 25°C.

~~64.~~4. A food product comprising the microbial olein of claim ~~62~~2.

~~65.~~5. A blended fat composition, wherein said composition comprises a vegetable oil lipid source, and at least 1% of the edible microbial oil and/or a derivative thereof of claim ~~62~~2.

~~66.~~6. The blended fat composition of claim ~~65~~5, wherein the vegetable oil lipid is soybean oil, corn oil, rapeseed oil, canola oil, sunflower oil, safflower oil, coconut oil, rice bran oil, olive oil, sesame oil, flaxseed oil, hemp oil, peanut oil, almond oil, beech nut oil, brazil nut oil, cashew oil, hazelnut oil, macadamia oil, mongongo nut oil, pecan oil, pine nut oil, pistachio oil, walnut oil, pumpkin seed oil, grapefruit seed oil, lemon oil, apricot oil, apple seed oil, argan oil, avocado oil, orange oil or cottonseed oil.

~~67. The blended fat composition of claim 65, wherein the vegetable oil lipid is peanut oil, almond oil, beech nut oil, brazil nut oil, cashew oil, hazelnut oil, macadamia oil, mongongo nut oil, pecan oil, pine nut oil, pistachio oil, walnut oil, or pumpkin seed oil.~~

~~68. The blended fat composition of claim 65, wherein the vegetable oil lipid is grapefruit seed oil, lemon oil, apricot oil, apple seed oil, argan oil, avocado oil, or orange oil.~~

~~69.~~7. The blended fat composition of claim ~~65~~5, wherein the composition is a cooking oil, frying oil, shortening, margarine, or butter-like product.

~~70.~~8. The blended fat composition of claim ~~65~~5, wherein the composition does not comprise palm oil or palm kernel oil.

~~71.~~9. A palm oil substitute comprising the edible microbial oil of claim ~~7~~1, the derivative of claim ~~62~~2, or the blended fat composition of claim ~~65~~5.

~~72. The edible microbial oil of claim 7, the derivative of claim 62, or the blended fat composition of claim 65, wherein the edible oil, derivative, or blended fat composition has one or more characteristics similar to plant-derived palm oil selected from the group consisting of: apparent density, refractive index, oxidative stability, saponification value, unsaponifiable matter, iodine value, slip melting point, fatty acid composition, triglyceride content, overall saturation level, and level of mono- and poly-unsaturated fatty acids.~~

~~73.~~10. The edible microbial oil of claim ~~7~~1, ~~the derivative of claim 62, or the blended fat composition of claim 65,~~ wherein the edible oil~~, derivative, or blended fat composition~~ comprises a slip melting point of 30°C-40°C.

~~74.~~11. A food product comprising ~~the edible microbial oil of claim 7,~~ the derivative of claim 2~~62, or the blended fat composition of claim 65~~.

~~75.~~12. The food product of claim ~~74~~11, wherein the food comprises between 0.1% and 30% edible microbial oil derivative~~, and/or blended fat composition~~.

~~76.~~13. The food product of claim 11~~74 or 75~~, wherein the food product is a nut butter or spread, a chocolate product, a chocolate countline product, a baked good, a meat substitute, a cheese-like product, a milk-like product, an infant formula, a cooking oil, shortening, margarine, or butter-like product.

~~77. The food product of claim 74 or 75, wherein the food product is a chocolate product or a chocolate countline product.~~

~~78. The food product of claim 74 or 75, wherein the food product is a baked good.~~

~~79. The food product of claim 74 or 75, wherein the food product is a meat substitute.~~

~~80.~~14. The food product of claim ~~79~~11, wherein the meat substitute is a ground-beef-like product.

~~81.~~15. The food product of claim 11~~74 or 75~~, wherein the food product is an animal fat substitute.

~~82.~~16. The food product of claim ~~79~~11, further comprising at least one of an edible gum, a starch, and a gelling agent.

~~83. The food product of claim 74 or 75, wherein the food product is a cheese-like substance.~~

~~84. The food product of claim 74 or 75, wherein the food product is a milk-like product.~~

~~85. The food product of claim 74 or 75, wherein the food product is an infant formula.~~

~~86.~~17. The food product of claim ~~74~~11, wherein the food product does not comprise palm oil or palm kernel oil.

~~87.~~18. The food product of claim ~~74~~11, wherein the food product does not comprise animal fat.

~~88. A method for producing an edible microbial oil comprising:~~

~~obtaining a whole cell or lysed microbial biomass; and~~

~~extracting crude microbial oil from the whole cell or lysed microbial biomass, wherein said extraction process removes toxins and produces a microbial oil safe for human consumption.~~

~~89. The method of claim 88, further comprising at least one of physically refining, chemically refining, deodorizing and bleaching the microbial oil.~~

~~90. The method of claim 88 or 89, further comprising modifying the microbial oil, wherein said modifying comprises fractionation, interesterification, transesterification, hydrogenation, steam hydrolysis, distillation, saponification, or combinations thereof.~~

~~91. The method of claim 90, wherein the method produces a derivative selected from a triglyceride, diglyceride, monoglyceride, free fatty acid, fatty acid salt, glycerin, ester, fatty alcohol, fatty amine, derivative thereof, and combinations thereof.~~

~~92. The method of claim 88, wherein the edible microbial oil further comprises ergosterol, β-carotene, torulene, and/or torularhodin.~~

~~93. The method of claim 88, wherein the whole cell or lysed microbial biomass is produced by *Rhodosporidium toruloides*.~~

~~94.~~19. A method for producing a food product comprising an edible microbial oil and/or a derivative thereof comprising:

obtaining an edible microbial oil, and/or a derivative thereof, wherein said oil is produced from an oleaginous yeast;

using the microbial oil and/or derivative thereof as an ingredient in a food product; and

producing a food product.

~~95.~~20. The method of claim ~~94~~19, wherein the edible microbial oil is produced by *Rhodosporidium toruloides.*

~~96.~~21. The method of claim 19~~94 or 95~~, wherein the food product is a nut butter or spread, a chocolate product, a baked good, a meat substitute, a cheese-like product, a milk-like product, an infant formula, a cooking oil, shortening, margarine, or butter-like product.