CLAIMS

We claim:

1. A method for producing a food product, said method comprising:

(a) processing microorganism cells that are harvested from a culture medium to produce a protein product, wherein said protein product comprises one or more of single cell protein, cell lysate, protein concentrate, protein isolate, protein extract, protein hydrolysate, free amino acids, peptides, and oligopeptides; and

(b) processing the protein product to produce a food product.

2. A food product comprising a protein product produced from microorganisms, wherein said protein product comprises one or more of single cell protein, cell lysate, protein concentrate, protein isolate, protein extract, protein hydrolysate, free amino acids, peptides, and oligopeptides.

32. The method of claim 1 or the food product of claim 2, wherein the food product is a meat analogue product, optionally.

3. The method of claim 2, wherein the meat analogue product comprises one or more physical characteristics and/or functional properties of meat, comprising texture, flavor, aroma, and/or appearance.

4. The method of claim 32 or the food product of claim 3, wherein the meat analogue product comprises:

(i) at least about 10% of the protein product by weight; or.

5. The method of claim 2, wherein the meat analogue product comprises

(ii) a heme compound, optionally.

6. The method of claim 5, wherein the heme compound is a heme-containing polypeptide, and/or.

7. The method of claim 5 or 6, wherein the heme compound is produced by the same microorganism from which the protein product is produced; or

(iii). about 5% to about 30% lipid by weight, about 0.5% to about 10% carbohydrate by weight, and/or about 0.5% to about 5% edible fiber by weight, optionally wherein the meat analogue product comprises at least about 30% moisture content by weight.

58. The method of claim 32 or the food product of claim 3, wherein a hydrogel, a lipogel, and/or an emulsion is included in the meat analogue product as an agent release system, optionally.

~~9. The method of claim 8,~~ wherein the agent release system promotes release of a coloring agent, a flavor agent, a fatty acid, a leavening agent, and/or a gelling agent during cooking of the meat analogue product.

~~10. The method of claim 2, wherein the meat analogue product comprises about 5% to about 30% lipid by weight, about 0.5% to about 10% carbohydrate by weight, and/or about 0.5% to about 5% edible fiber by weight.~~

~~11. The method of claim 10, wherein the meat analogue product comprises at least about 30% moisture content by weight.~~

6~~12~~. The method of claim 1, or the food product of claim 2, wherein the food product:

(i) is a food item, a food ingredient, a nutritional product, an animal feed product, or a pet food product; or~~.~~

~~13. The method of claim 1, wherein the food product~~ (ii) is a vegetarian or vegan food product; or~~.~~

~~14. The method of claim 1, wherein the food product~~(iii) is an organic food product, a pesticide-free food product, a herbicide-free food product, a fungicide-free food product, an antibiotic-free food product, or a non-genetically-modified (non-GMO) food product; or~~.~~

~~15. The method of claim 1, wherein the food product~~(iv) is a probiotic food product or a prebiotic food product; or~~.~~

~~16. The method of claim 1, wherein the food product~~ (v) comprises no animal protein or fat; or~~.~~

~~17. The method of claim 1, wherein the food product~~(vi) comprises a dairy product, a dairy replacement product, a bakery product, a confection, a health or protein bar, a protein powder, a sports and/or energy drink, a protein shake, or a smoothie; or~~.~~

~~18. The method of claim 1,~~ (vii) wherein the food product comprises one or more plant protein source, optionally ~~.~~

~~19. The method of claim 18,~~ wherein the plant protein source comprises one or more of pea, rice, glutinous rice, wheat, gluten, soy, hemp, canola, and buckwheat; or~~.~~

~~20. The method of claim 1, wherein the food product~~(viii) comprises an insect or algae protein source.

721. The method of claim 1 or the food product of claim 2, wherein the food product is a meat product, and wherein the protein product is incorporated into the meat product as a meat extender, optionally.

22. The method of claim 21, wherein the protein product replaces at least about 10% of meat in the meat product.

823. The method of claim 1, wherein the protein product is:

(i) textured for incorporation into a meat or meat analogue product; or.

24. The method of claim 1, wherein the protein product is(ii) formed into fibers, thermally extruded, and/or coagulated into a gel.

925. The method of claim 1 or the food product of claim 2, wherein the microorganism is a chemoautotrophic microorganism, optionally.

26. The method of claim 25, wherein the chemoautotrophic microorganism is an oxyhydrogen microorganism, further optionally.

27. The method of claim 26, wherein the oxyhydrogen microorganism is a *Cupriavidus* microorganism, even further optionally .

28. The method of claim 27, wherein the oxyhydrogen microorganism comprises *Cupriavidus necator* DSM 531 or DSM 541.

1029. The method of claim 1 or the food product of claim 2, wherein the microorganism is a lactic acid bacterial microorganism, optionally wherein: .

30. The method of claim 29, wherein(i) the lactic acid bacterium comprises one or more of *Lactococcus*, *Lactobacillus*, *Enterococcus*, *Streptococcus*, and *Pediococcus* bacteria; and/or.

31. The method of claim 29 or 30, wherein(ii) the lactic acid bacterium is a generally recognized as safe (GRAS) bacterium.

1132. The method of claim 1 or the food product of claim 2, wherein the microorganism is a *Fusarium*, a *Rhizopus*, or an *Aspergillus* fungal microorganism, optionally wherein: .

~~33. The method of claim 32, wherein~~(i) the fungal microorganism comprises one or more of *Fusarium venenatum*, *Rhizopus oligosporus*, *Rhizopus oryzae*, *Aspergillus oryzae*, or *Aspergillus sojae*; and/or~~.~~

~~34. The method of claim 32 or 33, wherein~~(ii) the fungal microorganism is a GRAS fungal microorganism.

12~~35~~. The method of claim 1, wherein step (a) comprises: (i) freeing organic molecules from the microorganism cells, via excretion, secretion, or cell lysis, or a combination thereof, wherein the organic molecules comprise proteins; and (ii) treating the freed organic molecules to hydrolyze peptide bonds between at least a portion of amino acids in at least a portion of the proteins, thereby producing a hydrolysis protein product that comprises polypeptides comprising 20 to 50 amino acids, oligopeptides comprising 2 to 20 amino acids, and/or free amino acids.

13~~36~~. The method of claim 1, wherein step (b) comprises combining the protein product with other edible ingredients to form the food product, optionally ~~.~~

~~37. The method of claim 36,~~ wherein the other edible ingredients comprise one or more of: apple cider, apple cider vinegar, baking powder, baking soda, beans, beef, beet juice, beet powder, black pepper, brown sugar, butter, canola oil, caramel, carrot fiber, carrots, cashews, cheese, chicken, chocolate, citrus, citrus extract, coconut oil, condensed milk, dairy, egg, egg substitute, fish, flour, garbanzo bean, garlic powder, honey, liquid smoke, maple syrup, margarine, monosodium glutamate, mustard powder, oil, olive oil, onion powder, paprika, pork, potato, potato starch, rice flour, salt, sodium benzoate, soy protein, soy oil, soy sauce, spices, spirulina, sugar, sunflower oil, tomato juice, tomato powder, tomato sauce, tomatoes, turmeric, vanilla, vinegar, vitamins and minerals, walnuts, water, wheat, wheat flour, wheat gluten, xanthan gum, yeast, and yeast extract.

14~~38~~. A food product prepared by the method of any of claims 1 or 3~~ to~~ 13~~37~~.

~~39. A food product comprising a protein product produced from microorganisms, wherein said protein product comprises one or more of single cell protein, cell lysate, protein concentrate, protein isolate, protein extract, protein hydrolysate, free amino acids, peptides, and oligopeptides.~~

~~40. The food product of claim 39, wherein the food product is a meat analogue product.~~

~~41. The food product of claim 40, wherein the meat analogue product comprises one or more physical characteristics and/or functional properties of meat, comprising texture, flavor, aroma, and/or appearance.~~

42. The food product of claim 40, wherein the meat analogue product comprises at least about 10% of the protein product by weight.

43. The food product of claim 40, wherein the meat analogue product comprises a heme compound.

44. The food product of claim 43, wherein the heme compound is a heme-containing polypeptide.

45. The food product of claim 43 or 44, wherein the heme compound is produced by the same microorganism from which the protein product is produced.

46. The food product of claim 40, wherein a hydrogel, a lipogel, and/or an emulsion is included in the meat analogue product as an agent release system.

47. The food product of claim 46, wherein the agent release system promotes release of a coloring agent, a flavor agent, a fatty acid, a leavening agent, and/or a gelling agent during cooking of the meat analogue product.

48. The food product of claim 40, wherein the meat analogue product comprises about 5% to about 30% lipid by weight, about 0.5% to about 10% carbohydrate by weight, and/or about 0.5% to about 5% edible fiber by weight.

49. The food product of claim 48, wherein the meat analogue product comprises at least about 30% moisture content by weight.

50. The food product of claim 49, wherein the food product is a food item, a food ingredient, a nutritional product, an animal feed product, or a pet food product.

51. The food product of claim 39, wherein the food product is a vegetarian or vegan food product.

52. The food product of claim 39, wherein the food product is an organic food product, a pesticide-free food product, a herbicide-free food product, a fungicide-free food product, an antibiotic-free food product, or a non-genetically-modified (non-GMO) food product.

53. The food product of claim 39, wherein the food product is a probiotic food product or a prebiotic food product.

54. The food product of claim 39, wherein the food product comprises no animal protein or fat.

55. The food product of claim 39, wherein the food product comprises a dairy product, a dairy replacement product, a bakery product, a confection, a health or protein bar, a protein powder, a sports and/or energy drink, a protein shake, or a smoothie.

56. The food product of claim 39, wherein the food product comprises one or more plant protein source.

57. The food product of claim 56, wherein the plant protein source comprises one or more of pea, rice, glutinous rice, wheat, gluten, soy, hemp, canola, and buckwheat.

58. The food product of claim 39, wherein the food product comprises an insect or algae protein source.

59. The food product of claim 39, wherein the food product is a meat product, and wherein the protein product is incorporated into the meat product as a meat extender.

60. The food product of claim 59, wherein the protein product comprises at least about 10% of meat in the meat product.

61. The food product of claim 39, wherein the microorganisms comprise a chemoautotrophic microorganism.

62. The food product of claim 61, wherein the chemoautotrophic microorganism comprises an oxyhydrogen microorganism.

63. The food product of claim 62, wherein the oxyhydrogen microorganism comprises a *Cupriavidus* microorganism.

64. The food product of claim 63, wherein the oxyhydrogen microorganism comprises *Cupriavidus necator* DSM 531 or DSM 541.

65. The food product of claim 39, wherein the microorganisms comprise a lactic acid bacterial microorganism.

66. The food product of claim 65, wherein the lactic acid bacterium comprises one or more of *Lactococcus*, *Lactobacillus*, *Enterococcus*, *Streptococcus*, and *Pediococcus* bacteria.

67. The food product of claim 65 or 66, wherein the lactic acid bacterium is a generally recognized as safe (GRAS) bacterium.

~~68. The food product of claim 39, wherein the microorganism is a *Fusarium*, a *Rhizopus*, or an *Aspergillus* fungal microorganism.~~

~~69. The food product of claim 68, wherein the fungal microorganism comprises one or more of *Fusarium venenatum*, *Rhizopus oligosporus*, *Rhizopus oryzae*, *Aspergillus oryzae*, or *Aspergillus sojae*.~~

~~70. The food product of claim 68 or 69, wherein the fungal microorganism is a GRAS fungal microorganism.~~

15~~71~~. The food product of claim 2~~39~~, wherein the food product further comprises one or more of: apple cider, apple cider vinegar, baking powder, baking soda, beans, beef, beet juice, beet powder, black pepper, brown sugar, butter, canola oil, caramel, carrot fiber, carrots, cashews, cheese, chicken, chocolate, citrus, citrus extract, coconut oil, condensed milk, dairy, egg, egg substitute, fish, flour, garbanzo bean, garlic powder, honey, liquid smoke, maple syrup, margarine, monosodium glutamate, mustard powder, oil, olive oil, onion powder, paprika, pork, potato, potato starch, rice flour, salt, sodium benzoate, soy protein, soy oil, soy sauce, spices, spirulina, sugar, sunflower oil, tomato juice, tomato powder, tomato sauce, tomatoes, turmeric, vanilla, vinegar, vitamins and minerals, walnuts, water, wheat, wheat flour, wheat gluten, xanthan gum, yeast, and yeast extract.