WHAT IS CLAIMED IS:

1. A protein composition comprising:

at least 50% by dry weight of a plurality of plant proteins, fungal proteins, algal proteins, bacterial proteins, protozoan proteins, invertebrate proteins, or a combination thereof,

wherein the protein composition is a low color protein composition or wherein the protein composition comprises less than 1.0% by dry weight of lipids.

~~2. A protein composition comprising:~~

~~at least 50% by dry weight of a plurality of plant proteins, fungal proteins, algal proteins, bacterial proteins, protozoan proteins, invertebrate proteins, or a combination thereof; and less than 1.0% by dry weight of lipids.~~

~~3~~2. A protein composition produced by a method comprising:

(a) adding an aqueous solution to a source protein composition to form a solution of solubilized protein;

(b) optionally removing solids from the solution of solubilized protein;

(c) optionally heating the solution of solubilized protein;

(d) optionally adjusting the pH of the solution of solubilized protein to about 4.0 to about 9.0;

(e) optionally cooling the solution of solubilized protein to about 0 °C to about 10 °C;

(f) adding an organic solvent to the solution of solubilized protein to form a solid phase and a liquid phase;

(g) separating the solid phase from the liquid phase to form the protein composition;

(h) optionally washing the protein composition with a wash solvent; and

(i) optionally treating the protein composition,

wherein the protein composition comprises at least at least 50% by dry weight of a plurality of plant proteins, fungal proteins, algal proteins, bacterial proteins, protozoan proteins, invertebrate proteins, or a combination thereof.

~~4. The protein composition of any one of claims 1-3, wherein the protein composition comprises at least about 90% by dry weight of the plurality of plant proteins, fungal proteins, algal proteins, bacterial proteins, protozoan proteins, invertebrate proteins, or the combination thereof.~~

~~5. The protein composition of any one of claims 1-3, wherein the protein composition comprises at least about 91% by dry weight of the plurality of plant proteins, fungal proteins, algal proteins, bacterial proteins, protozoan proteins, invertebrate proteins, or the combination thereof.~~

~~6. The protein composition of any one of claims 4-5, wherein the protein composition is a protein isolate.~~

~~7. The protein composition of claim 6, wherein the protein composition comprises less than 8% by dry weight of insoluble carbohydrates.~~

~~8. The protein composition claim 6 or claim 7, wherein the protein composition is a low flavor protein composition.~~

~~9~~3. The protein composition of any one of claims ~~6-8~~1-2, wherein the protein composition has an isoflavone content of less than about 125 ppm, a saponin content of less than about 75 ppm, or a phospholipid content of less than about 500 ppm.

~~10. The protein composition of any one of claims 6-9, wherein the protein composition has a saponin content of less than about 75 ppm.~~

~~11. The protein composition of any one of claims 6-10, wherein the protein composition has a phospholipid content of less than about 500 ppm.~~

~~12. The protein composition of any one of claims 6-11, wherein the protein composition has a phospholipid content of less than about 25 ppm.~~

~~13. The protein composition of any one of claims 6-12, wherein the protein composition has a phospholipid content of less than about 5 ppm.~~

~~14. The protein composition of any one of claims 1-3, wherein the protein composition comprises about 60% to about 80% by dry weight of the plurality of plant proteins, fungal proteins, algal proteins, bacterial proteins, protozoan proteins, invertebrate proteins, or the combination thereof.~~

~~15. The protein composition of claim 14, wherein the protein composition comprises about 65% to about 75% by dry weight of the plurality of plant proteins, fungal proteins, algal proteins, bacterial proteins, protozoan proteins, invertebrate proteins, or the combination thereof.~~

~~16. The protein composition of claim 14, wherein the protein composition is a protein concentrate.~~

~~17~~4. The protein composition of any one of claims 1-~~16~~3, wherein the protein composition comprises less than 8% by dry weight of insoluble carbohydrates and/or less than 0.8% by dry weight of lipids.

~~18. The protein composition of any one of claims 1-17, wherein the protein composition comprises less than 0.4% by dry weight of lipids.~~

~~195~~. The protein composition of any one of claims 1-~~184~~, wherein the protein composition has a luminance of at least 86 on a scale from 0 (black control value) to 100 (white control value), or wherein the protein composition has a chroma value of less than 14.

~~20. The protein composition of any one of claims 1-19, wherein the protein composition has a luminance of at least 90 on a scale from 0 (black control value) to 100 (white control value).~~

~~21. The protein composition of any one of claims 1-20, wherein the protein composition has a chroma value of less than 14.~~

~~22. The protein composition of any one of claims 1-21, wherein the protein composition has a chroma value of less than 8.~~

~~23. The protein composition of any one of claims 1-22, wherein the plurality of plant proteins, fungal proteins, algal proteins, bacterial proteins, protozoan proteins, invertebrate proteins, or the combination thereof comprises at least 90% plant proteins.~~

~~24. The protein composition of any one of claims 1-22, wherein the plurality of plant proteins, fungal proteins, algal proteins, bacterial proteins, protozoan proteins, invertebrate proteins, or the combination thereof comprises at least 90% fungal proteins.~~

~~25. The protein composition of any one of claims 1-22, wherein the plurality of plant proteins, fungal proteins, algal proteins, bacterial proteins, protozoan proteins, invertebrate proteins, or the combination thereof comprises at least 90% algal proteins.~~

~~26. The protein composition of any one of claims 1-25, wherein when cooked in a solution comprising a reducing sugar, a sulfur-containing amino acid, and a heme-containing protein, a 1% (w/v) of the protein composition produces one or more volatile compounds associated with the aroma and/or taste of meat.~~

~~27. The protein composition of any one of claims 1-26, wherein when assessed by a trained descriptive panel using the Spectrum method, the protein composition is described as having low intensity of one or more of: oxidized/rancid flavor, cardboard flavor, astringent flavor, bitter flavor, vegetable complex flavor, and sweet fermented flavor.~~

~~28. The protein composition of any one of claims 1-27, wherein when assessed by a trained descriptive panel using the Spectrum method, the protein composition is described as having low intensity of one or more of: beany flavor, fatty flavor, green flavor, pea flavor, earthy flavor, hay-like flavor, grassy flavor, rancid flavor, leafy flavor, cardboard flavor, acrid flavor, pungent flavor, medicinal flavor, metallic flavor, and brothy flavor.~~

~~29. The protein composition of any one of claims 1-28, wherein when assessed by a trained panel, the protein composition has a discriminability index of at least 1.0.~~

~~30. The protein composition of any one of claims 1-28, wherein when assessed by a trained panel, the protein composition has a discriminability index of at least 2.0.~~

~~31~~6. The protein composition of any one of claims 1-~~30~~5, wherein the protein composition is in the form of a solution, suspension, ~~or~~ emulsion, a solid, or a powder.

~~32. The protein composition of any one of claims 1-30, wherein the protein composition is in the form of a solid or a powder.~~

~~33~~7. A food product comprising the protein composition of any one of claims 1-~~32~~6.

~~34~~8. A method for producing a protein composition, the method comprising:

(a) adding an aqueous solution to a source protein composition to form a solution of solubilized protein;

(b) optionally removing solids from the solution of solubilized protein;

(c) optionally heating the solution of solubilized protein;

(d) optionally adjusting the pH of the solution of solubilized protein to about 4.0 to about 9.0;

(e) optionally cooling the solution of solubilized protein to about 0 °C to about 10 °C;

(f) adding an organic solvent to the solution of solubilized protein to form a solid phase and a liquid phase;

(g) separating the solid phase from the liquid phase to form the protein composition;

(h) optionally washing the protein composition with a wash solvent; and

(i) optionally resolubilizing the protein composition,

wherein the protein composition comprises at least at least 50% by dry weight of a plurality of plant proteins, fungal proteins, algal proteins, bacterial proteins, protozoan proteins, invertebrate proteins.

~~35~~9. The method of claim ~~34~~8, wherein step (a) is performed at a pH of about 7.0 to about 10.0.

~~36~~10. The method of any one of claims ~~34-35~~8-9, wherein step (d) comprises adjusting the pH of the solution of solubilized protein to about 6.0 to about 7.0.

~~37~~11. The method of any one of claims ~~34-36~~8-10, wherein step (f) comprises adding the organic solvent to a final concentration of about 40% to about 70% (v/v), optionally wherein at the beginning of step (f), the organic solvent has a temperature of about -20 °C to about 10 °C.

~~38. The method of any one of claims 34-37, wherein at the beginning of step (f), the organic solvent has a temperature of about -20 °C to about 10 °C.~~

~~39~~12. The method of any one of claims ~~34-38~~8-11, wherein step (e) comprises cooling the solution of solubilized protein to a temperature of about 0 °C to about 4 °C.

~~40~~13. The method of any one of claims ~~34-39~~8-12, wherein step (c) comprises heating the solution of solubilized protein at a temperature of about 85 °C to about 95 °C.

~~41~~14. The method of any one of claims ~~34-40~~8-13, wherein the organic solvent is selected from the group consisting of ethanol, methanol, propanol, isopropyl alcohol, and acetone.

~~42. The method of any one of claims 34-41, wherein the organic solvent is ethanol.~~

~~43. The method of any one of claims 34-42, wherein the wash solvent is an organic wash solvent.~~

~~44. The method of any one of claims 34-42, wherein the wash solvent is an aqueous solution.~~

~~45. The method of any one of claims 34-42, wherein the wash solvent is a mixture of an aqueous solution and an organic wash solvent.~~

~~46. The method of any one of claims 34-45, wherein the treating comprises resolubilizing the protein composition to a concentration of about 1.5 to about 50 mg/mL.~~

~~47. The method of any one of claims 34-46, wherein the treating comprises resolubilizing at least a portion of the protein composition at a pH of at least 8.0.~~

~~48. The method of any one of claims 34-47, wherein the treating comprises resolubilizing at least a portion of the protein composition using an enzyme.~~

~~49. The method of claim 48, wherein the enzyme is a protein deamidase.~~

~~50. The method of any one of claims 34-49, wherein, when cooked in water, a 1% (w/v) suspension of the protein composition by dry weight of the protein composition produces no more than 90% of the amount of one or more volatile compounds in a set of volatile compounds~~

~~produced by cooking a 1% (w/v) suspension of the source protein composition (by dry weight of the source protein composition).~~

~~51. The method of any one of claims 34-50, wherein, when cooked in water, a 1% (w/v) suspension of the protein composition by dry weight of the protein composition produces no more than 50% of the amount of one or more volatile compounds in a set of volatile compounds produced by cooking a 1% (w/v) suspension of the source protein composition (by dry weight of the source protein composition).~~

~~52. The method of any one of claims 34-51, wherein the protein composition produces no more than 90% of the amount of one or more volatile compounds in a set of volatile compounds produced by the source protein composition by solvent-assisted flavor extraction (SAFE).~~

~~53. The method of any one of claims 34-52, wherein the protein composition produces no more than 50% of the amount of one or more volatile compounds in a set of volatile compounds produced by the source protein composition by SAFE.~~

~~54. The method of any one of claims 50-53, wherein the set of volatile compounds comprises a volatile compound in any one of volatile sets 1-10.~~

~~55. The method of any one of claims 50-53, wherein the set of volatile compounds is any one of volatile sets 1-10.~~

~~56. The method of any one of claims 50-53, wherein the set of volatile compounds is selected from the group consisting of volatile set 1, volatile set 2, volatile set 3, volatile set 4, volatile set 5, volatile set 6, volatile set 7, volatile set 8, volatile set 9, volatile set 10, and combinations thereof.~~

~~57~~15. The method of any one of claims ~~34-56~~8-14, wherein the protein composition has a saponin content that is less than 50% of the saponin content of the source protein composition.

an isoflavone content that is less than 50% of the isoflavone content of the source protein composition, a phospholipid content that is less than 50% of the phospholipid content of the source protein composition, a lipid content that is less than 50% of the lipid content of the source protein composition, a phenolic acid content that is less than 50% of the phenolic acid content of the source protein composition, or a combination thereof.

~~58. The method of any one of claims 34-57, wherein the protein composition has an isoflavone content that is less than 50% of the isoflavone content of the source protein composition.~~

~~59. The method of any one of claims 34-58, wherein the protein composition has a phospholipid content that is less than 50% of the phospholipid content of the source protein composition.~~

~~60. The method of any one of claims 34-59, wherein the protein composition has a lipid content that is less than 50% of the lipid content of the source protein composition.~~

~~61. The method of any one of claims 34-60, wherein the protein composition has a phenolic acid content that is less than 50% of the phenolic acid content of the source protein composition.~~

~~62. The method of any one of claims 34-61, wherein the protein composition has a flavor compounds content that is less than 50% of the flavor compounds content of the source protein composition, wherein the flavor compounds are selected from the group consisting of elected from aldehydes, ketones, esters, alcohols, pyrazines, pyranones, acids, sulfur compounds, terpenes, furans, alkanes, alkenes, and combinations thereof.~~

~~63~~16. A food product comprising a protein composition produced by the method of any one of claims ~~34-62~~8-15.

~~64~~17. A method of extracting small molecules from a protein source composition, the method comprising:

(a) adding an aqueous solution to a source protein composition to form a solution of solubilized protein;

(b) optionally removing solids from the solution of solubilized protein;

(c) optionally heating the solution of solubilized protein;

(d) optionally adjusting the pH of the solution of solubilized protein to about 4.0 to about 9.0;

(e) optionally cooling the solution of solubilized protein to about 0 °C to about 10 °C;

(f) adding an organic solvent to the solution of solubilized protein to form a solid phase and a liquid phase;

(g) separating the solid phase from the liquid phase to form a solution enriched in small molecules.

~~65~~18. A food product comprising:

a fat;

optionally one or more flavor precursor compounds; and

at least 10% by dry weight of a protein composition, wherein the protein composition is the protein composition of any one of claims 1-~~32~~6.

~~66~~19. A food product comprising:

a fat;

optionally one or more flavor precursor compounds; and

at least 10% by dry weight of a protein composition, wherein the protein composition is a protein composition produced by the method of any one of claims ~~34-62~~8-15.

~~67. The food product of any one of claims 65-66, wherein the food product is a meat replica.~~

~~68. The food product of any one of claims 65-67, wherein the food product is plant-based.~~

~~69. The food product of any one of claims 65-68, wherein the food product contains less than 10% by weight animal products.~~

~~70~~20. A method for preparing a food product, the method comprising:

combining a fat, one or more optional flavor precursor compounds, and a protein composition, wherein the protein composition is the protein composition of any one of claims 1-~~32~~6.

~~71~~21. A method for preparing a food product, the method comprising:

combining a fat, one or more optional flavor precursor compounds, and a protein composition, the protein composition produced by the method by the method of any one of claims ~~34-62~~8-15.

~~72~~22. A method for reducing perceived protein source flavor in a food product, the method comprising:

combining a fat, one or more flavor precursor compounds and a protein composition, the protein composition produced by the method of any one of claims ~~34-62~~8-15,

wherein at least 5% by weight of the protein content of the food product comprises the protein composition, thereby reducing perceived protein source flavor in a food product, as compared to a food product having a similar protein content but lacking the protein composition.

~~73~~23. A method of evaluating a protein composition for effect on flavor in a food product, the method comprising:

determining that a level of one or more volatile compounds in a set of volatile compounds of a first protein composition from a protein source is higher than the level of the one or more volatile compounds of a second protein composition from the protein source; and

determining that the second protein composition is superior to the first protein composition for use in a food product.

~~74~~24. A method of evaluating a protein composition for effect on flavor in a food product, the method comprising:

determining that a level of one or more volatile compounds in a set of volatile compounds of a source protein composition from a protein source is higher than the level of the one or more volatile compounds of a protein composition from the protein source; and

determining that the protein composition is superior to the source protein composition for use in a food product.

~~75~~25. The method of claim ~~73~~23, wherein the second protein composition is the protein composition of any one of claims 1-~~32~~6.

~~76~~26. The method of claim ~~74~~24, wherein the protein composition is the protein composition of any one of claims 1-~~32~~6.

~~77. The method of any one of claims 73-76, wherein the food product is the food product of any one of claims 65-69.~~

~~78. The method of any one of claims 73-77, wherein the set of volatile compounds comprises a volatile compound from any one of volatile sets 1-10.~~

~~79. The method of any one of claims 73-77, wherein the set of volatile compounds is any one of volatile sets 1-10.~~

~~80. The method of any one of claims 73-77, wherein the set of volatile compounds is selected from the group consisting of volatile set 1, volatile set 2, volatile set 3, volatile set 4, volatile set 5, volatile set 6, volatile set 7, volatile set 8, volatile set 9, volatile set 10, and combinations thereof.~~

~~81. The method of any one of claims 73-80, wherein the protein source is soy.~~

~~82~~27. A method of reducing flavor in a protein composition, the method comprising:

(a) determining a level of one or more volatile compounds in a set of volatile compounds of a first protein composition from a protein source;

(b) preparing a second protein composition from the protein source, wherein preparing the second protein composition comprises reducing the amount of one or more components of the protein source that are included in the second protein composition; and

(c) determining that a level of one or more volatile compounds in a set of volatile compounds from the second protein composition is lower than the level of the one or more volatile compounds in a set of volatile compounds in the first protein composition.

~~83~~28. A method of determining a cause of flavor in a protein composition, the method comprising:

(a) determining a level of one or more volatile compounds in a set of volatile compounds of a first protein composition from a protein source;

(b) providing a second protein composition from the protein source, wherein the second protein composition comprises a decreased amount of one or more components of the protein source;

(c) determining that a level of one or more volatile compounds in a set of volatile compounds from the second protein composition is lower than the level the of one or more volatile compounds in a set of volatile compounds in the first protein composition; and

(d) identifying the one or more components of the protein course to be a cause of flavor in the protein composition.

~~84~~29. The method of claim ~~82~~ 27 or claim ~~83~~28, wherein the second protein composition is the protein composition of any one of claims 1-~~32~~6.

~~85. The method of any one of claims 82-84, wherein the set of volatile compounds comprises a volatile compound from any one of volatile sets 1-10.~~

~~86. The method of any one of claims 82-84, wherein the set of volatile compounds is any one of volatile sets 1-10.~~

~~87. The method of any one of claims 82-84, wherein the set of volatile compounds is selected from the group consisting of volatile set 1, volatile set 2, volatile set 3, volatile set 4, volatile set 5, volatile set 6, volatile set 7, volatile set 8, volatile set 9, volatile set 10, and combinations thereof.~~

~~88. The method of any one of claims 82-87, wherein the protein source is soy.~~

~~89. The method of any one of claims 82-88, wherein the component of the protein source that is decreased comprises lipids.~~

~~90. The method of any one of claims 82-89, wherein the component of the protein source that is decreased comprises a fatty acid, a wax, a sterol, a monoglyceride, a diglyceride, a triglyceride, a sphingolipid, phospholipid, or a combination thereof.~~

~~91. The method of any one of claims 82-90, wherein the component of the protein source that is decreased comprises phospholipids.~~

~~92~~30. A milk replica comprising:

an emulsion of a fat, water, and the protein composition of any one of claims 1-~~32~~6.

~~93. The milk replica of claim 92, wherein the fat is present in the milk replica in an amount of about 0.01% to about 5% of the milk replica.~~

~~94. The milk replica of claim 93, wherein the fat is selected from the group consisting of corn oil, olive oil, soy oil, peanut oil, walnut oil, almond oil, sesame oil, cottonseed oil, rapeseed oil, canola oil, safflower oil, sunflower oil, flax seed oil, palm oil, palm kernel oil, coconut oil,~~

~~babassu oil, shea butter, mango butter, cocoa butter, wheat germ oil, rice bran oil, and combinations thereof.~~

~~95. The milk replica of claim 92 or claim 93, wherein the emulsion is stable when added to a liquid with a temperature of between about 50 °C to about 85 °C.~~

~~96. The milk replica of claim 95, wherein the liquid is coffee, espresso, or a combination thereof.~~