# SYNTHETIC FOOD COMPOSITIONS

## CROSS-REFERENCE

**[001]** This application claims the benefit of U.S. Provisional Application No. 62/778,751, filed December 12, 2018, which is incorporated herein by reference in its entirety.

## BACKGROUND OF THE INVENTION

**[002]** Traditional meat production is a resource-intensive process that generates a significant environmental footprint. Domesticated animals are raised in agricultural settings requiring substantial quantities of fresh water, feed, land, and other resources. Similarly, consumption of fish is vulnerable to a number of problems including overfishing and by-catch as well as pollution caused by fisheries.

## SUMMARY OF THE INVENTION

**[003]** Disclosed herein are systems, methods, and compositions for producing synthetic or processed food products. Various ingredients for making these food products are described herein and are consistent with the present disclosure. In some instances, spinning techniques are utilized to create food products having at least one of a desired consistency, texture, composition, taste, and appearance. Examples of spinning techniques are electrospinning and solution blow spinning.

**[004]** Described herein are various approaches that provide an innovative approach that allows fine control over the composition of individual ingredients as well as how the ingredients are combined to generate the finished food product. In some embodiments, solution blow spinning is used to process and/or create the food product. One advantage of the present disclosure is that the processing or generation of the food product does not require the application of heat or high voltage. Another advantage is the ability to form fibers having a small diameter range such as, for example, ranges small enough to accommodate cells. Another advantage is the relatively high speed of the rate of formation using solution blow spinning compared to alternative methods.

**[004a]** In one aspect, provided herein is an edible composition for human consumption, comprising: a) a population of cells, wherein the population of cells comprises a cultured population of cells and a non-cultured population of cells; and b) a plurality of polymeric fibers or scaffolds, wherein one polymeric fiber of the polymeric fibers or scaffolds comprises a diameter of about 0.1 nm to about 500 nm, wherein the composition comprises a protein or a protein derivative thereof at a concentration of about about 1 % (w/w) to about 80 % (w/w).

**[004b]** In one aspect, provided herein is a method of manufacturing the composition as described herein.

**[005]** Disclosed herein is an edible composition for human consumption, comprising: a) a population of cells; and b) a plurality of polymeric fibers. Various aspects are consistent with the present disclosure. In some cases, the polymeric fibers comprise an edible ingredient. Sometimes, the edible ingredient comprises a texturizer, bulking agent or thickener, preservative, flavor enhancer, antimicrobial agent, pH modulator, desiccant, sweetener, curing or pickling agent, coloring agent, or any combination thereof. The edible ingredient often comprises a protein, a carbohydrate, a fat, or any combination thereof. In certain instances, the protein comprises gelatin, collagen, elastin, silk, soy derivatives, zein, gliadin, hordein, casein, wheat derivatives, gluten, whey, millet derivatives, quinoa derivatives, algae proteins, marine source proteins, pea proteins, or

## CLAIMS

What is claimed is:

1. An edible composition for human consumption, comprising:
    a) a population of cells, wherein the population of cells comprises a cultured population of cells and a non-cultured population of cells; and
    b) a plurality of polymeric fibers or scaffolds, wherein one polymeric fiber of the polymeric fibers or scaffolds comprises a diameter of about 0.1 nm to about 500 nm, wherein the composition comprises a protein or a protein derivative thereof at a concentration of about about 1 % (w/w) to about 80 % (w/w).
2. The composition of claim 1, wherein the polymeric fibers or scaffolds comprise at least one edible ingredient.
3. The composition of claim 2, wherein the edible ingredient comprises a texturizer, bulking agent or thickener, preservative, flavor enhancer, antimicrobial agent, pH modulator, desiccant, sweetener, curing or pickling agent, coloring agent, or any combination thereof.
4. The composition of claim 2, wherein the edible ingredient comprises a protein, a carbohydrate, a fat, or any combination thereof.
5. The composition of claim 1, wherein the polymeric fiber or scaffold comprises a supplement.
6. The composition of claim 5, wherein the supplement comprises a vitamin, a mineral, or both.
7. ~~The composition of claim 1, wherein the population of cells comprises a cultured population of cells.~~
8. ~~8.~~7. The composition of claim 1, wherein the population of cells comprises myocytes.
9. ~~9.~~8. The composition of claim ~~8~~7, wherein the plurality of fibers comprises a layer of fibers incorporating the myocytes ~~and aligned to mimic muscle fibers~~.
10. ~~10.~~9. The composition of claim 1, wherein the population of cells further comprises adipocytes.
11. ~~11.~~10. The composition of claim ~~10~~9, wherein the plurality of fibers comprises a layer of fibers incorporating the adipocytes ~~and configured to mimic adipose banding patterns~~.
12. ~~12.~~11. The composition of claim 1, wherein the population of cells is deposited onto and within the polymeric fibers.
13. ~~13.~~12. The composition of claim 1, wherein the population of cells is integrated into the polymeric fibers.
14. ~~The composition of claim 1, wherein the population of cells comprises a non-cultured population of cells.~~

~~15.~~13. The composition of claim 1~~4~~, wherein the non-cultured population of cells is derived or obtained from an animal, fish, or bird.

~~16.~~14. The composition of claim 1, wherein the polymeric fibers or scaffolds are generated using a fiber spinning technique.

~~17.~~15. The composition of claim 1~~46~~, wherein the fiber spinning technique is electrospinning or solution blow spinning.

~~18.~~16. The composition of claim 1, wherein the polymeric fibers or scaffolds are generated using unidirectional freeze-drying, electro-spinning, solution blow spinning, wet spinning, casting, micromolding, 3D printing or extrusion, or any combination thereof.

~~19.~~17. The composition of claim 1, wherein the composition comprises polymeric fibers generated using a fiber spinning technique and scaffolds generated using unidirectional freeze-drying, electro-spinning, solution blow spinning, wet spinning, casting, micromolding, 3D printing or extrusion, or any combination thereof.

~~20.~~18. The composition of claim 1, wherein the polymeric fibers or scaffolds and the population of cells are arranged as alternating layers of fibers and cells.

~~21. A method of producing an edible composition, comprising:~~

~~a) forming a plurality of polymer fibers using a solution blow spinning process, wherein said polymer fibers are formed from a composition comprising an edible ingredient dissolved in a solvent; and~~

~~b) depositing said plurality of blow spun polymer fibers onto a surface to form a layer of polymer fibers.~~

~~22. The method of claim 21, wherein the solvent comprises a volatile solvent.~~

~~23. The method of claim 22, wherein the composition comprises a supplement.~~

~~24. The method of claim 23, wherein the supplement comprises a vitamin, a mineral, or both.~~

~~25. A method of making a cultured food product, comprising:~~

~~a) forming polymer fibers using solution blow spinning;~~

~~b) seeding cultured cells onto the polymer fibers to form synthetic muscle tissue; and~~

~~c) processing the cultured cells and polymer fibers to produce the cultured food product.~~

~~26. The method of claim 25, wherein the synthetic muscle tissue comprises a first configuration comprising cultured muscle cells and nanofibers arranged in parallel alignment to simulate muscle fibers.~~

~~27. The method of claim 26, wherein the synthetic muscle tissue comprises a second configuration comprising cultured adipose cells and nanofibers arranged to simulate adipose banding patterns.~~

~~28. The method of claim 27, wherein the first configuration and second configuration are combined to form the cultured food product configured to simulate a taste and texture of non-synthetic muscle tissue.~~

~~29. The method of claim 25, wherein the step of forming the polymer fibers in (a) occurs concurrently with the step of seeding cultured cells onto the polymer fibers in (b).~~

~~30. The method of claim 25, wherein the polymer fibers are made of monomers comprising proteins, polysaccharides, or both.~~

~~31. A method of producing a food composition having a fat phase, comprising:~~

~~a) forming a plurality of polymer fibers using a solution blow spinning process, wherein said polymer fibers are formed from a composition comprising an edible ingredient dissolved in a solvent; and~~

~~b) dispersing said plurality of blow spun polymer fibers in a fat phase.~~

~~32. The method of claim 31, wherein the polymer fibers comprise a lipophilic material selected from prolamins and lipophilic cellulose derivatives.~~

~~33. The method of claim 31, further comprising homogenizing a mixture of the plurality of blow spun polymer fibers and the fat phase.~~

~~34. The method of claim 33, further comprising fragmenting the mixture into particles.~~

~~35. The method of claim 31, wherein the fat phase comprises a vegetable oil, a dairy oil, a fish oil, an algae oil, or any combination thereof.~~

~~36. An edible food composition for human consumption, comprising: a scaffold comprising a plurality of polymeric fibers, wherein the edible composition has a textural characteristic comparable to a corresponding conventional food composition.~~

~~37. The composition of claim 36, wherein the polymeric fibers comprise at least one edible ingredient.~~

~~38. The composition of claim 37, wherein the edible ingredient comprises a texturizer, bulking agent or thickener, preservative, flavor enhancer, antimicrobial agent, pH modulator, desiccant, sweetener, curing or pickling agent, coloring agent, or any combination thereof.~~

~~39. The composition of claim 36, wherein the polymeric fibers are generated using a fiber spinning technique.~~

~~40. The composition of claim 39, wherein the fiber spinning technique is electrospinning or solution blow spinning.~~

19. A method of manufacturing the composition of any one of claims 1-18.