WHAT IS CLAIMED IS:

1. An aerogel or foam comprising:

single structural cells, groups of structural cells, or both, derived from a plant or fungal tissue, the single structural cells or groups of structural cells having a decellularized 3-dimensional structure lacking cellular materials and nucleic acids of plant or fungal tissue;

the single structural cells, groups of structural cells, or both, being distributed within a carrier, the carrier derived from a dehydrated, lyophilized, or freeze-dried hydrogel.

2. The aerogel or foam of claim 1, wherein the aerogel or foam is rehydrated.

3. The aerogel or foam of claim 2, wherein the plant or fungal tissue from which the single structural cells or groups of structural cells are derived comprises decellularized plant or fungal tissue.

4. The aerogel or foam of claim 3, wherein the plant or fungal tissue is decellularized using SDS and optionally $CaCl_2$.

5. The aerogel or foam of claim 4, wherein the single structural cells, groups of structural cells, or both, are derived from the plant or fungal tissue by maceration or mercerization.

6. The aerogel or foam of claim 5, wherein the maceration or mercerization comprises treatment of the plant or fungal tissue using sodium hydroxide and hydrogen peroxide or sodium bicarbonate and hydrogen peroxide with heating.

7. The aerogel or foam of claim 6, having a particle size distribution of the single structural cells with an average feret diameter within a range of 1μm to 1000μm, such as 100 to 500μm, for example 100 to 300μm.

8. The aerogel or foam of claim 7, wherein the hydrogel comprises alginate, pectin, gelatin, methylcellulose, carboxymethylcellulose, hydroxypropylcellulose, hydroxypropyl methyl cellulose, hydroxyethyl methyl cellulose , agar, pluronic acid, triblock PEO–PPO–PEO copolymers of polyethylene oxide and polypropylene oxide, dissolved or regenerated plant

cellulose, dissolved cellulose-based hydrogel, hyaluronic acid, vegetable protein such as pea protein, food-grade coloring such as beet root, extracellular matrix proteins such as collagen, gelatin, or fibronectin, or any combinations thereof, monoacrylated polyethylene glycol, polyethylene glycol diacrylate, polyethylene glycol diacrylate -co-PEGMA, polyvinyl alcohol, polyvinylpyrrolidone, polylactic-co-glycolic acid, chitosan, chitin, xanthan gum, elastin, fibrin, fibrinogen, cellulose derivatives, carrageenan, or microcrystalline cellulose, or any combinations thereof; wherein the hydrogel is optionally cross-linked.

9. The aerogel or foam of claim 8, comprising templated or aligned microchannels created by directional freezing; non-directional freezing; by molding using molds having microscale and/or macroscale features such as channels; by punching, pressing, stamping, or otherwise forming geometric patterns, depressions, holes, channels, grooves, ridges, wells, or other structural features within and/or onto at least one surface for example using needles; or any combinations thereof.

10. The aerogel or foam of claim 9, wherein the plant tissue comprises apple tissue, pear tissue or heart of palm tissue.

11. The aerogel or foam of claim 10, comprising 5% to 95% m/m, such as 10-50% m/m or more, single structural cells, groups of structural cells, or both, when the aerogel or foam is in hydrated form.

12. The aerogel or foam of claim 11, wherein the hydrogel comprises alginate, pectin, or both, and a) wherein the aerogel or foam is rehydrated with a $CaCl_2$ solution when the aerogel or foam is not crosslinked; or b) wherein the aerogel or foam is rehydrated with water, an aqueous solution, a buffer, a cell buffer, an alcohol, any aqueous or non-aqueous solution when the aerogel of foam is crosslinked.

13. The aerogel or foam of claim 12, wherein the aerogel or foam comprises one or more animal cells and has a bulk modulus within a range of 0.1 to 500 kPa, such as 1 to 200kPa.

14. The aerogel or foam of claim 13, wherein at least some cellulose and/or cellulose derivative or derivatives of the aerogel or foam is cross-linked by physical cross-linking e.g. using glycine

and/or chemical cross-linking e.g. using citric acid in the presence of heat; wherein at least some cellulose and/or cellulose derivative or derivatives of the aerogel or foam is functionalized with a linker e.g. succinic acid to which one or more functional moieties are optionally attached e.g. amine-containing groups, wherein cross-linking may further optionally be achieved with one or more protein cross-linkers such as formalin, formaldehyde, glutaraldehyde, and/or transglutaminase; or any combinations thereof.

15. The aerogel of foam of claim 1, wherein the aerogel or foam comprises single structural cells, groups of structural cells, or both, derived from a decellularized plant or fungal tissue by maceration or mercerization of the decellularized plant or fungal tissue, the single structural cells or groups of structural cells having a decellularized 3-dimensional structure lacking cellular materials and nucleic acids of plant or fungal tissue, and lacking one or more base-soluble lignin components of the plant or fungal tissue.

16. Use of an aerogel or foam as defined in claim 1 in the manufacture of a medicament for growing or repairing bone tissue or for treating spinal cord injury in a subject in need thereof,

wherein the aerogel or foam as defined in claim 1 is to be implanted at an affected site of the subject in need thereof;

such that the aerogel or foam promotes bone tissue generation or repair.

17. A method for templating or aligning growth of cells, comprising:

culturing cells on an aerogel or foam as defined in any one of claims 1-15, wherein the aerogel or foam comprises templated or aligned microchannels on at least one surface of the aerogel or foam, within the aerogel or foam, or both, optionally formed by directional or non-directional freezing; by molding using molds having microscale features; by punching, pressing, stamping, or otherwise forming geometric patterns, depressions, holes, channels, grooves, ridges, wells, or other structural features within and/or onto at least one surface; or any combinations thereof;

such that the cultured cells align along the microchannels.

18. The method of claim 17, further comprising using needles in the molds, preferably a 30G gauge or 30G needle.

19. The method of claim 17 or 18, wherein the cells comprise muscle cells or nerve cells.

20. The use of claim 16, wherein:

an aerogel or foam as defined in claim 1 is to be implanted at an affected site, wherein the aerogel or foam comprises templated or aligned microchannels;

such that the aerogel or foam promotes spinal cord repair by aligning growth of nerve cells along the templated or aligned microchannels.

21. A food product comprising the aerogel or foam as defined in claim 1.

22. The food product of claim 21, further comprising a dye or coloring agent.

23. The food product of claim 21, comprising two or more aerogel or foam subunits glued together, wherein the glues comprises agar.

24. The food product of claim 21, wherein the aerogel or foam comprises templated or aligned microchannels optionally formed by directional or non-directional freezing, and wherein the aerogel or foam comprises muscle cells, fibroblasts, myofibroblasts, neurons, dorsal root ganglion cells, neuronal structures such as axons, neural precursor cells, neural stem cells, glial cells, endogenous stem cells, neutrophils, mesenchymal stem cells, satellite cells, myoblasts, myotubes, muscle progenitor cells, adipocytes, preadipocytes, chondrocytes, osteoblasts, osteoclasts, pre-osteoblasts, tendon progenitor cells, tenocytes, periodontal ligament stem cells, or endothelial cells, or any combinations thereof, aligned along the templated or aligned microchannels; preferably wherein the aerogel or foam comprises templated or aligned microchannels optionally formed by directional or non-directional freezing, and wherein the aerogel or foam comprises muscle cells, fat cells, connective tissue cells e.g. fibroblasts, cartilage, bone, epithelial, or endothelial cells, or any combinations thereof, aligned along the templated or aligned microchannels.

25. The aerogel or foam of claim 1, wherein the aerogel or foam comprises cellulose derived from decellularized plant or fungal tissue via dissolution with dimethylacetamide and lithium chloride followed by regeneration with ethanol.

26. The aerogel or foam of claim 1, wherein the aerogel or foam comprises cellulose derived from decellularized plant or fungal tissue via dissolution with: dimethylacetamide and lithium chloride, $LiClO_4$, xanthate, EDA/KSCN, H_3PO_4, NaOH/urea, $ZnCl_2$, TBAF/DMSO, NMMO, an ionic liquid such as 1-butylpyridinium chloride and aluminum chloride, alkyl imidazolium in association with nitrate, preferably a room temperature ionic liquid, or any combinations thereof.

27. A food product comprising the aerogel or foam as defined in claim 1, wherein the food product is a meat mimic and comprises a plurality of lines providing the appearance of fatty white lines found in tuna, salmon, or another fish-type meat.

28. The food product of claim 27, wherein the food product is a mimic of tuna, salmon, or another fish meat.

29. The food product of claim 27, wherein the food product contains one or more dyes or colorants providing the color of tuna, salmon, or another fish meat.

30. The food product of claim 27, wherein the plurality of lines are formed in cuts or channels formed in the aerogel or foam, wherein the plurality of lines comprise titanium dioxide or beetroot, optionally combined with agar or sodium alginate as a binding agent.

31. The food product of claim 30, wherein the titanium dioxide, optionally combined with agar or sodium alginate as a binding agent, is applied into cuts or channels formed in the aerogel or foam to provide the appearance of the fatty white lines found in tuna, salmon, or another fish-type meat.

32. A method for preparing a food product, the food product being a tuna, salmon, or other fish meat mimic, said method comprising:

providing an aerogel as defined in any one of claims 1-15;

optionally, dying or coloring the aerogel a color of tuna, salmon, or other fish meat;

cutting or otherwise processing the aerogel in order to form cuts or channels along the surface of the aerogel; and

applying a dye or coloring agent to the cuts or channels to provide an appearance of fatty white lines characteristic of tuna, salmon, or other fish meat.

33. The method of claim 32, wherein the dye or coloring agent applied to the cuts or channels comprises or beetroot.

34. The method of claim 32 or 33, wherein the dye or coloring agent applied to the cuts or channels is combined with a binding agent.

35. The method of claim 34, wherein the binding agent comprises agar or sodium alignate.

36. A food product prepared by the method of any one of claims 32-35.

37. The aerogel, foam, or structural cell, as defined in claim 1 in the form of a non-resorbable dermal filler.

38. The dermal filler of claim 37, wherein the filler comprises single structural cells, groups of structural cells, or both, derived from a plant or fungal tissue, the single structural cells or groups of structural cells having a decellularized 3-dimensional structure lacking cellular materials and nucleic acids of plant or fungal tissue, the single structural cells, groups of structural cells, or both, being derived from the plant or fungal tissue by maceration or mercerization.

39. The dermal filler of claim 38, wherein the dermal filler further comprises a carrier fluid or gel.

40. The dermal filler of claim 39, wherein the carrier fluid or gel comprises water, an aqueous solution such as a saline solution or a hydrogel such as a collagen, hyaluronic acid, methylcellulose, and/or dissolved plant-derived decellularized cellulose-based hydrogel.

41. The dermal filler of claim 40, further comprising an anesthetic agent such as lidocaine, benzocaine, tetracaine, polocaine, epinephrine, or any combinations thereof.

42. The dermal filler of claim 41, wherein the dermal filler comprises PBS or saline, cross-linked hyaluronic acid, non-crosslinked hyaluronic acid, alginate, collagen, pluronic acid e.g. pluronic F 127, agar, agarose, or fibrin, calcium hydroxylapatite, Poly-L-lactic acid, autologous fat, silicone, dextran, methylcellulose, or any combinations thereof.

43. The dermal filler of claim 42, wherein the dermal filler comprises, at stock concentrations, of at least one of: 2% lidocaine gel; a triple anesthetic gel comprising 20% benzocaine, 6% lidocaine, and 4% tetracaine e.g. BLTgel; 3% Polocaine; or a mixture of 2% lidocaine with epinephrine.

44. The dermal filler of claim 43, wherein the structural cells have a size, diameter, or feret diameter distribution within a range from at least 20 μm to 1000 μm and an average projected particle area within a range of 30,000 to 75,000 μm^2.

45. The dermal filler of claim 44, wherein the structural cells have a particle size, diameter, or feret diameter distribution having a peak 200 - 300 μm or a mean particle size, diameter, or feret diameter within a range of 200 μm to 300 μm.

46. The dermal filler of claim 45, wherein the dermal filler is sterilized.

47. The dermal filler of claim 46, wherein the sterilization is by gamma sterilization.

48. The dermal filler of claim 46, wherein the dermal filler is formulated for subdermal injection, deep dermal injection, subcutaneous injection e.g. subcutaneous fat injection, or any combinations thereof and is provided in a syringe or an injection device.

49. The dermal filler as defined in any one of claims 37-48 for use in the manufacture of a medicament for improving cosmetic appearance, increasing tissue volume, smoothing wrinkles, or any combinations thereof, in a subject in need thereof.

50. The use of claim 49, wherein native cells of the subject infiltrate the dermal filler.

51. The use of claim 50, or the dermal filler of claim 44, wherein the dermal filler is non-resorbable such that the decellularized plant or fungal tissue remains substantially intact within the subject.

52. The aerogel or foam of claim 8, wherein the cross-linking is performed by extruding the hydrogel from a mold into a cross-linker bath for continuous feed crosslinking.

53. The aerogel or foam of claim 52, wherein the hydrogel has a desired shape.

54. The dermal filler of claim 42, wherein the dermal filler comprises a final concentration of 0.3% to 2% lidocaine gel.