of connective tissues. There is therefore a need to develop alternates to these processes and connective tissue analogs. A related need exists for products incorporating such analogs, and methods of making the analogs and related plant-based meat substitutes containing them.

SUMMARY ~~OF THE INVENTION~~

[0005] In one aspect, the present disclosure encompasses a method of preparing a connective tissue analog. The method comprises the steps of combining ingredients comprising a hydrocolloid base and a dietary fiber additive to form a substantially homogenous mixture; hydrating the substantially homogenous mixture to form a hydrated gel; and at least partially dehydrating the gel to obtain an at least partially dehydrated gel comprising a non-covalently cross-linked polymer network~~-~~, thereby forming the connective tissue analog. The method may further comprise combining at least one of a protein, a crosslinking agent, a flavoring agent, a dietary fat, or a combination thereof with the hydrocolloid base and dietary fiber additive. In one ~~aspect~~example of the method, the at least partially dehydrated gel is rehydrated. Rehydration of the gel can be performed before, or because of, combining the gel with a plant-based meat-like base as described further below, to form a meat analog composition.

[0005a] In another aspect, the present disclosure provides a meat analog comprising the connective tissue analog as described herein combined with additional plant-based ingredients to form a plant-based meat product. In yet another aspect, the present disclosure provides a connective tissue analog composition comprising an at least partially dehydrated and comminuted gel obtained from a gel formed by hydration of a substantially homogeneous mixture comprising a hydrocolloid base and a dietary fiber additive. In a further aspect, the present disclosure provides a method of preparing a meat analog composition for human or animal consumption, the method comprising: a) obtaining at least a connective tissue analog comprising an at least partially dehydrated and comminuted gel obtained from a gel formed by hydration of a substantially homogeneous mixture comprising a hydrocolloid base and a dietary fiber additive; and b) combining the connective tissue analog with a plant-based meat-like base to form the meat analog.

In a further aspect, the present disclosure provides a plant-based connective tissue cartilage-like or connective tissue perimysium-like analog comprising, in weight ratio, 1-10 parts k-carrageenan, 0.1 -10 parts glucomannan and 0.1-10 parts gum Arabic; or a plant-based connective tissue elastin-like analog comprising, in weight ratio, 1-20 parts protein, 0.1-1 part a carrageenan, and 0.1-1 part of gum Arabic, wherein the protein is soy protein, pea protein, or a mixture of soy protein and pea protein; or a plant-based connective tissue tendon-like analog comprising, in weight ratio, 1 part rice protein, 1 part k-carrageenan and 1 part glucomannan.

[0006] In a method of preparing a connective tissue analog, the hydrated gel may be cast into a sheet form, block form and/or may be comminuted to form gel particles. The gel particles may be comminuted to form the gel before or after dehydrating the gel. Comminuting may comprise grinding, milling, rolling, chopping, cutting, pulverizing, breaking, pounding, abrading, rasping or any combination thereof. The gel particles may have an average width or average diameter of about 0.1 to about 10 mm, about 0.2 mm to about 10 mm, about 0.1 mm to about 5 mm, about 0.1 mm to about 4 mm, about 0.1 mm to about 3 mm, about 0.1 mm to about 2 mm, about 0.1 mm to about 1 mm, about 0.1 mm to about 0.5 mm, about 0.1 to about 0.3 mm, about 0.5 to about 2 mm, about 0.75 to about 2 mm, about 0.75 to about 2.5 mm, about 0.75 to about 3 mm, about 1 mm to about 2 mm, about 2 mm to about 3 mm, about 3 mm to about 4 mm, about 4 mm to about 5 mm, about 5 mm to about 6 mm, about 6 mm to about 7 mm, about 7 mm to about 8 mm, about 8 mm

to about 9 mm, about 9 mm to about 10 mm, less than about 10 mm, less than about 9 mm, less than about 8 mm, less than about 7 mm, less than about 6 mm, less than about 5 mm, less than about 4 mm, less than about 3 mm, less than about 2 mm, less than about 1.5 mm, less than about 1 mm, less than about 0.5 mm, about 0.25 mm. about 0.5 mm, about 0.75 mm, about 1 mm, about 1.25 mm, about 1.5 mm, about 1.75 mm, about 2 mm, about 2.5 mm, about 3 mm, about 4 mm, about 5 mm, about 6 mm, about 7 mm, about 8 mm, about 9 mm, or about 10 mm.

[0007] In one ~~aspect~~example of a method of preparing a connective tissue analog, the hydrating of the substantially homogeneous mixture of the hydrocolloid base and a dietary fiber additive may comprise adding a hydration agent, mixing, heating, cooling, setting, or any combination thereof. The hydration agent may be water, steam, a buffered water, a non-aqueous solvent, a gelling agent, or any combination thereof. The gelling agent may comprise an inorganic ion, an organic ion, a crosslinking agent, a sugar, a salt, an acid, a base, or any combination thereof.

[0008] In another ~~aspect~~example of a method of preparing a connective tissue analog, the dehydrating may comprise subjecting the hydrated gel to a dehydration condition for a time sufficient to achieve about 10% up to about 100% dehydration of the gel. The dehydrating may comprise placing the hydrated gel in an oven, a dryer, a microwave oven, a freeze dryer, a smoker, a stove, a range, a desiccator, or any combination thereof. In one ~~aspect~~example, the dehydrating comprises subjecting the hydrated gel to convective drying in a temperature range from about 40ºC to about 50ºC, and for a time period of about 4 hours to about 24 hours.

[0009] Another ~~aspect~~example of the methods described herein is that they can be performed devoid of extrusion. In another ~~aspect~~example of the method, the substantially homogenous mixture in the methods is substantially devoid of any spun protein fibers.

[0010] In another ~~aspect~~example of a method of preparing a connective tissue analog, the hydrocolloid base may comprise a carrageenan, carrageenan, agar-agar, pectin, alginate, gellan gum, glucomannan, a modified starch, methyl cellulose, hydroxypropyl methyl cellulose, carboxymethyl cellulose, methyl cellulose, gelatin, guar gum, locust bean gum, tara gum, gum tragacanth, gum ghatt, gum Arabic, analogs or derivatives thereof, or any combination thereof.

[0011] In another ~~aspect~~example of the methods, the connective tissue obtained upon rehydrating the at least partially dehydrated gel, exhibits rheological properties with a storage modulus (G') which is greater than the loss modulus (G") across a linear viscoelastic region and with G' and G" increasing with decreasing gaps and/or decreasing water content. The connective tissue obtained by the method in some ~~aspect~~examples upon rehydrating the at least partially dehydrated gel exhibit hydrogel-like mechanical properties. In some ~~aspect~~examples the connective tissue obtained by the method upon rehydrating the at least partially dehydrated gel, has a Young's modulus ranging from about 50kPa to about 500kPa and demonstrates hydrogel-like mechanical properties outlined herein.

[0012] In yet another ~~aspect~~example of a method of preparing a connective tissue analog, the dietary fiber additive may comprise one or more of structured polysaccharides, non-structured polysaccharides, structural non-polysaccharides and/or biopolymers. Some examples include but are not limited to glucomannan, guar gum, gum Arabic, xanthan gum, a psyllium, a chitin, an inulin, a pectin, a dextrin, a starch, a cellulose, a hemicellulose, a lignin, a citrus fiber extract, analogs or derivatives thereof, or any combination thereof. In some ~~aspect~~example the dietary fiber additive is water soluble. In some ~~aspect~~example the dietary fiber additive is not water soluble.

[0013] In still another ~~aspect~~example of a method of preparing a connective tissue analog, the ingredients comprise in weight ratio: 10 parts hydrocolloid base such as but not limited to a carrageenan, and 2 parts dietary fiber additive. The 2 parts dietary fiber additive may comprise 1 part of a first dietary fiber additive and 1 part of a second dietary fiber additive, such as by way of non-limiting example, 1 part glucomannan, and 1 part gum Arabic.

[0014] In yet another ~~aspect~~example of a method of preparing a connective tissue analog, the ingredients may further comprise a protein. The protein may be derived from wheat, pea, soy, potato, chickpea, rice, corn, bean, sorghum, quinoa, vegetables, fruits, seaweed, bacteria, yeast, mushrooms, any flour thereof, or any combination thereof.

[0015] In still another ~~aspect~~example of a method of preparing a connective tissue analog, the ingredients further comprise a crosslinking agent. The crosslinking agent

may comprise a dietary enzyme, a transglutaminase, a laccase, or any combination thereof.

[0016] In still another ~~aspect~~example of a method of preparing a connective tissue analog comprising a protein, the ingredients are combined in a weight ratio of 1-20 parts protein, 0.1-10 parts hydrocolloid base such as, but not limited to a carrageenan, and 0.1-10 part dietary fiber additive such as but not limited to gum Arabic or glucomannan.

[0017] Another ~~aspect~~example of the present disclosure encompasses a connective tissue analog obtained from any of the disclosed preparation methods for a connective tissue analog as described herein. A connective tissue analog may include only ingredients suitable for human or animal consumption and be devoid of ingredients unsuitable for human or animal consumption. The connective tissue analog composition may for example also be devoid of any animal-derived tissue or cells. A connective tissue analog composition may comprise an at least partially dehydrated and comminuted gel obtained by dehydrating a gel formed from the hydration and then dehydration of a substantially homogeneous mixture of any hydrocolloid base and any dietary fiber additive as disclosed herein. The at least partially dehydrated and comminuted gel may be in the form of gel particles. The gel particles may have an average width or diameter in a range from about 0.5 mm to about 3.0 mm, or any particle size disclosed herein. The at least partially dehydrated and comminuted gel may comprise, in non-limiting example, a carrageenan, glucomannan, and gum Arabic. These ingredients may be present, for example, in weight ratio: 1-10 parts carrageenan, 0.1-10 part glucomannan, and 0.1-10 part gum Arabic.

[0018] The connective tissue analog composition may further comprise a protein, a crosslinking agent, a flavoring agent, a dietary fat, or any combination thereof, as disclosed herein. The protein may be any protein, such as but not limited to soy protein, pea protein, rice protein, or any combination thereof. A crosslinking agent may comprise a dietary enzyme, a transglutaminase, a laccase, or a combination thereof. In one ~~aspect~~example, a connective tissue analog composition comprises a protein, a carrageenan, and gum Arabic. In some ~~aspect~~example a connective tissue analog composition may comprise a protein, a carrageenan, glucomannan. In

some other ~~aspect~~example the connective tissue analog composition may comprise a protein, a carrageenan, glucomannan and gum Arabic. A connective tissue analog composition may comprise, in non-limiting example, rice protein, kappa-carrageenan, and glucomannan. In yet another ~~aspect~~example, a connective tissue analog composition comprises, in weight ratio: 1-20 parts protein, 0.1-10 part any carrageenan, and optionally 0.1-10 part gum Arabic and optionally 0.1-10 part glucomannan.

[0019] In another ~~aspect~~example, a connective tissue analog composition as disclosed herein is substantially devoid of spun protein fibers, and/or devoid of extruded gel.

[0020] In another ~~aspect~~example, the present disclosure encompasses a method of preparing a meat analog composition for human or animal consumption. The method comprises obtaining a connective tissue analog comprising an at least partially dehydrated and comminuted gel obtained by hydration of a substantially homogeneous mixture comprising a hydrocolloid base and a dietary fiber additive, followed by at least partial dehydration of the gel, and combining the resulting connective tissue analog with a plant-based meat formulation to form the meat analog composition. In one ~~aspect~~example, both the connective tissue analog and the plant-based meat-like base are devoid of any animal tissues or cells. In another ~~aspect~~example, the connective tissue analog and/or the plant-based meat-like base further comprise a protein, a crosslinking agent, a flavoring agent, a dietary fat, or any combination thereof. In the meat analog composition, the connective tissue analog may contribute about 0.5 wt% to about 3 wt% of meat analog composition. The combining of the connective tissue analog with the plant-based meat-like base may further comprise at least partially rehydrating the at least partially dehydrated gel forming the connective tissue analog, in the plant-based meat–like base. In yet another ~~aspect~~example, the method of preparing the meat analog may comprise at least partially rehydrating the gel forming the connective tissue analog before combining the connective tissue analog with the plant-based meat-like base. In the method of preparing a meat analog, the connective tissue analog may comprise any of the ingredients, in any weight ratio as disclosed herein. The connective tissue analog may take any of the forms or particle sizes as disclosed herein.

[0021] Still another ~~aspect~~example of the present disclosure encompasses a meat analog comprising a connective tissue analog, wherein the meat analog is prepared by any of the methods disclosed herein.

[0022] In another ~~aspect~~example, the present disclosure encompasses a meat analog composition for human or animal consumption, which comprises a plant-based meat-like base and connective tissue analog. The connective tissue analog may be any of the connective tissue analogs described herein, made by any method described herein.

[0023] Yet another ~~aspect~~example of the present disclosure encompasses a meat analog composition for human or animal consumption, comprising a plant-based meat-like base and any connective tissue analog as disclosed herein, made by any method as disclosed herein.

[0024] Another ~~aspect~~example of the present disclosure encompasses a plant-based connective tissue cartilage-like or connective tissue perimysium-like analog comprising, in weight ratio, 1-10 parts kappa-carrageenan, 0.1-10 part glucomannan and 0.1-10 part gum Arabic. In some particular ~~aspect~~example the connective tissue cartilage-like or connective tissue perimysium-like analog may comprise 1 part kappa carrageenan, 0.1 part glucomannan and 0.1 part gum Arabic. Another ~~aspect~~example of the present disclosure is a plant-based connective tissue elastin-like analog comprising, in weight ratio, 1-20 parts protein, 0.1-10 part carrageenan, and 0.1-10 part of gum Arabic; wherein the protein is soy protein, pea protein, or a mixture of soy protein and pea protein. In some ~~aspect~~example the elastin-like analog may comprise 20 parts pea or soy protein or combination thereof, 1 part carrageenan and 1 part gum Arabic. Another ~~aspect~~example of the present disclosure is a plant-based connective tissue tendon-like analog comprising, in weight ratio, 1-20 part rice protein, 0.1-1 part carrageenan, 0.1-1 part glucomannan. In some ~~aspect~~example the tendon-like analog may comprise 1 part each of carrageenan, rice protein and konjac glucomannan. The rice protein may comprise a protein selected from the group consisting of Oryzatein 80, Oryzatein Silk 80, Oryzatein Silk 90, and any combinations thereof. In yet another ~~aspect~~example, the plant-based cartilage or perimysium analog, the plant-based connective tissue elastin-like analog, or the plant-based tendon analog, each is in particle form. In one ~~aspect~~example, the

particles have an average maximum diameter of about 2.0 mm, about 2.5 mm, or about 3.0 mm.

[0025] Yet another ~~aspect~~example of the present disclosure encompasses a meat analog composition comprising particles of any plant-based cartilage, perimysium, elastin or tendon analog as disclosed herein, wherein the particles are incorporated in a plant-based meat-like base. In some ~~aspect~~examples the meat analog may comprise about 0.5-3% plant based connective tissue.

[0026] In another ~~aspect~~example, any meat analog composition disclosed herein may take the form of a burger patty, ground meat, meatball, sausage, meat jerky, bacon or hot-dog analogous to meat containing products in market. In any of the plant-based connective tissue analogs, including any cartilage-like, perimysium-like or elastin-like analog as described herein, the analog may have a Young's modulus ranging from about 50kPa to about 500kPa and demonstrate hydrogel-like mechanical and rheological properties outlined herein.

BRIEF DESCRIPTION OF THE FIGURES

[0027] **FIG. 1** illustrates the general process and steps of making the connective tissue analogs.

[0028] **FIG. 2** are photos taken during the process of making elastin-type connective tissue analog and the final meat analog in the form of a burger patty. The elastin-type connective tissue analog made from soy protein, carrageenan, and gum Arabic. The photos include microscope pictures of the surface and the internal parts of the analogs to provide details.

[0029] **FIG. 3** are photos taken during the process of making elastin-type connective tissue analog and the final meat analog in the form of a burger patty. The elastin-type connective tissue analog made from pea protein, carrageenan, and gum Arabic. The photos include microscope pictures of the surface and the internal parts of the analogs to provide details.

[0030] **FIG. 4** are photos taken during the process of making collagen-type connective tissue analog and the final meat analog in the form of a burger patty. The collagen-type connective tissue analog made from using carrageenan,

CLAIMS

1. A method of preparing a connective tissue analog, the method comprising the steps of:

a) combining ingredients comprising a hydrocolloid base and a dietary fiber additive to form a substantially homogenous mixture;

b) hydrating the substantially homogenous mixture to form a hydrated gel;

c) at least partially dehydrating the gel to obtain an at least partially dehydrated gel comprising a non-covalently cross-linked polymer network, thereby forming the connective tissue analog.

2. The method of claim~~s~~ 1, wherein step (a) further comprises combining at least one of a protein, a crosslinking agent, a flavoring agent, a dietary fat, or any combination thereof.

3. The method of any one of claims 1-2, wherein the hydrocolloid base comprises a carrageenan, κ-carrageenan, agar-agar, pectin, alginate, gellan gum, glucomannan, a modified starch, methyl cellulose, hydroxypropyl methyl cellulose, carboxymethyl cellulose, methyl cellulose, gelatin, guar gum, locust bean gum, tara gum, gum tragacanth, gum ghatt, gum Arabic, analogs or derivatives thereof, or any combination thereof~~.~~ and wherein the dietary fiber additive comprises glucomannan, guar gum, gum Arabic, xanthan gum, a psyllium, a chitin, an inulin, a pectin, a dextrin, a starch, a cellulose, a hemicellulose, a lignin, a citrus fiber extract, analogs or derivatives thereof, or any combination thereof.

~~4. The method of any one of claims 1-2, wherein the dietary fiber additive comprises glucomannan, guar gum, gum Arabic, xanthan gum, a psyllium, a chitin, an inulin, a pectin, a dextrin, a starch, a cellulose, a hemicellulose, a lignin, a citrus fiber extract, analogs or derivatives thereof, or any combination thereof.~~

4~~5~~. The method of any one of claims 1-3~~4~~, wherein the ingredients comprise in weight ratio, 1-10 parts a carrageenan and 0.1-10 parts glucomannan and optionally 0.1-10 parts gum Arabic.

5~~6~~. The method of any one of claims 1-4~~5~~, wherein the ingredients further comprise a protein, wherein the protein is derived from wheat, pea, soy, potato, chickpea, rice, corn, bean, sorghum, quinoa, fruits, vegetables, seaweed, bacteria, yeast, mushrooms, any flour thereof, or

any combination thereof; a crosslinking agent, wherein the crosslinking agent comprises a dietary enzyme, a transglutaminase, a laccase, or any combination thereof; or both. .

67. The method of any one of claims 1-56, wherein the ingredients comprise in weight ratio, 1-20 parts a protein, 0.1-10 parts a carrageenan, and optionally 0.1-10 parts gum Arabic and optionally 0.1-10 parts glucomannan.

8. The method of any one of claims 1-7, wherein the ingredients further a crosslinking agent, wherein the crosslinking agent comprises a dietary enzyme, a transglutaminase, a laccase, or any combination thereof.

79. The method of any one of claims 1-68, wherein the substantially homogenous mixture is substantially devoid of spun protein fibers.

810. The method of claim 1, wherein step (b) further comprises the steps of adding a hydration agent, mixing while heating to a homogenous consistency, cooling, and setting to form a gel.

911. The method of any one of claims 1-810, further comprising casting the hydrated gel into a sheet form or block form, and optionally dehydrating the sheet or block form to form a dehydrated sheet form or a dehydrated block form.

102. The method of claim 911, further comprising comminuting the hydrated gel to form gel particles, or comminuting the dehydrated sheet form or the dehydrated block form.

13. The method of claim 11, further comprising dehydrating the sheet or block form.

14. The method of claim 13, further comprising comminuting the dehydrated sheet form or block form.

115. The method of any one of claims 1-104, wherein the dehydrating the gel comprises subjecting the hydrated gel to a dehydration condition for a time sufficient to achieve about 10% up to about 100% dehydration of the gel.

126. The method of claim 115, wherein subjecting the gel to a dehydration condition comprises placing the gel in an oven, a dryer, a microwave oven, a freeze dryer, a smoker, a stove or range, a desiccator, an air fryer or any combination thereof.

137. The method of any one of claims 1, 115 or 126, wherein dehydrating the hydrated gel comprises convective drying in a temperature range from ~~about~~ 40ºC to ~~about~~ 50ºC for a time period of ~~about~~ 4 hours to ~~about~~ 24 hours.

148. The method of claim 102 ~~or 14~~, wherein the comminuting comprises grinding, milling, rolling, chopping, cutting, pulverizing, breaking, pounding, abrading, rasping or any combination thereof.

159. The method of any one of claims 102, ~~14~~ or 148, wherein the gel particles have an average width or a diameter of ~~about~~ 0.1 to ~~about~~ 10 mm, ~~about~~ 0.2 mm to ~~about~~ 10 mm, ~~about~~ 0.1 mm to ~~about~~ 5 mm, ~~about~~ 0.1 mm to ~~about~~ 4 mm, ~~about~~ 0.1 mm to ~~about~~ 3 mm, ~~about~~ 0.1 mm to ~~about~~ 2 mm, ~~about~~ 0.1 mm to ~~about~~ 1 mm, ~~about~~ 0.1 mm to ~~about~~ 0.5 mm, ~~about~~ 0.1 to ~~about~~ 0.3 mm, ~~about~~ 0.5 to ~~about~~ 2 mm, ~~about~~ 0.75 to ~~about~~ 2 mm, ~~about~~ 0.75 to ~~about~~ 2.5 mm, ~~about~~ 0.75 to ~~about~~ 3 mm, ~~about~~ 1 mm to ~~about~~ 2 mm, ~~about~~ 2 mm to ~~about~~ 3 mm, ~~about~~ 3 mm to ~~about~~ 4 mm, ~~about~~ 4 mm to ~~about~~ 5 mm, ~~about~~ 5 mm to ~~about~~ 6 mm, ~~about~~ 6 mm to ~~about~~ 7 mm, ~~about~~ 7 mm to ~~about~~ 8 mm, ~~about~~ 8 mm to ~~about~~ 9 mm, ~~about~~ 9 mm to ~~about~~ 10 mm, less than about 10 mm, less than about 9 mm, less than about 8 mm, less than about 7 mm, less than about 6 mm, less than about 5 mm, less than about 4 mm, less than about 3 mm, less than about 2 mm, less than about 1.5 mm, less than about 1 mm, less than about 0.5 mm, about 0.25 mm. about 0.5 mm, about 0.75 mm, about 1 mm, about 1.25 mm, about 1.5 mm, about 1.75 mm, about 2 mm, about 2.5 mm, about 3 mm, about 4 mm, about 5 mm, about 6 mm, about 7 mm, about 8 mm, about 9 mm, or about 10 mm.

1620. The method of any one of claim~~s~~ 1 or any one of claims 115-138, further comprising rehydrating the at least partially dehydrated gel to at least about 90 wt%, or to at least about 85 wt%, or to at least about 80 wt%, to at least about 75 wt%, to at least about 70 wt%, to at least about 65 wt%, to at least about 60 wt%.

1721. The method of any one of claims 1, 810 or 1620, wherein the hydrating or rehydrating comprises adding a hydration agent to the dehydrated or partially dehydrated gel.

1822. The method of claim 1721, wherein the hydration agent is water, steam, a buffered water, a non-aqueous solvent, a gelling agent, or any combination thereof.

1923. The method of claim 1822, wherein the gelling agent comprises an inorganic ion, an organic ion, a crosslinking agent, a sugar, a salt, an acid, a base, or any combination thereof.

204. The method of any one of claims 1 or 1620-1923, wherein upon rehydrating the at least partially dehydrated gel, the connective tissue analog has a Young's Modulus ranging from about 50 kPa to about 500 kPa.

215. The method of any one of claims 1 or 1620-1923, wherein upon rehydrating the at least partially dehydrated gel, the connective tissue analog exhibits hydrogel-like rheological properties.

226. The method of any one of claims 1 or 1620-1923, wherein upon rehydrating the at least partially dehydrated gel, the connective tissue analog exhibits hydrogel-like mechanical properties.

237. The method of any one of claims any one of claims 1 or 1620-1923, wherein upon rehydrating the at least partially dehydrated gel, the connective tissue analog has at least one of the following: a Young's Modulus ranging from about 50 kPa to about 500 kPa; hydrogel-like mechanical properties; and hydrogel-like rheological properties.

248. The method of any one of claims 1-237, wherein the connective tissue analogs are made without an extrusion or micro-extrusion step.

259. A meat analog comprising the connective tissue analog of any one of claims 1-248 combined with additional plant-based ingredients to form a plant-based meat product.

2630. A connective tissue analog composition comprising an at least partially dehydrated and comminuted gel obtained from a gel formed by hydration of a substantially homogeneous mixture comprising a hydrocolloid base and a dietary fiber additive.

31. The connective tissue analog composition of claim 30, wherein the connective tissue analog has at least one of the following: a Young's Compressive Modulus ranging from about 50 kPa to about 500 kPa; hydrogel-like mechanical properties; and hydrogel-like rheological properties.

32. The connective tissue analog composition of claim 30 or 31, devoid of any animal tissues or cells, and devoid of ingredients unsuitable for human or animal consumption.

33. The connective tissue analog composition of any one of claims 30-32, wherein the at least partially dehydrated and comminuted gel comprises particles having a diameter in a range from about 0.5 mm to about 3.0 mm.

34. The connective tissue analog composition of any one of claims 30-33, wherein the hydrocolloid base comprises a carrageenan, agar-agar, pectin, alginate, gellan gum, glucomannan, a modified starch, methyl cellulose, hydroxypropyl methyl cellulose, carboxymethyl cellulose, methyl cellulose, guar gum, locust bean gum, tara gum, gum tragacanth, gum ghatt, gum Arabic, derivatives, or analogs thereof, or any combination thereof.

35. The connective tissue analog composition of any one of claims 30-33, wherein the dietary fiber additive comprises glucomannan, guar gum, gum Arabic, xanthan gum, psyllium, a chitin, an inulin, a pectin, a dextrin, a starch, a cellulose, a hemicellulose, a lignin, a citrus fiber extract, derivatives, or analogs thereof, or any combination thereof.

36. The connective tissue analog composition of any one of claims 30-33, wherein the at least partially dehydrated and comminuted gel comprises a carrageenan, glucomannan, and gum Arabic.

37. The connective tissue analog composition of claim 30-36, comprising in weight ratio, 1-10 parts a carrageenan, 0.1-10 parts glucomannan, and optionally 0.1-10 parts gum Arabic.

38. The connective tissue analog composition of any one of claims 30-37, further comprising a protein, a crosslinking agent, a flavoring agent, a dietary fat, or any combination thereof.

39. The connective tissue analog composition of any one of claims 38, wherein the protein is derived from wheat, pea, soy, potato, chickpea, rice, corn, bean, sorghum, quinoa, fruits, vegetables, seaweed, bacteria, yeast, mushrooms, any flour thereof, or any combination thereof.

40. The connective tissue analog composition of claim 30-33, comprising a protein, a carrageenan, and optionally gum Arabic and optionally glucomannan.

41. The connective tissue analog composition of claim 40, wherein the protein is soy protein, pea protein, or a combination thereof.

42. The connective tissue analog composition of claim 40, comprising rice protein, k-carrageenan, and glucomannan.

43. The connective tissue analog composition of claim 40, comprising in weight ratio, 1-20 parts protein, 0.1-10 part a carrageenan, and 0.1-10 part gum Arabic or 0.1-10 part glucomannan.

~~44. The connective tissue analog composition of claim 38, wherein the crosslinking agent is a dietary enzyme, a transglutaminase, a laccase, or a combination thereof.~~

~~45. The connective tissue analog composition of any one of claims 30-44, wherein the at least partially dehydrated and comminuted gel is substantially devoid of spun protein fibers.~~

~~46. The connective tissue analog composition of any one of claims 30-45, wherein the at least partially dehydrated and comminuted gel is devoid of extruded or micro-extruded gel.~~

247. A method of preparing a meat analog composition for human or animal consumption, the method comprising:

a) obtaining at least a connective tissue analog comprising an at least partially dehydrated and comminuted gel obtained from a gel formed by hydration of a substantially homogeneous mixture comprising a hydrocolloid base and a dietary fiber additive; and

b) combining the connective tissue analog with a plant-based meat-like base to form the meat analog.

~~48. The method of claim 47, wherein the connective tissue analog and the plant-based meat-like base are devoid of any animal tissues or cells.~~

~~49. The method of claim 47 or 48, wherein the connective tissue analog further comprises a protein, a crosslinking agent, a flavoring agent, a dietary fat, or any combination thereof.~~

~~50. The method of any one of claims 47-49, wherein the combining comprises mixing an amount of the connective tissue analog with an amount of the plant-based meat-like base such that the meat analog composition comprises about 0.5 wt% to about 3 wt% of the connective tissue analog.~~

~~51. The method of any one of claims 47-50, wherein the combining the connective tissue analog with the plant-based meat-like base comprises at least partially rehydrating the connective tissue analog in the plant-based meat–like base.~~

~~52. The method of any one of claims 47-50, further comprising at least partially rehydrating the connective tissue analog before combining the connective tissue analog with the plant-based meat-like base.~~

53. The method of any one of claims 47-52, wherein the hydrocolloid base comprises a carrageenan, κ-carageenan, agar-agar, pectin, alginate, gellan, glucomannan, a modified starch, methyl cellulose, hydroxypropyl methyl cellulose, carboxymethyl cellulose, methyl cellulose, guar gum, locust bean gum, tara gum, gum tragacanth, gum ghatt, gum Arabic, derivatives, or analogs thereof, or any combination thereof.

54. The method of any one of claims 47-53, wherein the dietary fiber additive comprises glucomannan, guar gum, gum Arabic, xanthan gum, psyllium, a chitin, an inulin, a pectin, a dextrin, a starch, cellulose, hemicellulose, a lignin, a citrus fiber extract, derivatives, or analogs thereof, or any combination thereof.

55. The method of any one of claims 49-54, wherein the protein is derived from wheat, pea, soy, potato, chickpea, rice, corn, sorghum, quinoa, fruits, vegetables, seaweed, bacteria, yeast, mushrooms, any flour thereof, or any combination thereof.

56. The method of any one of claims 49-55, wherein the crosslinking agent is a dietary enzyme, a transglutaminase, a laccase, or any combination thereof.

57. The method of any one of claims 49-56, wherein the connective tissue analog comprises a carrageenan, glucomannan, and gum Arabic.

58. The method of any one of claims 49-56, wherein the connective tissue analog comprises a protein, a carrageenan, and at least one of:

i. gum Arabic,

ii. glucomannan; or

iii. a combination of gum Arabic and glucomannan.

59. The method of any of claims 47-58, wherein the connective tissue analog is devoid of spun protein fibers.

60. The method of any of claims 47-59, wherein the connective tissue analog is devoid of extruded gel.

61. A meat analog composition for human or animal consumption, comprising:

a) a plant-based meat-like base; and

b) a connective tissue analog comprising an at least partially dehydrated and comminuted gel obtained from a gel formed by hydration of a homogeneous mixture comprising a hydrocolloid base and a dietary fiber additive.

62. The meat analog composition of claim 61, devoid of any animal tissues or cells.

63. The meat analog composition of claim 61 or 62, wherein the connective tissue analog has at least one of the following: a Young's Modulus ranging from about 50kPa to about 500kPa; hydrogel-like mechanical properties; and hydrogel-like rheological properties. The meat analog composition of claim 61 or 62, wherein the meat analog further comprises a protein, a crosslinking agent, a flavoring agent, a dietary fat, or any combination thereof.

64. The meat analog composition of any one of claims 61-63, wherein the connective tissue analog comprises particles having an average diameter in a range from about 0.1 mm to about 2.0 mm, from about 0.2 mm to about 10 mm, about 0.1 mm to about 5 mm, about 0.1 mm to about 4 mm, about 0.1 mm to about 3 mm, about 0.1 mm to about 2 mm, about 0.1 mm to about 1 mm, about 0.1 mm to about 0.5 mm, about 0.1 to about 0.3 mm, about 0.5 to about 2 mm, about 0.75 to about 2 mm, about 0.75 to about 2.5 mm, about 0.75 to about 3 mm, about 1 mm to about 2 mm, about 2 mm to about 3 mm, about 3 mm to about 4 mm, about 4 mm to about 5 mm, about 5 mm to about 6 mm, about 6 mm to about 7 mm, about 7 mm to about 8 mm, about 8 mm to about 9 mm, about 9 mm to about 10 mm, less than about 10 mm, less than about 9 mm, less than about 8 mm, less than about 7 mm, less than about 6 mm, less than about 5 mm, less than about 4 mm, less than about 3 mm, less than about 2 mm, less than about 1.5 mm, less than about 1 mm, less than about 0.5 mm, about 0.25 mm. about 0.5 mm, about 0.75 mm, about 1 mm, about 1.25 mm, about 1.5 mm, about 1.75 mm, about 2 mm, about 2.5 mm, about 3 mm, about 4 mm, about 5 mm, about 6 mm, about 7 mm, about 8 mm, about 9 mm, or about 10 mm.

65. The meat analog composition of any one of claims 61-64, wherein the hydrocolloid base comprises a carrageenan, κ-carrageenan, agar-agar, pectin, alginate, gellan gum, glucomannan, a modified starch, methyl cellulose, hydroxypropyl methyl cellulose, carboxymethyl cellulose, methyl cellulose, guar gum, locust bean gum, tara gum, gum tragacanth, gum ghatt, gum Arabic, derivatives, or analogs thereof, or a combination thereof.

66. The meat analog composition of any one of claims 61-65, wherein the dietary fiber additive comprises glucomannan, guar gum, gum Arabic, xanthan gum, psyllium, a chitin, an

inulin, a pectin, a dextrin, a starch, a cellulose, a hemicellulose, a lignin, a citrus fiber extract, derivatives or analogs thereof, or a combination thereof.

67. The meat analog composition of any one of claims 63-66, wherein the protein is derived from wheat, pea, soy, potato, chickpea, rice, corn, bean, sorghum, quinoa, fruits, vegetables, seaweed, bacteria, yeast, mushrooms, any flour thereof, or any combination thereof.

68. The meat analog composition of any one of claims 63-67, wherein the crosslinking agent is a dietary enzyme, a transglutaminase, a laccase, or any combination thereof.

69. The meat analog composition of any one of claims 61-68, wherein the connective tissue analog comprises a carrageenan, glucomannan, and gum Arabic.

70. The meat analog composition of any one of claims 61-69, wherein the connective tissue analog comprises a protein, a carrageenan, and,

a) gum Arabic,

b) glucomannan; or

c) a combination of gum Arabic and glucomannan.

71. The meat analog composition of any one of claims 61-70, wherein the plant-based meat-like base comprises a plant protein.

72. The meat analog composition of claim 61-70, wherein the connective tissue analog comprises, in weight ratio, 1-10 parts of a carrageenan, 0.1-10 parts glucomannan and 0.1-10 parts gum Arabic.

73. The meat analog composition of claims 61-71, wherein the connective tissue analog comprises, in weight ratio, 1-20 parts protein, 0.1-1 parts a carrageenan, and 0.1-1 parts dietary fiber additive.

74. The meat analog composition of any one of claims 61-63, wherein:

a) the protein comprises a protein selected from soy protein, pea protein, rice protein and any combination thereof; and/or

~~b) the carrageenan comprises a carrageenan selected from kappa-carrageenan, lota-carrageenan, lambda-carrageenan, or any combination thereof; and/or~~

~~c) the dietary fiber additive comprises gum Arabic, glucomannan, or a combination thereof.~~

~~75. The meat analog composition of any one of claims 61-74, wherein the connective tissue analog is devoid of any spun protein fibers.~~

~~76. The meat analog composition of any one of claims 61-75, wherein the connective tissue analog is devoid of extruded gel.~~

~~77. The meat analog composition of any one of claims 61-77 in the form of a burger patty.~~

~~78. A plant-based connective tissue cartilage-like or connective tissue perimysium-like analog comprising, in weight ratio, 1-10 parts k-carrageenan, 0.1 -10 parts glucomannan and 0.1-10 parts gum Arabic.~~

28~~79~~. A plant-based connective tissue cartilage-like or connective tissue perimysium-like analog comprising, in weight ratio, 1-10 parts k-carrageenan, 0.1 -10 parts glucomannan and 0.1-10 parts gum Arabic; or a plant-based connective tissue ~~A plant-based connective tissue~~ elastin-like analog comprising, in weight ratio, 1-20 parts protein, 0.1-1 part a carrageenan, and 0.1-1 part of gum Arabic,~~;~~ wherein the protein is soy protein, pea protein, or a mixture of soy protein and pea protein; or a plant-based connective tissue tendon-like analog comprising, in weight ratio, 1 part rice protein, 1 part k-carrageenan and 1 part glucomannan.

~~80. A plant-based connective tissue tendon-like analog comprising, in weight ratio, 1 part rice protein, 1 part k-carrageenan and 1 part glucomannan.~~

29~~81~~. The plant-based tendon analog of claim 28~~80~~, wherein the rice protein comprises a protein selected from the group consisting of Oryzatein 80 (Original 80), Oryzatein Silk 80, Oryzatein Silk 90, and any combinations thereof.

30~~82~~. The plant-based cartilage or perimysium analog ~~of claim 78~~, the plant-based connective tissue elastin-like analog ~~of claim 79~~, or the plant-based tendon analog ~~of~~ claim 28~~81~~, in particle form.

~~83. The plant-based cartilage, perimysium, tendon, or elastin-like analog of any one of claims 79-81, wherein the particles have an average maximum diameter of about 2.0 mm, about 2.5 mm, or about 3.0 mm.~~

~~84. A meat analog composition comprising particles of the plant-based cartilage, perimysium, elastin, or tendon analog according to claims 79-81, in a plant-based meat-like base.~~

~~85. The meat analog composition of claim 84, in the form of a burger patty, meatball, sausage, jerky, or hot-dog.~~

~~86. The plant-based connective tissue cartilage-like, connective tissue perimysium-like or connective tissue elastin-like analog of any of claims 79-85, having at least one of the following: a Young's Modulus ranging from about 50kPa to about 500kPa; hydrogel-like mechanical properties; and hydrogel-like rheological properties.~~