WHAT IS CLAIMED:

1. A method for preparing a tissue graft, the method comprising:

treating tissue with a digestion solution comprising (a) trypsin and alpha-chymotrypsin (ACT), or (b) trypsin, ACT and ethylenediaminetetraacetic acid (EDTA), to substantially remove one or more susceptible proteins from the tissue.

2. The method of claim 1, wherein the digestion solution comprises one or more of:

about 3.5 x 10^3 USP units/mL to about 4.5 x 10^3 USP units/mL of trypsin;

about 50 USP units/mL to about 55 USP units/mL of ACT; and

about 1.2 mM to about 1.5 mM of EDTA.

3. The method of claim 1, wherein the digestion solution further comprises at least one proteolytic enzyme.

4. The method of claim 1, wherein the one or more susceptible proteins include at least one of laminin alpha-1, laminin alpha-2, laminin alpha-4, laminin alpha-5, laminin beta-1, laminin beta-2, laminin gamma-1, collagen IV alpha-1(IV) chain, collagen IV alpha-1/5(IV) chain, collagen alpha IV-2 chain, collagen alpha IV-3 chain, fibronectin 1 (type-iii 4, 7 domain), perlecan, nidogen-1, nidogen-2, or a combination thereof.

5. The method of claim 1, wherein the treated tissue is substantially free of one or more of laminin alpha-1, laminin alpha-2, laminin alpha-4, laminin alpha-5, laminin beta-1, laminin beta-2, laminin gamma-1, collagen IV alpha-1(IV) chain, collagen IV alpha-1/5(IV) chain, collagen alpha IV-2 chain, collagen alpha IV-3 chain, fibronectin 1 (type-III 4, 7 domain), perlecan, nidogen-1, or nidogen-2.

6. The method of claim 1, wherein the treated tissue comprises one or more of collagen I alpha-1 chain, collagen alpha-2(I) chain, collagen alpha-3(VI) chain, lumican, collagen alpha-1(VI) chain, collagen alpha-1(XXVIII) chain, dermatopontin, collagen alpha-1(III) chain, collagen alpha-3(V) chain, keratin, type-II cytoskeletal 1, fibrillin-1, decorin, collagen alpha-1(XVI) chain, vitronectin, collagen alpha-1(XXXI) chain, myelin proteins P0, collagen alpha-2(VI) chain, collagen alpha-1(VIII) chain, collagen alpha-1(V) chain, asporin, prolargin,

biglycan, collagen alpha-1(II) chain, myelin P2 protein, periostin, collagen alpha-1(XIV) chain, alpha-crystallin B chain, or collagen alpha-1(XII) chain.

7. The method of claim 1, wherein the tissue is treated with the digestion solution at a temperature ranging from about 4°C to about 40°C.

8. The method of claim 1, wherein the tissue is treated with the digestion solution for a period of time ranging from about 4 hours to about 24 hours.

9. The method of claim 1, further comprising washing the treated tissue with a buffer solution having a pH ranging from about 6.8 to about 7.5.

10. The method of claim 9, wherein the buffer solution comprises phosphate buffered saline, saline catholytes, Tris-buffered saline, cacodylate buffer, Sørensen's phosphate buffer, phosphate-citrate buffer, or barbital buffer.

11. The method of claim 9, wherein the treated tissue is washed with the buffer solution two or more times.

12. The method of claim 9, wherein the treated tissue is washed with the buffer solution for at least one of (a) a temperature ranging from about 4°C to about 40°C, or (b) for a period of time ranging from about 1 minute to about 4 hours.

13. The method of claim 1, further comprising washing the treated tissue with a serum comprising alpha-antitrypsin and alpha-2-macroglobulin, wherein the serum is fetal bovine serum, rabbit serum, goat serum, horse serum, sheep serum, porcine serum, or chicken serum.

14. The method of claim 13, wherein the treated tissue is washed with the serum two or more times.

15. The method of claim 13, wherein the treated tissue is washed with the serum for at least one of (a) a temperature ranging from about 4°C to about 40°C, or (b) for a period of time ranging from about 30 minutes to about 8 hours.

16. The method of claim 1, further comprising contacting the treated tissue with a calcium channel blocker, extracellular calcium, a glycosaminoglycan, and/or a glycoprotein, optionally wherein the buffer solution, the serum, or both the buffer solution and the serum comprises the calcium channel blocker, the extracellular calcium, the glycosaminoglycan, and/or the glycoprotein.

17. The method of claim 16, wherein the tissue graft comprises a calcium channel blocker, and wherein the calcium channel blocker comprises one or more of cobalt Co^{2+}, manganese Mn^{2+}, lanthanum La^{3+}, or nitrendipine.

18. The method of claim 16, wherein the tissue graft comprises a glycosaminoglycan, and wherein the glycosaminoglycan comprises one or more of keratin sulfate or chondroitin sulfate.

19. The method of claim 16, wherein the tissue graft comprises a glycoprotein, and wherein the glycoprotein comprises one or more myelin-associated glycoproteins.

20. The method of claim 1, wherein the tissue graft has a dimension of at least one of:
a length of about 3 mm to about 100 mm, or
a diameter of about 1 mm to about 10 mm.

21. The method of claim 1, wherein the tissue graft defines a total volume ranging from about 5 mm^3 to about 55,000 mm^3.

22. The method of claim 1, wherein the treated tissue is further processed by at least one of lyophilizing, forming a paste out of the treated tissue, or forming a gel out of the treated tissue.

23. The method of claim 1, wherein the tissue is mammalian tissue, such as human tissue, non-human primate tissue, rodent tissue, equine tissue, canine tissue, rabbit tissue, porcine tissue, or ovine tissue.

24. The method of claim 1, wherein the tissue is synthetic tissue or non-mammalian tissue, such as piscine tissue, amphibian tissue, insect tissue, or plant tissue.

25. The method of claim 1, wherein the tissue is at least one of nerve tissue, such as peripheral nerve tissue, or central nervous system tissue; epithelial tissue; connective tissue; muscular tissue; capillary tissue; dermal tissue; skeletal tissue; smooth muscle tissue; cardiac tissue; or adipose tissue.

26. A tissue graft prepared according to the method of claim 1.

27. The tissue graft of claim 26, wherein the nerve graft is substantially free of one or more of laminin alpha-1, laminin alpha-2, laminin alpha-4, laminin alpha-5, laminin beta-1, laminin beta-2, laminin gamma-1, collagen iv alpha-1(IV) chain, collagen IV alpha-1/5(IV) chain, collagen alpha IV-2 chain, collagen alpha IV-3 chain, fibronectin 1 (type-iii 4, 7 domain), perlecan, nidogen-1, or nidogen-2.

28. A tissue graft,

wherein the tissue graft is substantially free of one or more of laminin alpha-1, laminin alpha-2, laminin alpha-4, laminin alpha-5, laminin beta-1, laminin beta-2, laminin gamma-1, collagen iv alpha-1(IV) chain, collagen IV alpha-1/5(IV) chain, collagen alpha IV-2 chain, collagen alpha IV-3 chain, fibronectin 1 (type-iii 4, 7 domain), perlecan, nidogen-1, or nidogen-2; and

wherein the tissue graft comprises one or more of collagen I alpha-1 chain, collagen alpha-2(I) chain, collagen alpha-3(VI) chain, lumican, collagen alpha-1(VI) chain, collagen alpha-1(XXVIII) chain, dermatopontin, collagen alpha-1(III) chain, collagen alpha-3(V) chain, keratin, type-II cytoskeletal 1, fibrillin-1, decorin, collagen alpha-1(XVI) chain, vitronectin, collagen alpha-1(XXXI) chain, myelin proteins P0, collagen alpha-2(VI) chain, collagen alpha-1(VIII) chain, collagen alpha-1(V) chain, asporin, prolargin, biglycan, collagen alpha-1(II) chain, myelin P2 protein, periostin, collagen alpha-1(XIV) chain, alpha-crystallin B chain, or collagen alpha-1(XII) chain.

29. The tissue graft of claim 28 wherein the nerve graft is substantially free of one or more of laminin alpha-1, laminin alpha-2, laminin alpha-4, laminin alpha-5, laminin beta-1, laminin beta-2, laminin gamma-1, collagen IV alpha-1(IV) chain, collagen IV alpha-1/5(IV)

chain, collagen alpha IV-2 chain, collagen alpha IV-3 chain, fibronectin 1 (type-iii 4, 7 domain), perlecan, nidogen-1, or nidogen-2.

30. The tissue graft of claim 28, wherein the tissue graft comprises at least 0.1 nmol/g of one or more of collagen I alpha-1 chain, collagen alpha-2(I) chain, collagen alpha-3(VI) chain, lumican, collagen alpha-1(VI) chain, collagen alpha-1(XXVIII) chain, dermatopontin, collagen alpha-1(III) chain, collagen alpha-3(V) chain, keratin, type-II cytoskeletal 1, fibrillin-1, decorin, collagen alpha-1(XVI) chain, vitronectin, collagen alpha-1(XXXI) chain, myelin proteins P0, collagen alpha-2(VI) chain, collagen alpha-1(VIII) chain, collagen alpha-1(V) chain, asporin, prolargin, biglycan, collagen alpha-1(II) chain, myelin P2 protein, periostin, collagen alpha-1(XIV) chain, alpha-crystallin B chain, or collagen alpha-1(XII) chain.

31. The tissue graft of claim 28, wherein the tissue graft comprises one or more calcium channel blockers, extracellular calcium, glycosaminoglycans, and/or glycoproteins.

32. The tissue graft of claim 31, wherein the tissue graft comprises a calcium channel blocker, and wherein the calcium channel blocker comprises one or more of cobalt Co^{2+}, manganese Mn^{2+}, lanthanum La^{3+}, or nitrendipine.

33. The tissue graft of claim 31, wherein the tissue graft comprises a glycosaminoglycan, and wherein the glycosaminoglycan comprises one or more of keratin sulfate or chondroitin sulfate.

34. The tissue graft of claim 31, wherein the tissue graft comprises a glycoprotein, and wherein the glycoprotein comprises one or more myelin-associated glycoproteins.

35. The tissue graft of claim 28, wherein the tissue graft has a dimension of at least one of:

a length of about 3 mm of about 100 mm; or

a diameter of about 1 mm to about 10 mm.

36. The tissue graft of claim 28, wherein the tissue graft defines a total volume ranging from about 5 mm^3 to about 55,000 mm^3.

37. The tissue graft of claim 28, wherein the tissue graft is a nerve graft.

38. A kit for preparing a tissue graft, the kit comprising:
tissue;
trypsin; and
alpha-chymotrypsin (ACT).

39. The kit of claim 38, further comprising ethylenediaminetetraacetic acid (EDTA).

40. The kit of claim 38, wherein the kit comprises a first container that includes the trypsin and the EDTA, and a second container that includes the ACT.

41. The kit of claim 38, further comprising a buffer solution.

42. The kit of claim 41, wherein the buffer solution comprises phosphate buffered saline, saline catholytes, Tris-buffered saline, cacodylate buffer, Sørensen's phosphate buffer, phosphate-citrate buffer, or barbital buffer.

43. The kit of claim 38, further comprising a serum that comprises alpha-antitrypsin and alpha-2-macroglobulin, wherein the serum is fetal bovine serum, rabbit serum, goat serum, horse serum, sheep serum, porcine serum, or chicken serum.

44. The kit of claim 38, further comprising instructions for preparing a digestion solution comprising the trypsin and the ACT, or a digestion solution comprising the trypsin, the ACT, and ethylenediaminetetraacetic acid (EDTA).

45. The kit of claim 44, further comprising instructions for treating the tissue with the digestion solution.

46. The kit of claim 38, wherein the tissue is synthetic tissue; or mammalian tissue, such as human tissue, non-human primate tissue, rodent tissue, equine tissue, canine tissue, rabbit tissue, porcine tissue, or ovine tissue; or non-mammalian tissue, such as piscine tissue, amphibian tissue, insect tissue or plant tissue.

47. The kit of claim 38, wherein the tissue is one of nerve tissue, such as peripheral nerve tissue or central nervous system tissue; epithelial tissue; connective tissue; muscular tissue; capillary tissue; dermal tissue; skeletal tissue; smooth muscle tissue; cardiac tissue; or adipose tissue.

48. A method for preparing a tissue graft, the method comprising:

treating tissue with a digestion solution comprising trypsin, alpha-chymotrypsin (ACT) and ethylenediaminetetraacetic acid (EDTA);

washing the treated tissue one or more times with a buffer solution; and

after washing with the buffer solution, washing the treated tissue one or more times with a serum comprising alpha-antitrypsin and alpha-2-macroglobulin;

wherein the treated tissue is substantially free of one or more of laminin alpha-2, laminin alpha-4, laminin alpha-5, laminin beta-1, laminin beta-2, laminin gamma-1, collagen IV alpha-1(IV) chain, collagen IV alpha-1/5(IV) chain, collagen alpha IV-2 chain, collagen alpha IV-3 chain, fibronectin 1 (type-III 4, 7 domain), perlecan, nidogen-1, or nidogen-2; and

wherein the treated tissue comprises one or more of collagen I alpha-1 chain, collagen alpha-2(I) chain, collagen alpha-3(VI) chain, lumican, collagen alpha-1(VI) chain, collagen alpha-1(XXVIII) chain, dermatopontin, collagen alpha-1(III) chain, collagen alpha-3(V) chain, keratin, type-II cytoskeletal 1, fibrillin-1, decorin, collagen alpha-1(XVI) chain, vitronectin, collagen alpha-1(XXXI) chain, myelin proteins P0, collagen alpha-2(VI) chain, collagen alpha-1(VIII) chain, collagen alpha-1(V) chain, asporin, prolargin, biglycan, collagen alpha-1(II) chain, myelin P2 protein, periostin, collagen alpha-1(XIV) chain, alpha-crystallin B chain, or collagen alpha-1(XII) chain.

49. The method of claim 48 wherein the tissue is nerve tissue.