

WHAT IS CLAIMED IS:

1. A decellularized mammalian organ, comprising
5 a decellularized extracellular matrix of said organ, wherein said extracellular matrix comprises an exterior surface, and wherein said extracellular matrix, including the vascular tree, substantially retains the morphology of said extracellular matrix prior to decellularization, and wherein said exterior surface is substantially intact.
- 10 2. The decellularized organ of claim 1, wherein said organ is cadaveric.
- 15 3. The decellularized organ of claim 1, wherein said organ is a heart.
4. The decellularized organ of claim 3, wherein said heart is a rodent heart, a pig heart, a rabbit heart, a bovine heart, a sheep heart, or a canine heart.
- 20 5. The decellularized organ of claim 4, wherein said heart is a human heart.
6. The decellularized organ of claim 3, wherein said heart is a portion of an entire heart.
- 25 7. The decellularized organ of claim 6, wherein said portion of said entire heart is an aortic valve, a mitral valve, a pulmonary valve, a tricuspid valve, a right atrium, a left atrium, a right ventricle, a left ventricle, a cardiac patch, septum, a coronary vessel, a pulmonary artery, and a pulmonary vein.
- 30 8. The decellularized organ of claim 1, wherein said organ is a kidney.
9. The decellularized organ of claim 8, wherein said kidney comprises a substantially intact glomerular structure.

10. A solid organ, comprising said decellularized organ of claim 1,
and a population of regenerative cells attached thereto.

5 11. The solid organ of claim 10, wherein said solid organ comprises
multiple histological structures including blood vessels.

12. The solid organ of claim 10, wherein said decellularized organ is
a heart, a kidney, a liver, or a lung.

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13. The solid organ of claim 10, wherein said decellularized organ is
a heart.

14. The solid organ of claim 13, wherein said solid organ exhibits
15 contractile activity.

15. The solid organ of claim 10, wherein the number of said
regenerative cells attached to said decellularized organ is at least about 1,000.

20 16. The solid organ of claim 10, wherein the number of said
regenerative cells attached to said decellularized organ is about 1,000 cells/mg
tissue to about 10,000,000 cells/mg tissue.

25 17. The solid organ of claim 10, wherein said regenerative cells are
pluripotent cells.

18. The solid organ of claim 10, wherein said regenerative cells are
embryonic stem cells or a subset thereof, umbilical cord cells or a subset thereof,
bone marrow cells or a subset thereof, peripheral blood cells or a subset thereof,
30 adult-derived stem or progenitor cells or a subset thereof, tissue-derived stem or
progenitor cells or a subset thereof, mesenchymal stem cells (MSC) or a subset
thereof, skeletal muscle-derived stem or progenitor cells or a subset thereof,
multipotent adult progenitor cells (MAPC) or a subset thereof, cardiac stem

cells (CSC) or a subset thereof, or multipotent adult cardiac-derived stem cells or a subset thereof.

19. The solid organ of claim 10, wherein said regenerative cells are
5 cardiac fibroblasts, cardiac microvasculature endothelial cells, or aortic
endothelial cells.

20. The solid organ of claim 10, wherein said regenerative cells are
allogeneic or xenogeneic to said decellularized organ.

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21. The solid organ of claim 10, wherein said solid organ is to be
transplanted into a patient and wherein said regenerative cells are autologous to
said patient.

15 22. The solid organ of claim 10, wherein said solid organ is to be
transplanted into a patient and wherein said decellularized organ is allogeneic or
xenogeneic to said patient.

23. A method of making an organ, comprising
20 providing said decellularized organ of claim 1, and contacting
said decellularized organ with a population of regenerative cells under
conditions in which said regenerative cells engraft, multiply and/or differentiate
within and on said decellularized organ.

24. The method of claim 23, wherein said regenerative cells are
25 injected into said decellularized organ.

25. The method of claim 23, wherein said decellularized organ is a
heart, a kidney, a liver, spleen, pancreas, or a lung.

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26. A method of decellularizing an organ, comprising:
providing said organ;
cannulating said organ at one or more cavities, vessels, and/or
ducts, thereby producing a cannulated organ; and

perfusing said cannulated organ with a first cellular disruption medium via said one or more cannulations.

27. The method of claim 26, wherein essentially the entire vascular
5 tree is contacted with the first cellular disruption medium.

28. The method of claim 26, wherein said organ is a heart, a kidney, a liver, spleen, pancreas, or a lung.

10 29. The method of claim 26, wherein said perfusion is multi-directional from each cannulated cavity, vessel, and/or duct.

30. The method of claim 26, wherein said cellular disruption medium comprises at least one detergent.

15 31. The method of claim 30, wherein said detergent is selected from the group consisting of SDS, PEG, or Triton X.

20 32. The method of claim 26, further comprising perfusing said cannulated organ with a second cellular disruption medium via said more than one cannulations.

25 33. The method of claim 32, wherein said first cellular disruption medium is an anionic detergent and wherein said second cellular disruption medium is an ionic detergent.

34. The method of claim 33, wherein the anionic detergent is SDS and wherein said ionic detergent is Triton X.

30 35. The method of claim 26, wherein said perfusing is for about 2 to 12 hours per gram of organ tissue.

36. Decellularized vascular mammalian tissue, comprising

decellularized extracellular matrix of said tissue, wherein said extracellular matrix comprises an exterior surface, and wherein said extracellular matrix, including the vascular tree, substantially retains the morphology of said extracellular matrix prior to decellularization, and wherein said exterior surface
5 is substantially intact.

37. The decellularized tissue of claim 36, wherein said tissue is cadaveric.

10 38. The decellularized tissue of claim 36, wherein said tissue is spinal cord, trachea, or a joint or portion thereof.

39. Decellularized avascular mammalian tissue, comprising
decellularized extracellular matrix of said tissue, wherein said
15 extracellular matrix comprises an exterior surface, and wherein said extracellular matrix substantially retains the morphology of said extracellular matrix prior to decellularization, and wherein said exterior surface is substantially intact.

20 40. The decellularized tissue of claim 39, wherein said tissue is cartilage or cornea.

41. The decellularized tissue of claim 39, wherein said tissue is cadaveric.

CLAIMS

1. A decellularized pig, bovine, sheep, canine or human organ, comprising:
a decellularized extracellular matrix of said organ, wherein said extracellular matrix comprises an intact exterior surface and a vascular tree, wherein said decellularized extracellular matrix of said organ retains a majority of fluid introduced to the decellularized extracellular matrix vascular tree.
2. The decellularized organ of claim 1, wherein said organ is cadaveric.
3. The decellularized organ of claim 1, wherein said organ is a heart.
4. The decellularized organ of claim 3, wherein said heart is a pig heart, a bovine heart, a sheep heart, or a canine heart.
5. The decellularized organ of claim 3, wherein said heart is a human heart.
6. The decellularized organ of claim 1, wherein said organ is a kidney.
7. The decellularized organ of claim 8, wherein said kidney comprises an intact glomerular structure.
8. A method of decellularizing a pig, bovine, sheep, canine or human organ, comprising:
providing said organ;
cannulating said organ at one or more cavities, vessels, and/or ducts, thereby producing a cannulated organ; and
perfusing said cannulated organ with a first cellular disruption medium so as to yield a decellularized pig, bovine, sheep, canine or human organ comprising an extracellular matrix having an exterior surface and a vascular tree, and wherein said decellularized extracellular

matrix of said organ retains a majority of fluid introduced to the decellularized extracellular matrix vascular tree.

9. The method of claim 8, wherein essentially the entire vascular tree is contacted with the first cellular disruption medium.

10. The method of claim 8, wherein said organ is a heart, a kidney, a liver, spleen, pancreas, or a lung.

11. The method of claim 8, wherein said perfusion is multi-directional from each cannulated cavity, vessel, and/or duct.

12. The method of claim 8, wherein said cellular disruption medium comprises at least one detergent.

13. The method of claim 12, wherein said detergent is selected from the group consisting of SDS, PEG, or Triton X.

14. The method of claim 8, further comprising perfusing said cannulated organ with a second cellular disruption medium.

15. The method of claim 14, wherein said first cellular disruption medium is an anionic detergent and wherein said second cellular disruption medium is a non-ionic detergent.

16. The method of claim 15, wherein the anionic detergent is SDS and wherein said non-ionic detergent is Triton X.

17. The method of claim 8, wherein said perfusing is for about 2 to 12 hours per gram of organ tissue.

18. The decellularized organ of claim 1, wherein said organ is a lung, liver, spleen or pancreas.
19. A perfusion decellularized extracellular matrix of a mammalian organ prepared by: perfusing a mammalian organ from a pig, bovine, sheep, canine or human through one or more cavities, vessels, and/or ducts with a first cellular disruption medium, so as to yield a decellularized pig, bovine, sheep, canine or human organ comprising extracellular matrix having an exterior surface and a vascular tree, wherein said decellularized extracellular matrix of said organ retains a majority of fluid introduced to the decellularized extracellular matrix vascular tree.
20. The perfusion decellularized extracellular matrix of claim 19 wherein said mammalian organ is a heart.
21. The perfusion decellularized extracellular matrix of claim 19 wherein said mammalian organ is a kidney.
22. The perfusion decellularized extracellular matrix of claim 21 which comprises an intact glomerular structure.
23. The perfusion decellularized extracellular matrix of claim 19 wherein said mammalian organ is a liver.
24. The perfusion decellularized extracellular matrix of claim 19 wherein said mammalian organ is a pancreas.
25. The perfusion decellularized extracellular matrix of claim 19 wherein said mammalian organ is a spleen or lung.

26. The decellularized organ of claim 1, wherein said organ is a bone.
27. The perfusion decellularized extracellular matrix of claim 19, wherein said mammalian organ is a bone.
28. The method of claim 8, wherein said organ is a bone.