

What is claimed is:

1. A method of preserving an organ or tissue for organ transplantation comprising contacting the organ with a solution comprising an isolated polypeptide comprising the carboxy-terminal amino acid sequence of an alpha connexin, or a conservative variant thereof.
2. The method of claim 1, wherein the organ is selected from the group consisting of heart, kidneys, liver, lungs, pancreas, intestine, and thymus.
3. The method of claim 2, wherein the organ is a kidney.
4. The method of claim 2, wherein the organ is a heart.
5. The method of any one of claims 1-4, wherein the polypeptide inhibits cellular injury in the organ or tissue.
6. The method of any one of claims 1-4, wherein the method reverses cellular injury in the organ or tissue.
7. The method of any one of claims 1-4, wherein the method rescues a marginal organ or tissue for transplantation, wherein the marginal organ or tissue would not otherwise be suitable for transplantation.
8. The method of any one of claims 1-7, wherein the polypeptide promotes cell-cell communication in the organ.
9. The method of any one of claims 1-8, wherein the polypeptide stabilizes gap junctions in cells of the organ.
10. The method of any one of claims 1-9, wherein the polypeptide stabilizes tight junctions in cells of the organ.
11. The method of any one of claims 1-10, wherein the polypeptide inhibits or mitigates hemichannel activity in cells of the organ.

12. The method of any one of claims 1-11, wherein the polypeptide inhibits apoptosis in cells of the organ.
13. The method of any one of claims 1-12, wherein the polypeptide inhibits mitochondrial oxidant production in cells of the organ.
14. The method of any one of claims 1-13, wherein the polypeptide promotes the integrity of endothelial cells of the organ.
15. The method of any one of claims 1-14, wherein the polypeptide promotes barrier function of endothelial cells of the organ.
16. The method of any one of claims 1-15, wherein the polypeptide inhibits pro-inflammatory cytokine release from cells in the organ.
17. The method of claim 16, wherein the pro-inflammatory cytokine is IL-8.
18. The method of claim 5 or 6, wherein the cellular injury is caused by cold preservation induced damage.
19. The method of claim 5 or 6, wherein the cellular injury is caused by hypoxia.
20. The method of claim 5 or 6, wherein the cellular injury is ischemia reperfusion injury (IRI).
21. The method of claim 5 or 6, wherein the cellular injury is ischemic reperfusion induced graft injury.
22. The method of any one of claims 1-21, wherein the polypeptide comprises the amino acid sequence selected from the group consisting of SEQ ID NO: 1, SEQ ID NO: 2, SEQ ID NO: 3, SEQ ID NO: 4, and SEQ ID NO: 5.
23. The method of claim 22, wherein the polypeptide comprises the amino acid sequence of SEQ ID NO: 2.

24. The method of any one of claims 1-21, wherein the polypeptide comprises an amino acid sequence with at least 65% sequence identity to the c-terminal most 9 amino acids of SEQ ID NO: 1.
25. The method of any one of claims 1-21, wherein the polypeptide comprises from 4 to 30 contiguous amino acids of the carboxy-terminus of the alpha connexin.
26. The method of claim 25, wherein the polypeptide comprises from 5 to 19 contiguous amino acids of the carboxy-terminus of the alpha connexin.
27. The method of any one of claims 1-26, wherein the alpha connexin is connexin 43.
28. The method of any one of claims 1-27, wherein the isolated peptide comprises a cellular penetration sequence.
29. The method of claim 28, wherein the isolated peptide comprises SEQ ID NO: 9.
30. The method of any one of claims 1-29, wherein the polypeptide is present in the solution at a concentration of about 1 μ M to about 10 μ M.
31. The method of any one of claims 1-29, wherein the polypeptide is present in the solution at a concentration of less than about 10 μ M.
32. The method of any one of claims 1-29, wherein the polypeptide is present in the solution at a concentration of about 1 μ M.
33. The method of any one of claims 1-32, wherein the organ or tissue is contacted with the solution via *ex vivo* incubation, perfusion, or nebulization.
34. An organ or tissue preservation solution comprising a polypeptide comprising the carboxy-terminal amino acid sequence of an alpha connexin, or a conservative variant thereof, wherein the polypeptide is present in the solution in an amount effective for reversing cellular injury in the organ or tissue.

35. The organ preservation solution of claim 34, wherein the polypeptide comprises a sequence selected from the group consisting of SEQ ID NOs: 1, 2, 3, 4, 5, and 9.
36. The organ preservation solution of claim 34 or 35, wherein the polypeptide is present in the solution at a concentration of about 1 μ M to about 10 μ M.
37. The organ preservation solution of claim 34 or 35, wherein the polypeptide is present in the solution at a concentration of less than about 10 μ M.
38. The organ preservation solution of claim 34 or 35, wherein the polypeptide is present in the solution at a concentration of about 1 μ M.
39. A composition comprising (i) one or more organs or tissues for transplant and (ii) a polypeptide comprising the carboxy-terminal amino acid sequence of an alpha connexin, or a conservative variant thereof, wherein the polypeptide is present in the composition in an amount of about 1 μ M to about 10 μ M.
40. The composition of claim 39, wherein the polypeptide is present in the composition in an amount of less than about 10 μ M.
41. The composition of claim 39 or 40, wherein the polypeptide is present in the composition in an amount of about 1 μ M.
42. The composition of any one of claims 39-41, wherein the polypeptide comprises a sequence selected from the group consisting of SEQ ID NOs: 1, 2, 3, 4, and 5.
43. The composition of any one of claims 39-42, wherein the organ is selected from the group consisting of heart, kidneys, liver, lungs, pancreas, intestine, and thymus.