

WHAT IS CLAIMED IS:

1. A dual cell aggregate composition comprising retinal pigment epithelium cells (RPE) with photoreceptors and/or photoreceptor precursor cells (PR/PRP).
2. The composition of claim 1, wherein the composition is xeno-free, feeder-free, and defined.
3. The composition of claim 1 or 2, wherein the RPE are mature RPE expressing Bestrophin-1 (BEST1) and/or ZO-1.
4. The composition of claim 1 or 2, wherein the RPE are immature RPE with essentially no expression of BEST1 and/or ZO-1.
5. The composition of any of claims 1-4, wherein the RPE are polarized.
6. The composition of any of claims 1-4, wherein the RPE are not polarized.
7. The composition of any of claims 1-5, wherein the composition is essentially free of a bioabsorbable scaffold and/or extracellular matrix (ECM) proteins.
8. The composition of any of claims 1-7, wherein the ratio of PR/PRP to RPE is about 2:1 to about 500:1 at the time of assembly of the dual cell aggregate composition.
9. The composition of any of claims 1-7, wherein the ratio of PR/PRP to RPE is about 1:1 to about 100:1 at the time of assembly of the dual cell aggregate composition.
10. The composition of any of claims 1-9, wherein the RPE and/or the PR/PRP are derived from pluripotent stem cells (PSCs).
11. The composition of claim 10, wherein PSCs are induced pluripotent stem cells (iPSCs) or embryonic stem cells (ESCs).
12. The composition of claim 11, wherein the iPSCs are human iPSCs (hiPSCs).

13. The composition of any of claims 1-12, wherein PR/PRP were not derived from organoids.
14. The composition of any of claims 1-13, wherein the RPE and/or the PR/PRP have been previously cryopreserved.
15. The composition of claim 14, wherein the cryopreserved RPE and/or PR/PRP have been thawed and cultured for at least one week.
16. The composition of any of claims 1-15, wherein the RPE and PR/PRP are formed at a density of about 1 million cells/mL to about 10 million cells/mL.
17. The composition of any of claims 1-16, wherein the RPE and PR/PRP are formed at a density of about 5 million cells/mL.
18. The composition of any of claims 1-18, wherein the RPE and/or the PR/PRP are from same donor.
19. The composition of any of claims 1-18, wherein the PR/PRP are rod-predisposed.
20. The composition of any of claims 1-18, wherein the PR/PRP are cone-predisposed.
21. A pharmaceutical composition comprising the dual cell aggregate composition of any of claims 1-20.
22. The pharmaceutical composition of claim 21, further comprising hyaluronate.
23. The pharmaceutical composition of claim 22, wherein the hyaluronate is added at a concentration of less than about 0.5%.
24. The pharmaceutical composition of any of claims 21-23, further comprising sodium bicarbonate, calcium chloride, potassium chloride, potassium phosphate monobasic, magnesium chloride, magnesium sulfate, sodium chloride, and/or sodium phosphate dibasic.

25. The pharmaceutical composition of any of claims 21-24, wherein the dual cell aggregate composition is cryopreserved.
26. The pharmaceutical composition of any of claims 21-25, wherein the dual cell aggregate composition comprises 200,000 to 3,000,000 cells.
27. The pharmaceutical composition of any of claims 21-25, wherein the dual cell aggregate composition comprises about 700,000 cells.
28. A method for producing the dual cell aggregate composition of any of claims 1-24 comprising seeding RPE and PR/PRP in culture medium comprising a ROCK inhibitor and culturing for a period of time sufficient to produce the dual cell aggregate composition.
29. The method of claim 28, wherein the RPE and PR/PRP are seeded as essentially single-cell suspensions.
30. The method of claim 28, wherein the RPE are seeded as an essentially single-cell suspension and the PR/PRP are seeded as aggregates.
31. The method of any of claims 28-30, wherein the ROCK inhibitor is Y-27632.
32. The method of claim 31, wherein the Y-27632 is added at a concentration of 10 μ M.
33. The method of any of claims 28-32, wherein the ratio of PR/PRP to RPE is about 2:1 to about 500:1 at the time of assembly of the dual cell aggregate composition.
34. The method of any of claims 28-32, wherein the ratio of PR/PRP to RPE is about 100:1 at the time of assembly of the dual cell aggregate composition.
35. The method of any of claims 28-34, wherein the culture medium further comprises prostaglandin E2 (PGE-2).

36. The method of any of claims 28-34, wherein the RPE were previously cultured in the presence of PGE-2.
37. The method of any of claims 28-36, wherein the PR/PRP express PRPH2.
38. The method of any of claims 28-37, wherein the PR/PRP are rod-disposed.
39. The method of any of claims 28-38, wherein the PR/PRP are cone-disposed.
40. The method of any of claims 28-39, wherein the RPE and PR/PRP are seeded at a density of about 1 million cells/mL to about 10 million cells/mL.
41. The method of any of claims 28-40, wherein the RPE and PR/PRP are seeded at a density of about 5 million cells/mL
42. The method of any of claims 28-41, wherein the RPE and/or the PR/PRP have been previously cryopreserved.
43. The method of any of claims 28-42, wherein the culture medium further comprises taurine and hydrocortisone.
44. The method of any of claims 28-43, wherein the culture medium further comprises triiodothyronine.
45. The method of any of claims 28-44, wherein the culture medium is defined media or serum-free media.
46. The method of any of claims 28-45, wherein the culture medium comprises serum replacement.
47. The method of any of claims 28-46, wherein culture medium is RPE-MM media.
48. The method of any of claims 28-47, wherein the culturing is for at least 10 days.

49. The method of any of claims 28-47, wherein the culturing is for 2 weeks to one month.
50. The method of any of claims 28-47, wherein the culturing is for at least two months.
51. The method of any of claims 28-50, wherein the culture medium is exchanged at least once every five days.
52. The method of any of claims 28-50, wherein the culture medium is exchanged at least once every three days.
53. The method of any of claims 28-50, wherein culture medium is exchanged at least once every other day.
54. The method of any of claims 28-53, further comprising cryopreserving the dual cell aggregate composition.
55. A method for treating an ocular injury or disorder in a subject comprising transplanting an effective amount of a dual cell aggregate composition of any of claims 1-27 to an eye of the subject.
56. The method of claim 55, wherein the subject is administered a dose of 200,000 to 3,000,000 of the RPE and PR/PRP cells.
57. The method of claim 55, wherein the subject is administered a dose of about 700,000 of the RPE and PR/PRP cells.
58. The method of claim 55, wherein the composition is transplanted to the subretinal space of the eye.
59. The method of claim 55 or 58, wherein the ocular disorder is due to RPE dysfunction or photoreceptor dysfunction.

60. The method of any of claims 55-59, wherein the ocular disorder is age-related macular degeneration, retinitis pigmentosa, cone-rod dystrophies, or Leber congenital amaurosis.
61. The method of any of claims 55-60, wherein the dual cell aggregate composition produces both rod and cone photoreceptors in the eye of the subject.
62. Use of the dual cell aggregate composition of any of claims 1-20 as a model retina.
63. A method of screening a compound comprising contacting one or more candidate compounds with the dual cell aggregate composition of any of claims 1-20 and detecting an effect on the RPE-PRP dual cell aggregates.
64. The method of claim 63, wherein the one or more candidate compounds are selected from the group consisting of a chemical compound, small molecule, polypeptide, growth factor, solvent, oligonucleotide, and cytokine.
65. The method of claim 63, wherein detecting an effect comprises measuring cell proliferation, cell viability, cell death, drug toxicity, or retinal tissue maintenance or repair.
66. The method of any of claims 63-65, wherein the method is *in vivo*.
67. The method of any of claims 63-65, wherein the method is *in vitro*.
68. The method of any of claims 63-67, wherein the method is performed in a high-throughput manner.
69. The method of claim 68, wherein the dual cell aggregate composition is placed in a multi-well culture plate.
70. An *in vitro* retina model comprising the dual cell aggregate composition of any of claims 1-20.
71. The model of claim 70, wherein the RPE and/or PR/PRP are obtained from a disease cell line.

- 72. The model of claim 71, wherein the disease is an ocular disease.
- 73. The model of claim 72, wherein the ocular disease is age-related macular degeneration, retinitis pigmentosa, cone-rod dystrophies, or Leber congenital amaurosis.