

CLAIMS

What is claimed is:

- 5 1. A fluidic device comprising:
 - a) a first fluidic channel in contact with a semi-permeable membrane,
 - b) first cells comprising at least one parenchymal cell type; and
 - c) second cells comprising at least one stromal cell type.
- 10 2. The fluidic device of Claim 1, wherein said parenchymal cell type is selected from the group consisting of epithelial cells of the lung, epithelial cells of the skin and epithelial cells of the urogenital tract.
3. The fluidic device of Claim 2, wherein said epithelial cells of the lung are selected
15 from the group consisting of alveolar epithelial cells and airway epithelial cells.
4. The fluidic device of Claim 2, wherein said epithelial cells of the skin comprise keratinocytes.
- 20 5. The fluidic device of Claim 1, wherein said parenchymal cell type is selected from the group consisting of hepatocytes, muscle cells, neurons and parenchymal cells of the pancreas.
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- 25 7. The fluidic device of Claim 5, wherein said muscle cells are selected from the group consisting of skeletal muscle cells, smooth muscle cells and cardiomyocytes.
8. The fluidic device of Claim 1, wherein at least one of said first cells and second cells
30 comprise cancer cells.

9. The fluidic device of Claim 1, wherein at least one of said first cells and second cells comprise cells derived from a tumor.
10. The fluidic device of Claim 1, wherein at least one of said first cells and second cells
5 comprise cells derived from a region in or around a tumor.
11. The fluidic device of Claim 1, wherein at least one of said first cells and second cells comprise cells derived from an ulcer.
- 10 12. The fluidic device of Claim 1, wherein at least one of said first cells and second cells comprise cells from a region of inflammation.
13. The fluidic device of Claim 1, wherein said stromal cell type is a lamina propria-derived cell.
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14. The fluidic device of Claim 1, wherein said stromal cell type comprises resident immune cells.
15. The fluidic device of Claim 1, wherein said stromal cell type comprises cells selected
20 from the group consisting of fibroblasts, macrophages, and dendritic cells.
16. The fluidic device of Claim 1, wherein said stromal cell types comprises primary stromal cells.
- 25 17. The fluidic device of Claim 15, wherein said primary stromal cells comprise biopsy-derived cells or lavage-derived cells.
18. The fluidic device of Claim 15, wherein said primary stromal cells are patient-derived cells.
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19. The fluidic device of Claim 17, wherein said patient-derived cells are from a patient with an inflammatory disease.
20. The fluidic device of Claim 1, wherein at least a portion of said second cells are
5 disposed in contact with said semi-permeable membrane.
21. The fluidic device of Claim 1, wherein the device further comprises a gel.
22. The fluidic device of Claim 20, wherein at least a portion of said second cells are
10 disposed within said gel.
23. The device of Claim 1, wherein the device is a microfluidic device, said first channel comprises a first microfluidic channel.
- 15 24. The device of Claim 22, wherein said microfluidic device further comprises a second microfluidic channel in fluidic communication with said first microfluidic channel.
25. The fluidic device of Claim 23, wherein said membrane is disposed between said first and second microfluidic channels.
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26. The fluidic device of Claim 24, wherein said membrane is a porous membrane.
27. The fluidic device of Claim 1, further comprising a removable top.
- 25 28. The fluidic device of Claim 1, further comprising an open region in contact with at least one of said first fluidic channel, said semi-permeable membrane, said first cells, or said second cells.
29. The fluidic device of Claim 20, wherein said gel is fluid permeable.
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30. The fluidic device of Claim 20, wherein said gel is water impermeable.

31. A method comprising:

- 5 a. providing a first fluidic device comprising i) a first fluidic channel in contact with a semi-permeable membrane, ii) first cells comprising at least one parenchymal cell type, and iii) second cells comprising at least one stromal cell type; and
- b. perfusing said first fluidic device with fluid.

10 32. The method of Claim 30, wherein said parenchymal cell type is selected from the group consisting of epithelial cells of the lung, epithelial cells of the skin and epithelial cells of the urogenital tract.

33. The method of Claim 31, wherein said epithelial cells of the lung are selected from the group consisting of alveolar epithelial cells and airway epithelial cells.

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34. The method of Claim 31, wherein said epithelial cells of the skin comprise keratinocytes.

20 35. The method of Claim 30, wherein said parenchymal cell type is selected from the group consisting of hepatocytes, muscle cells, neurons and parenchymal cells of the pancreas.

36. The method of Claim 34, wherein said muscle cells are selected from the group consisting of skeletal muscle cells, smooth muscle cells and cardiomyocytes.

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37. The method of Claim 30, wherein at least one of said first cells and second cells comprise cancer cells.

38. The method of Claim 30, wherein at least one of said first cells and second cells

30 comprise cells derived from a tumor.

39. The method of Claim 30, wherein at least one of said first cells and second cells
comprise cells derived from a region in or around a tumor.
40. The method of Claim 30, wherein at least one of said first cells and second cells
5 comprise cells derived from an ulcer.
41. The method of Claim 30, wherein at least one of said first cells and second cells
comprise cells from a region of inflammation.
- 10 42. The method of Claim 30, wherein said stromal cell type is a lamina propria-derived
cell.
43. The method of Claim 30, wherein said stromal cell type comprises resident immune
cells.
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44. The method of Claim 30, wherein said stromal cell type comprises cells selected from
the group consisting of fibroblasts, macrophages, and dendritic cells.
45. The method of Claim 30, wherein said stromal cell type comprises primary stromal
20 cells.
46. The method of Claim 44, wherein said primary stromal cells comprise biopsy-derived
cells or lavage-derived cells.
- 25 47. The method of Claim 44, wherein said primary cells are patient-derived cells.
48. The method of Claim 46, wherein said patient-derived cells are from a patient with an
inflammatory disease.

49. The method of Claim 24, wherein at least a portion of said second cells are disposed in contact with said semi-permeable membrane.
50. The method of Claim 30, wherein the device further comprises a gel.
51. The method of Claim 49, wherein at least a portion of said second cells are disposed within said gel.
52. The method of Claim 30, wherein the device is a microfluidic device, said first channel comprises a first microfluidic channel.
53. The method of Claim 51, wherein said microfluidic device further comprises a second microfluidic channel in fluidic communication with said first microfluidic channel.
54. The method of Claim 52, wherein said membrane is disposed between said first and second microfluidic channels.
55. The method of Claim 30, wherein said membrane is a porous membrane.
56. The method of Claim 49, wherein said gel is fluid permeable.
57. The method of Claim 49, wherein said gel is water impermeable.
58. The method of Claim 30, wherein said device further comprises a removable top.
59. The method of Claim 57, wherein said method further comprises c) removing said removable top.
60. The method of Claim 1, wherein said device further comprises an open region in contact with at least one of said first fluidic channel, said semi-permeable membrane,

said first cells, or said second cells.

61. The method of Claim 30, further comprising c) contacting said first cells, said second cells or both with a first agent.

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62. The method of Claim 60, further comprising d) detecting at least one response to said first agent.

63. The method of Claim 61, wherein the said at least one response comprises modulation of the inflammation reaction.

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64. The method of Claim 61, wherein the said at least one response comprises modulation of cytokine profile.

65. The method of Claim 61, wherein the said at least one response comprises modulation of gene expression.

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66. The method of Claim 61, wherein the said at least one response comprises modulation of cell or tissue morphology.

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67. The method of Claim 60, wherein said first agent causes an inflammatory reaction.

68. The method of Claim 66, wherein the method further comprises d) contacting said first cells, said second cells or both with a second agent.

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69. The method of Claim 67, wherein the method further comprises e) detecting inhibition of said inflammatory reaction by said second agent.

70. The method of Claim 68, wherein the method further comprises f) comparing the degree of inhibition by said second agent with said second cells of a first patient with the degree of inhibition by said second agent with second cells of a second patient.

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71. The method of Claim 68, wherein the method further comprises f) comparing the degree of inhibition by said second agent with said second cells of a first organ with the degree of inhibition by said second agent with second cells of a second organ.
- 5 72. The method of Claim 68, wherein the method further comprises f) comparing the degree of inhibition by said second agent with said second cells of a first region of an organ with the degree of inhibition by said second agent with second cells of a second region of an organ.
- 10 73. A method comprising:
- a) providing a first and second fluidic devices, each device comprising i) a first fluidic channel in contact with a semi-permeable membrane, ii) parenchymal cells, and iii) stromal cells, wherein said parenchymal cells, said first stromal cells or both cells of said first fluidic device are different from said parenchymal cells, said first stromal cells or both cells of said second device; and
 - 15 b) perfusing said first and second fluidic devices with fluid.
74. The method of Claim 72, wherein said parenchymal cells, said first stromal cells or both cells of said first fluidic device are derived from a different organ than said parenchymal cells, said first stromal cells or both cells from said second fluidic device.
- 20 75. The method of Claim 72, wherein said parenchymal cells, said first stromal cells or both cells of said first fluidic device are derived from the same organ than said parenchymal cells, said first stromal cells or both cells from said second fluidic device.
- 25 76. The method of Claim 72, wherein said parenchymal cells, said first stromal cells or both cells of said first fluidic device come from a first region associated with a first phenotype and said parenchymal cells, said first stromal cells or both cells from said
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second fluidic device come from a second region associated with a second phenotype.

77. The method of Claim 75, wherein said first phenotype is a diseased phenotype and said second phenotype is a healthy phenotype.

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78. The method of Claim 75, wherein said first phenotype is an inflamed phenotype and said second phenotype is a non-inflamed phenotype.

79. The method of Claim 75, wherein said first phenotype is a cancer phenotype and said
10 second phenotype is a non-cancer phenotype.

80. The method of Claim 75, wherein said first and second regions are from the same organ.

15 81. The method of Claim 75, wherein said first and second regions are from the same patient.

82. The method of Claim 72, further comprising c) comparing at least one property of at least one cell type of said first fluidic device with at least one cell type of said second
20 fluidic device.

83. The method of Claim 81, wherein said property comprises permeability.

84. The method of Claim 81, wherein said property comprises cytokine secretion.
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85. The method of Claim 81, wherein said property comprises gene expression.

86. The method of Claim 81, wherein said property comprises cell morphology.

30 87. The method of Claim 81, wherein said property is selected from the group consisting of protein expression, protein activity, extent of post-translational modification, and

combinations thereof.

88. The method of Claim 72, wherein said first fluidic device, said second fluidic device or both are perfused with an agent.

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89. The method of Claim 87, wherein both fluidic devices are perfused with the same agent.

90. The method of Claim 87, wherein said agent is at a first concentration for said first device and a second concentration for said second device.

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91. The method of Claim 87, wherein said fluidic devices are perfused with different agents.

92. The method of Claim 87, wherein only the first fluidic device is perfused with said agent.

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93. The method of Claim 72, wherein said parenchymal cells are selected from the group consisting of epithelial cells of the lung, epithelial cells of the skin and epithelial cells of the urogenital tract.

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94. The method of Claim 92, wherein said epithelial cells of the lung are selected from the group consisting of alveolar epithelial cells and airway epithelial cells.

95. The method of Claim 92, wherein said epithelial cells of the skin comprise keratinocytes.

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96. The method of Claim 72, wherein said parenchymal cell type is selected from the group consisting of hepatocytes, muscle cells, neurons and parenchymal cells of the pancreas.

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97. The method of Claim 95, wherein said muscle cells are selected from the group consisting of skeletal muscle cells, smooth muscle cells and cardiomyocytes.
98. The method of Claim 72, wherein at least one of said first and second fluidic devices
5 comprise cancer cells.
99. The method of Claim 72, wherein at least one of said first and second fluidic devices comprise cells derived from a tumor.
- 10 100. The method of Claim 72, wherein at least one of said first and second fluidic devices comprise cells derived from a region in or around a tumor.
101. The method of Claim 72, wherein at least one of said first and second devices comprise cells derived from an ulcer.
- 15 102. The method of Claim 72, wherein at least one of said first and second fluidic devices comprise cells from a region of inflammation.
103. The method of Claim 72, wherein said stromal cells comprise lamina propria-derived cells.
- 20 104. The method of Claim 72, wherein said stromal cells comprises resident immune cells.
- 25 105. The method of Claim 72, wherein said stromal cells comprises cells selected from the group consisting of fibroblasts, macrophages, and dendritic cells.
106. The method of Claim 72, wherein said stromal cells comprises primary stromal cells.

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107. The method of Claim 105, wherein said primary stromal cells comprise biopsy-derived cells or lavage-derived cells.
108. The method of Claim 105, wherein said primary cells are patient-derived cells.
- 5 109. The method of Claim 107, wherein said patient-derived cells are from a patient with an inflammatory disease.
110. The method of Claim 72, wherein at least a portion of said cells in said first and
10 second fluidic devices are disposed in contact with said semi-permeable membrane.
111. The method of Claim 72, wherein at least one of said first and second fluidic devices further comprises a gel.
- 15 112. The method of Claim 110, wherein at least a portion of said parenchymal cells or said stromal cells or both are disposed within said gel.
113. The method of Claim 72, wherein the first and second fluidic devices are microfluidic devices, said first channel comprising a first microfluidic channel.
- 20 114. The method of Claim 112, wherein said microfluidic device further comprises a second microfluidic channel in fluidic communication with said first microfluidic channel.
- 25 115. The method of Claim 113, wherein said membrane is disposed between said first and second microfluidic channels.
116. The method of Claim 114, wherein said membrane is a porous membrane.
- 30 117. The method of Claim 110, wherein said gel is fluid permeable.

118. The method of Claim 110, wherein said gel is water impermeable.
119. The method of Claim 72, wherein said device further comprises a removable top.
- 5 120. The method of Claim 118, wherein said method further comprises c) removing
said removable top.
121. The method of Claim 72, wherein said device further comprises an open region in
contact with at least one of said first fluidic channel, said semi-permeable membrane,
10 said parenchymal cells, or said stromal cells or both.