What is claimed:

1. A microfluidic device for culturing one or more mammalian cells comprising:

an enclosure having a single inlet port, a single outlet port and a flow region, the flow region connecting the single inlet and outlet ports and configured to contain a flow of a first fluidic medium; and

at least one growth chamber comprising an isolation region having a single opening and a connection region, the connection region comprising a proximal opening to the flow region and a distal opening to the isolation region, wherein a width Wcon of the connection region at the proximal opening is about 20 microns to about 100 microns and a length of Lcon of the connection region from the proximal opening to the distal opening is at least 1.0 times the width Wcon of the connection region at the proximal opening, and wherein when the first fluidic medium flows within the flow region, the connection region is configured to allow diffusion of the first fluidic medium into the isolation region while allowing substantially no fluid flux into the isolation region; and

wherein the at least one growth chamber further comprises at least one surface conditioned to support cell growth, viability, portability, or any combination thereof of said mammalian cells within the microfluidic device.

2. The microfluidic device of claim 1, wherein the at least one conditioned surface is conditioned with one or more agents that support cell portability within the microfluidic device.

3. The microfluidic device of claim 1 or 2, wherein the at least one conditioned surface is conditioned with a polymer comprising alkylene ether moieties.

4. The microfluidic device of any one of the preceding claims, wherein the at least one conditioned surface is conditioned with a polymer comprising saccharide moieties.

5. The microfluidic device of any one of the preceding claims, wherein the at least one conditioned surface is conditioned with a polymer comprising amino acid moieties.

6. The microfluidic device of any one of the preceding claims, wherein the at least one conditioned surface of the microfluidic device is conditioned with a polymer comprising carboxylic acid moieties, sulfonic acid moieties, nucleic acid moieties, or phosphonic acid moieties.

7. The microfluidic device of any one of the preceding claims, wherein the at least one conditioned surface comprises covalently bound molecules, each having a linking group covalently linked to the at least one surface, a linker, and a moiety configured to support cell growth, viability, portability, or any combination thereof within the microfluidic device.

8. The microfluidic device of claim 7, wherein the linking group is a siloxy linking group.

9. The microfluidic device of claim 7 or 8, wherein the covalently bound molecules comprise alkyl or fluoroalkyl linkers.

10. The microfluidic device of claim 9, wherein the alkyl or fluoroalkyl linkers have a backbone chain length of greater than 10 carbons.

11. The microfluidic device of any one of claims 7 to 10, wherein the covalently bound molecules further comprise a coupling group.

12. The microfluidic device of claim 11, wherein the linker comprises a triazolylene moiety.

13. The microfluidic device of any one of the preceding claims, wherein the covalently bound molecules comprise saccharide moieties.

14. The microfluidic device of any one of the preceding claims, where the covalently bound molecules comprise alkylene ether moieties.

15. The microfluidic device of any one of the preceding claims, wherein the at least one conditioned surface comprises amino acid moieties.

16. The microfluidic device of any one of claims 7 to 15, wherein the at least one conditioned surface comprises zwitterions.

17. The microfluidic device of any one of the preceding claims, wherein the at least one conditioned surface comprises at least one cell adhesion blocking molecule and wherein the at least one cell adhesion blocking molecule is an RGD containing peptide.

18. The microfluidic device of any one of the preceding claims, wherein the conditioned surface comprises a cleavable moiety.

19. The microfluidic device of any one of the preceding claims, wherein the at least one conditioned surface of the microfluidic device comprises one or more components of mammalian serum.

20. The microfluidic device of any one of the preceding claims, wherein the microfluidic device further comprises a substrate having a dielectrophoresis (DEP) configuration.

21. The microfluidic device of claim 20, wherein the DEP configuration is optically actuated.

22. The microfluidic device of any one of the preceding claims, wherein the at least one growth chamber comprises at least one surface conditioned to support cell growth, viability, portability, or any combination thereof of a mammalian cell.

23. The microfluidic device of any one of the preceding claims, wherein the at least one growth chamber comprises at least one surface conditioned to support cell growth, viability, portability, or any combination thereof of an immunological cell.

24. The microfluidic device of claim 23, wherein the immunological cell is a lymphocyte or leukocyte.

25. The microfluidic device of claim 23, wherein the immunological cell is a B cell, a T cell, NK cell, a macrophage, or a dendritic cell.

26. The microfluidic device of any one of claims 1 to 22, wherein the at least one growth chamber comprises at least one surface conditioned to support cell growth, viability, portability, or any combination thereof of an adherent cell.

27. The microfluidic device of any one of claims 1 to 22, wherein the at least one growth chamber comprises at least one surface conditioned to support cell growth, viability, portability, or any combination thereof of a hybridoma cell.

28. The microfluidic device of any one of the preceding claims, wherein the at least one growth chamber comprises at least one surface conditioned to support cell growth, viability, portability, or any combination thereof a single cell and a corresponding clonal colony of mammalian cells.

29. The microfluidic device any one of claims 1 to 28, wherein the length Lcon of the connection region is at least 1.5 times the width Wcon at the proximal opening of the connection region.

30. The microfluidic device any one of claims 1 to 28, wherein the length Lcon of the connection region is at least 2.0 times the width Wcon at the proximal opening of the connection region.

31. The microfluidic device any one of claims 1 to 28, wherein the width Wcon of the connection region at the proximal opening is about 20 microns to about 60 microns.

32. The microfluidic device any one of claims 1 to 28, wherein the length Lcon of the connection region is between about 20 microns and about 500 microns.

33. The microfluidic device any one of claims 1 to 28, wherein a width of the microfluidic channel at the proximal opening of the connection region is between about 50 microns and about 500 microns.

34. The microfluidic device any one of claims 1 to 28, wherein a height of the microfluidic channel at the proximal opening of the connection region is between 20 microns and 100 microns.

35. The microfluidic device any one of claims 1 to 28, wherein the volume of the isolation region ranges from about 2 x 104 to about 2 x 106 cubic microns.

36. A system for culturing one or more mammalian cells on a microfluidic device, the system comprising:

a microfluidic device comprising:

an enclosure having a single inlet port, a single outlet port and a flow region, the flow region connecting the single inlet and outlet ports and configured to contain a flow of a first fluidic medium; and

at least one growth chamber comprising an isolation region having a single opening and a connection region, the connection region comprising a proximal opening to the flow region and a distal opening to the isolation region, wherein a width Wcon of the connection region at the proximal opening is about 20 microns to about 100 microns and a length of Lcon of the connection region from the proximal opening to the distal opening is at least 1.0 times the width Wcon of the connection region at the proximal opening, and wherein when the first fluidic medium flows within the flow region, the connection region is configured to allow diffusion of the first fluidic medium into the isolation region while allowing substantially no fluid flux into the isolation region is; and

wherein the at least one growth chamber has at least one surface conditioned to support cell growth, viability, portability, or any combination thereof of said mammalian cells within the microfluidic device.

37. The system of claim 36, wherein the microfluidic device is any one of the microfluidic devices of claims 1 to 35.

38. The system of claim 36 or 37, further comprising a flow controller configured to perfuse at least the first fluidic medium.

39. The system of claim 38, wherein the controller is configured to perfuse the at least first fluidic medium non-continuously.

40. The system of any one of claims 36 to 39, wherein the microfluidic device further comprises a substrate having a dielectrophoresis (DEP) configuration configured to introduce one or more mammalian cells into or move the one or more mammalian cells out of the growth chamber.

41. The system of claim 40, wherein the DEP configuration is optically actuated.

42. The system of any one of claims 36 to 41 further comprising a reservoir configured to contain the first fluidic medium, wherein the reservoir is fluidically connected to the microfluidic device.

43. The system of claim 42, wherein the reservoir is configured to be contacted by a gaseous environment capable of saturating the first fluidic medium with dissolved gaseous molecules.

44. The system of any one of claims 36 to 43, further comprising a sensor connected to at least one inlet port of the microfluidic device, wherein the sensor is configured to detect a pH of the first fluidic medium.

45. The system of any one of claims 36 to 44, further comprising a sensor connected to at least one outlet, wherein the sensor is configured to detect a pH of the first fluidic medium as the first fluidic medium leaves the microfluidic device.

46. The system of claim 44 or 45, wherein the sensor is an optical sensor.

47. The system of any one of claims 36 to 46 further comprising a detector configured to capture an image of the at least one growth chamber and any mammalian cells contained therein.

48. A kit for culturing a mammalian cell, comprising:

a microfluidic device comprising:

an enclosure having a single inlet port, a single outlet port and a flow region, the flow region connecting the single inlet and outlet ports and configured to contain a flow of a first fluidic medium; and

at least one growth chamber comprising an isolation region having a single opening and a connection region, the connection region comprising a proximal opening to the flow region and a distal opening to the isolation region, wherein a width Wcon of the connection region at the proximal opening is about 20 microns to about 100 microns and a length of Lcon of the connection region from the proximal opening to the distal opening is at least 1.0 times the width Wcon of the connection region at the proximal opening, and wherein the isolation region is an unswept region of said microfluidic device; and

wherein the at least one growth chamber further comprises at least one surface conditioned to support cell growth, viability, portability, or any combination thereof of said mammalian cells within the microfluidic device.

49. The kit of claim 48, wherein the microfluidic device is the microfluidic device of any one of claims 1-35.

50. The kit of claim 48 or 49 wherein the at least one conditioned surface of the microfluidic device comprises alkyl moieties, fluoroalkyl moieties, mono- or polysaccharide moieties, alcohol moieties, polyalcohol moieties, alkylene ether moieties; polyelectrolyte moieties, amino moieties, carboxylic acid moieties, phosphonic acid moieties, sulfonate moieties, carboxybetaine moieties, sulfobetaine moieties, sulfamic acid moieties, or amino acid moieties.

51. The kit of any one of claims 48 to 50, wherein the at least one conditioned surface of the microfluidic device comprises at least one of saccharide moieties, alkylene ether moieties, alkyl moieties, fluoroalkyl moieties, or amino acid moieties.

52. The kit of claim 51, wherein the alkyl or fluoroalkyl moieties have a backbone chain length of greater than 10 carbons.

53. The kit of any one of claims 48 to 52, wherein the at least one conditioned surface comprises a linking group covalently linked to a surface of the microfluidic device, and

further wherein the linking group is linked to a moiety configured to support growth, viability, portability, or any combination thereof of the mammalian cell within the microfluidic device.

54. The kit of claim 53, wherein the linking group is a siloxy linking group.

55. The kit of claim 53 or 54, wherein the linking group is indirectly linked to the moiety configured to support cell growth, viability, portability, or any combination thereof.

56. The kit of claim 55, wherein the linking group is indirectly linked to the moiety configured to support cell growth, viability, portability, or any combination thereof, via a linker.

57. The kit of any one of claims 48 to 56, wherein the microfluidic device further comprises a surface conditioning reagent.

58. The kit of claim 57, wherein the surface conditioning reagent comprises a polymer comprising at least one of alkylene ether moieties, carboxylic acid moieties, sulfonic acid moieties, phosphonic acid moieties, amino acid moieties, nucleic acid moieties or saccharide moieties.

59. The kit of claim 57 wherein the surface conditioning reagent comprises at least one cell adhesion blocking molecule.

60. The kit of claim 57, wherein the surface conditioning reagent comprises one or more components of mammalian serum.

61. The kit of any one of claims 48 to 60, further comprising a culture medium additive comprising a reagent configured to replenish the conditioning of the at least one surface of growth chamber.

62. The kit of any one of claims 48 to 61 wherein the conditioned surface comprises a cleavable moiety.

63. The kit of claim 62, wherein the kit further comprises a reagent configured to cleave the cleavable moiety of the conditioned surface.

64. The kit of any one of claims 48 to 63, wherein the length Lcon of the connection region is at least 1.5 times the width Wcon at the proximal opening of the connection region.

65. The kit of any one of claims 48 to 63, wherein the length Lcon of the connection region is at least 2.0 times the width Wcon at the proximal opening of the connection region.

66. The kit of any one of claims 48 to 63, wherein the width Wcon of the connection region at the proximal opening is about 20 microns to about 60 microns.

67. The kit of any one of claims 48 to 63, wherein the length Lcon of the connection region is between about 20 microns and about 500 microns.

68. The kit of any one of claims 48 to 63, wherein a width of the microfluidic channel at the proximal opening of the connection region is between about 50 microns and about 500 microns.

69. The kit of any one of claims 48 to 63, wherein a height of the microfluidic channel at the proximal opening of the connection region is between 20 microns and 100 microns.

70. The kit of any one of claims 48 to 63, wherein the volume of the isolation region ranges from about 2 x 104 to about 2 x 106 cubic microns.

71. A method of culturing at least one mammalian cell in a microfluidic device having an enclosure having a single inlet port, a single outlet port and a flow region, the flow region connecting the single inlet and outlet ports and configured to contain a flow of a first fluidic medium and at least one growth chamber comprising an isolation region having a single opening and a connection region, the connection region comprising a proximal opening to the flow region and a distal opening to the isolation region, wherein a width Wcon of the connection region at the proximal opening is about 20 microns to about 100 microns and a

length of Lcon of the connection region from the proximal opening to the distal opening is at least 1.0 times the width Wcon of the connection region at the proximal opening, and wherein when the first fluidic medium flows within the flow region, the connection region is configured to allow diffusion of the first fluidic medium into the isolation region while allowing substantially no fluid flux into, comprising the steps:

introducing the at least one mammalian cell into the at least one growth chamber, wherein the at least one growth chamber is configured to have at least one surface conditioned to support cell growth, viability, portability, or any combination thereof; and,

incubating the at least one mammalian cell for a period of time at least long enough to expand the at least one mammalian cell to produce a colony of mammalian cells.

72. The method of claim 57, wherein the microfluidic device is the microfluidic device of any one of claims 1-28.

73. The method of any one of claims 57 to 58, wherein the at least one conditioned surface comprises a linking group covalently linked to the surface, and further wherein the linking group is linked to a moiety configured to support cell growth, viability, portability, or any combination thereof of the at least one mammalian cell within the microfluidic device.

74. The method of any one of claims 57 to 59, wherein the at least one conditioned surface comprises alkyl or perfluoroalkyl moieties.

75. The method of any one of claims 57 to 59, wherein the at least one conditioned surface comprises alkylene ether moieties or dextran moieties.

76. The method of any one of claims 57 to 61, further comprising conditioning at least a surface of the at least one growth chamber.

77. The method of claim 62, wherein conditioning comprises treating the at least a surface of the at least one growth chamber with a conditioning reagent comprising a polymer.

78. The method of any one of claims 62 to 63, wherein conditioning comprises treating at least a surface of the at least one growth chamber with one or more components of mammalian serum.

79. The method of any one of claims 62 to 64, wherein conditioning comprises treating at least one surface of the at least one growth chamber with at least one cell adhesion blocking molecule.

80. The method of any one of claims 57 to 65, wherein introducing the at least one mammalian cell into the at least one growth chamber comprises using a dielectrophoresis (DEP) force having sufficient strength to move the at least one mammalian cell.

81. The method of claim 66, wherein the DEP force is optically actuated.

82. The method of any one of claims 57 to 67, further comprising perfusing the first fluidic medium during the incubating step, wherein the first fluidic medium is introduced via at least one inlet port of the microfluidic device and exported via at least one outlet of the microfluidic device, wherein, upon export, the first fluidic medium optionally comprises components from a second fluidic medium.

83. The method of any one of claims 71 to 68, further comprising the step of cleaving one or more cleavable moieties of the conditioned surface after the incubating step, thereby facilitating export of the at least one mammalian cell out of the growth chamber or isolation region thereof and into the flow region.

84. The method of any one of claims 71 to 83, further comprising the step of exporting the at least one mammalian cell out of the growth chamber or the isolation region thereof into the flow region.

85. The method of any one of claims 70 to 84, wherein the at least one mammalian cell is an immunological cell.

86. The method of claim 85, wherein the immunological cell is a lymphocyte or leukocyte.

87. The method of claim 85, wherein the immunological cell is a B cell, a T cell, NK cell, a macrophage, or a dendritic cell.

88. The method of any one of claims 70 to 85, wherein the at least one mammalian cell is an adherent cell.

89. The method of any one of claims 70 to 85, wherein the at least one mammalian cell is a hybridoma cell.

90. The method of any one of claims 70 to 89, wherein introducing the at least one mammalian cell into the at least one growth chamber comprises introducing a single cell into the growth chamber, and wherein the colony of mammalian cells produced by the incubating step is a clonal colony.