CLAIMS

1. A microfluidic device comprising:

(a) a first microfluidic channel in fluidic communication with a second microfluidic channel, with a semi-permeable membrane disposed between the first and second microfluidic channels,

(b) first cells comprising alveolar epithelial cells; and

(c) second cells comprising at least one resident immune cell type;

in which the cells are configured to promote the expression of Surfactant B.

2. A microfluidic device according to Claim 1, in which the second cells comprise primary fibroblasts.

3. A microfluidic device according to Claim 1, in which the second cells comprise primary adult human fibroblasts.

4. A microfluidic device according to Claim 1, in which at least a portion of the second cells are disposed in contact with the semi-permeable membrane.

5. A microfluidic device according to Claim 1, in which the device further comprises a gel.

6. A microfluidic device according to Claim 4, in which at least a portion of the second cells are disposed within the gel.

7. A microfluidic device according to Claim 1, further comprising a removable top.

8. A microfluidic device according to Claim 1, further comprising an open region in contact with at least one of the first fluidic channel, the semi-permeable membrane, the first cells, or the second cells.

9. A method comprising:

(a) providing a first microfluidic device comprising

(i) a first fluidic channel in fluidic communication with a second microfluidic channel with a semi-permeable membrane disposed between the first and second microfluidic channels,

(ii) first cells comprising alveolar epithelial cells, the first cells positioned in the first microfluidic channel or in the second microfluidic channel, and

(iii) second cells comprising at least one stromal cell type, the second cells positioned in the first microfluidic channel or the second microfluidic channel in which the stromal cell type is a lamina propria-derived cell; and

(b) perfusing the first microfluidic device with fluid;

in which the second cells promote the expression of Surfactant B.

10. A method according to Claim 9, in which the second cells comprise primary fibroblasts.

11. A method according to Claim 9, in which the second cells comprise primary adult human fibroblasts.

12. A method according to Claim 9, in which at least a portion of the second cells are disposed in contact with the semi-permeable membrane.

13. A method according to Claim 9, in which the device further comprises a gel.

14. A method according to Claim 13, in which at least a portion of the second cells are disposed within the gel.

15. A method according to Claim 9, in which the device further comprises a removable top.

16. A method according to Claim 15, in which the method further comprises (c) removing the removable top.

17. A method according to Claim 9, in which the device further comprises an open region in contact with at least one of the first fluidic channel, the semi-permeable membrane, the first cells, or the second cells.

18. A method according to Claim 9, further comprising (c) contacting the first cells, the second cells or both with a first agent.

19. A method according to Claim 18, further comprising (d) detecting at least one response to the first agent.

20. A method according to Claim 19, in which the at least one response comprises modulation of the inflammation reaction.

21. A method according to Claim 19, in which the at least one response comprises modulation of cytokine profile.

22. A method according to Claim 19, in which the at least one response comprises modulation of gene expression.

23. A method according to Claim 19, in which the at least one response comprises modulation of cell or tissue morphology.

24. A method according to Claim 18, in which the first agent causes an inflammatory reaction.

25. A method according to Claim 24, in which the method further comprises (d) contacting the first cells, the second cells or both with a second agent.

26. A method according to Claim 25, in which the method further comprises (e) detecting inhibition of the inflammatory reaction by the second agent.

27. A method according to Claim 26, in which the method further comprises (f) comparing the degree of inhibition by the second agent with the second cells of a first patient with the degree of inhibition by the second agent with second cells of a second patient.

28. A method according to Claim 26, in which the method further comprises (f) comparing the degree of inhibition by the second agent with the second cells of a first organ with the degree of inhibition by the second agent with second cells of a second organ.

29. A method according to Claim 26, in which the method further comprises (f) comparing the degree of inhibition by the second agent with the second cells of a first region of an organ with the degree of inhibition by the second agent with second cells of a second region of an organ.