

CLAIMS

1. A microfluidic device comprising (i) a chamber comprising a lumen and a fluidic cover comprising a microfluidic channel, the lumen comprising (ii) a gel matrix, the gel matrix positioned above (iii) a porous membrane, and the membrane positioned under the chamber,
5 in which the fluidic cover is configured to removably cover and close the chamber.
2. A microfluidic device according to Claim 1, in which fibroblasts are within the gel matrix and keratinocytes are on top of the gel matrix.
3. A microfluidic device according to Claim 2, in which the keratinocytes comprise more than one layer on top of the gel matrix.
- 10 4. A microfluidic device according to Claim 1, in which a layer of endothelial cells is positioned on the bottom of the membrane so as to be in contact with the microfluidic channels.
5. A microfluidic device according to Claim 1, in which the lumen is circular.
6. A microfluidic device according to Claim 1, in which the gel matrix comprises at least
15 one of neurons and astrocytes and the membrane comprises brain microvascular endothelial cells in contact with the microfluidic channels.
7. A microfluidic device according to Claim 6, in which neurons are on, in or under the gel matrix.
8. A microfluidic device according to Claim 6, in which astrocytes are on, in or under the
20 gel matrix.
9. A microfluidic device according to Claim 1, in which the gel matrix comprises cells.
10. A microfluidic device according to Claim 9, in which the cells comprise lung cells.
11. A microfluidic device according to Claim 1, in which the chamber is configured for fluid flow.
- 25 12. A method comprising:
 - (a) providing a microfluidic device comprising (i) a chamber comprising a lumen and a fluidic cover comprising a microfluidic channel, the lumen comprising (ii) a gel

matrix, the gel matrix comprising cells and positioned above (iii) a porous membrane, the membrane positioned under the chamber, in which the fluidic cover is configured to removably cover and close the chamber;

(b) extracting the gel matrix in whole or in part from the lumen; and

5 (c) staining the cells from the extracted gel matrix.

13. A method according to Claim 12, further comprising, prior to step (b), removing the cover and treating the cells with an aerosol.