

CLAIMS

1. A microfluidic device for studying interactions of a first cell type with a second cell type, the device comprising
 - 5 a first region configured to hold the first cell type;
 - a second region configured to hold the second cell type; and
 - a third region for collecting cells of the second cell type that have not interacted with the first cell type;
 - an array of micropillars disposed between the first and second regions
 - 10 and disposed between the third region and the second region,
 - wherein the first region is in fluid communication with the second region and the third region being in fluid communication with the first and second regions,
 - and wherein the array of micropillars is configured to selectively allow
 - 15 movement of the second cell type, from the second region to an interaction zone that is at least partially disposed within the first region, for interaction with the first cell type in the interaction zone.
2. The device as claimed in claim 1, wherein the first and second
- 20 regions are symmetrical about a same line of symmetry.
3. The device as claimed in claim 1, wherein the third region substantially surrounds the first region.
- 25 4. The device as claimed in claim 1, wherein the first, second and third regions are symmetrical about a same line of symmetry.
5. The device as claimed in any one of claims 1 to 4 wherein the array of micropillars comprises micropillars organised in a radial manner or a
- 30 grid-like manner.

6. The device as claimed in any one of claims 1 to 5 wherein the array of micropillars comprises micropillars organised as substantially concentric rows of micropillars.

5 7. The device as claimed in claim 6, wherein the distance between the micropillars in the row closest to the first region is smaller than the distance between the micropillars in the row furthest from the first region.

8. The device as claimed in claim 6 or 7, wherein the size of the
10 micropillars in the row closest to the first region is smaller than the size of the micropillars in the row furthest from the first region.

9. The device as claimed in any one of claims 1 to 8, wherein each of said regions comprises a shape defined by tapering of a bigger area to a
15 smaller area.

10. The device as claimed in any one of claims 1 to 9, further comprising ports corresponding to each of said regions for providing access to each of the regions.

20 11. The device as claimed in claim 10, wherein the device comprises a seeding layer and a support layer, wherein the ports are disposed on the seeding layer and the corresponding regions are disposed on the support layer.

25 12. The device as claimed in any one of claims 1 to 11, wherein the first region has a larger depth than the second region.

13. The device as claimed in any one of claims 1 to 12, wherein the
30 second region has substantially the same depth as the third region.

14. A chip comprising a plurality of the device of any one of claims 1 to 13.

5 15. A method of studying interactions of a first cell type with a second cell type, the method comprising:

providing a device comprising a first region configured to hold a first cell type; a second region configured to hold a second cell type; and an array of microstructures disposed between the first and second regions, wherein the first region is in fluid communication with the second region, and wherein
10 the array of microstructures is configured to selectively allow movement of the second cell type from the second region to an interaction zone that is at least partially disposed within the first region, to allow interaction of the first cell type and the second cell type in the interaction zone;

seeding the first cell type in the first region of the device;
15 applying a first external force to direct the first cell type to the interaction zone;

seeding the second cell type in the second region of the device;
allowing the second cell type to migrate from the second region to the interaction zone for interaction with the first cell type in the interaction zone;
20 and

monitoring migration of the second cell type and interaction of the second cell type with the first cell type.

16. The method of claim 15, wherein the method further comprises,
25 subsequent to the monitoring step, applying a second external force to direct cells present within the interaction zone away from the interaction zone for retrieval and analysis.

17. The method of claim 15 or 16, wherein the monitoring step
30 comprises monitoring the migration and interaction of the cells with an image capturing apparatus.

18. The method of any one of claims 15 to 17, wherein the device further comprises one or more third regions, and the method further comprises, prior to the step of applying the first external force, seeding microenvironment materials into the one or more third regions,

5 wherein the third region is in fluid communication with the first and second regions, and wherein the array of microstructures comprises microstructures disposed between the third region and the first region.