

CLAIMS

1. A microfluidic device comprising
a first region configured to hold tumor cells;
5 a second region configured to hold immune cells; and
an array of microstructures disposed between the first and second
regions,
wherein the first region is in fluid communication with the second
region,
10 and wherein the array of microstructures is configured to selectively
allow movement of immune cells, from the second region to an interaction
zone that is at least partially disposed within the first region, for interaction
with tumor cells in the interaction zone.
- 15 2. The device as claimed in claim 1, wherein the first and second
regions are symmetrical about a same line of symmetry.
3. The device as claimed in claim 1 or 2, further comprising one or
more third regions, the third region being in fluid communication with the first
20 and second region, wherein the array of microstructures comprises
microstructures disposed between the third region and the first region.
4. The device as claimed in claim 3, wherein the array of
microstructures comprises microstructures disposed between the third region
25 and the second region.
5. The device as claimed in any one of claims 3 to 4, wherein the
third region substantially surrounds the first region.
- 30 6. The device as claimed in in any one of claims 3 to 5, wherein
the first, second and third regions are symmetrical about a same line of
symmetry.

7. The device as claimed in any one of claims 1 to 6 wherein the array of microstructures comprises microstructures organised in a radial manner or a grid-like manner.

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8. The device as claimed in any one of claims 1 to 7 wherein the array of microstructures comprises microstructures organised as substantially concentric rows of microstructures.

10 9. The device as claimed in claim 8, wherein the distance between the microstructures in the row closest to the first region is smaller than the distance between the microstructures in the row furthest from the first region.

15 10. The device as claimed in claim 8 or 9, wherein the size of the microstructures in the row closest to the first region is smaller than the size of the microstructures in the row furthest from the first region.

20 11. The device as claimed in any one of claims 1 to 10, wherein each of said regions comprises a shape defined by tapering of a bigger area to a smaller area.

25 12. The device as claimed in any one of claims 1 to 11, further comprising ports corresponding to each of said regions for providing access to each of the regions.

30 13. The device as claimed in claim 12, 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.

14. The device as claimed in any one of claims 1 to 13, wherein the first region has a larger depth than the second region.

15. The device as claimed in any one of claims 1 to 14, wherein the second region has substantially the same depth as the third region.

5 16. A chip comprising a plurality of the device of any one of claims 1 to 15.

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

10 providing a device comprising a first region configured to hold a first cell type; a second region configured to 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 the array of microstructures is configured to selectively allow movement of the
15 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;

 applying a first external force to direct the first cell type to the interaction
20 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;
 and

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

18. The method of claim 17, wherein the method further comprises, subsequent to the monitoring step, applying a second external force to direct
30 cells present within the interaction zone away from the interaction zone for retrieval and analysis.

19. The method of claim 17 or 18, wherein the monitoring step comprises monitoring the migration and interaction of the cells with an image capturing apparatus.

5 20. The method of any one of claims 17 to 19, 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,

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