

the microfluidic interface channel. The magnetic receptacle above the tip of each of the permanent magnetic pins arrest one to five cells at about a 1.0  $\mu\text{l}$ /second minute flow rate in the 100 $\times$ 100  $\mu\text{m}$  channel, forming the desired array on the substrate, forming the desired array on the substrate.

#### Example 4

The external neodymium iron boron magnet has a strength of 12,000 Gauss. Stainless steel highly-magnetically-permeable pins embedded in PDMS with their tips coplanar with the substrate create localized magnetic field gradients. 1 ml Spherotech™ 9  $\mu\text{m}$  diameter magnetic beads at a density of  $1\times 10^6$  beads/ $\mu\text{l}$  suspension coated with the bioaffinity ligand streptavidin are pre-incubated with a biotinylated anti-mouse anti-syndecan antibody at a final antibody concentration of 50  $\mu\text{g}/\text{ml}$ . The antibody conjugated beads are then washed to PBS remove unbound antibody. 1 ml hybridoma cells (at a concentration of  $2\times 10^5/\mu\text{l}$ ) in RPMI media are then incubated with 1 ml antibody conjugated Spherotech™ 9  $\mu\text{m}$  diameter magnetic beads at a density of  $1\times 10^6$  beads/ $\mu\text{l}$  suspension 50  $\mu\text{l}$  of the magnetic bead and cell containing RPMI media (Sigma) is introduced into the in-port of the cell delivery device's microfluidic interface as shown in FIG. 4B, which had channel with a diameter of 100 $\times$ 100  $\mu\text{m}$  when mated to the substrate. The immobilized cells are washed by introducing 50  $\mu\text{l}$  of cell-free PBS into the microfluidic interface channel. The magnetic receptacles above the tips of each of the highly-magnetically-permeable pins is able to arrest one to five cells at about a 1.0  $\mu\text{l}$ /second minute flow rate in the 100 $\times$ 100  $\mu\text{m}$  channel, forming the desired array on the substrate.

What is claimed is:

1. A device for arraying a plurality of cells into discrete and predetermined locations for further experimentation, said device comprising a substrate having an essentially flat surface, wherein a plurality of magnets are contained in said substrate, wherein said plurality of magnets are arrayed in said substrate such that each magnet defines a localized magnetic field gradient to define a magnetic area, wherein said magnetic area is situated on the surface of the substrate in a predetermined location discrete from other magnetic areas to provide a plurality of discrete magnetic areas, wherein the plurality of magnetic areas defined by said plurality of magnets are disposed in a two-dimensional array on the substrate, wherein said localized magnetic field gradient immobilize one to about five cells within said each of said plurality of magnetic areas, wherein said cells are associated with magnetic material at the time that said cells are immobilized within said plurality of magnetic areas.

2. The device of claim 1 wherein said cells are hybridoma cells.

3. The device of claim 1 wherein the substrate is fabricated from a material selected from the group consisting of glass, urethane, rubber, molded plastic, polymethyl-

methacrylate, polycarbonate, polytetrafluoroethylene, polyvinylchloride, polydimethylsiloxane, and polysulfone.

4. The device of claim 1 further comprising a layer on top of said substrate wherein said layer has micro-gaps positioned over said magnetic areas.

5. The device of claim 1 further comprising a cell isolation device, wherein said cell isolation device comprises a membrane containing a plurality of wells that match the plurality of the magnetic areas, such that when said cell isolation device is placed on said substrate, said cell isolation device is capable of isolating said one to about 5 cells immobilized in one of said plurality of magnetic areas from other of said cells immobilized in said other of said plurality of magnetic areas arrayed within the cell isolation device.

6. The device of claim 5, wherein the wells of the cell isolation device are micro through-holes, wherein the micro through-holes are defined by inner walls of the membrane.

7. The device of claim 6, wherein the device further comprises a semi-permeable membrane opposite the substrate, wherein said semi-permeable membrane restricts cell movement between wells and is permeable to fluid.

8. The device of claim 7 wherein at least one of the walls of the micro through-holes are canted or perpendicular to the substrate.

9. The device of claim 5, wherein said plurality of magnetic areas further comprises immobilized cells, such that when the cell isolation device is placed on said substrate, said cells are capable of being transferred from said plurality of magnetic areas to said cell isolation device, and when the substrate is removed, the cells remain in the cell isolation device.

10. The device of claim 9 wherein said cells are capable of being transferred from said plurality of magnetic areas to said cell isolation device by centrifugal force.

11. The device of claim 1 wherein the substrate is coated with a hydrophobic agent.

12. The device of claim 11 wherein the hydrophobic agent is selected from the group consisting of teflon, perfluorinated plastic, polyethylene glycol, ethylene oxide-terminated trichlorosilane, and hydrophobic alkyltrichlorosilane.

13. The device of claim 1 wherein the substrate is coated with an anti-coagulant.

14. The device of claim 13 wherein the anti-coagulant is selected from the group consisting of heparin, heparin fragments, tissue-type plasminogen activator (tPA), urokinase (uPA), Hirudan, albumin, anti-platelet receptor GPIIb/IIIa antibodies, anti-platelet receptor GPIIb/IIIa antibodies, and anti-von Willebrand Factor (vWF) antibodies.

15. The device of claim 1 wherein at least one of the magnets is a permanent magnet.

16. The device of claim 1 wherein at least one of the magnets is made of highly-magnetically-permeable material.

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