

producing cells contained within the plurality of fluidic droplets are able to secrete a plurality of distinguishable antibodies and the antibody-producing cells do not all produce the same antibodies, culturing the antibody-producing cell to secrete antibodies able to recognize at least one of the first cell and the second cell, and determining a difference in binding between the antibodies and the first and second targets.

[0012] According to another set of embodiments, the method includes acts of removing blood cells from a subject, encapsulating at least some of the blood cells in a plurality of fluidic droplets, and at least partially separating, from the plurality of fluidic droplets, droplets containing antibody-producing cells. In yet another set of embodiments, the method includes acts of encapsulating blood cells and target cells in a plurality of fluidic droplets, at least partially separating, from the plurality of fluidic droplets, droplets containing blood cells able to produce a species able to associate with the target cell.

[0013] In one set of embodiments, the method includes acts of removing blood cells from a subject, encapsulating at least some of the blood cells in a plurality of fluidic droplets, at least partially separating, from the plurality of fluidic droplets, droplets containing antibody-producing cells, sequencing DNA from at least one of the antibody-producing cells, and inserting at least a portion of the DNA in a host cell.

[0014] In another aspect, the present invention is directed to a method of making one or more of the embodiments described herein. In another aspect, the present invention is directed to a method of using one or more of the embodiments described herein.

[0015] Other advantages and novel features of the present invention will become apparent from the following detailed description of various non-limiting embodiments of the invention when considered in conjunction with the accompanying figures. In cases where the present specification and a document incorporated by reference include conflicting and/or inconsistent disclosure, the present specification shall control. If two or more documents incorporated by reference include conflicting and/or inconsistent disclosure with respect to each other, then the document having the later effective date shall control.

BRIEF DESCRIPTION OF THE SEQUENCES

[0016] SEQ ID NO: 1 is CCPGCC, a Lumio tag.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] Non-limiting embodiments of the present invention will be described by way of example with reference to the accompanying figures, which are schematic and are not intended to be drawn to scale. In the figures, each identical or nearly identical component illustrated is typically represented by a single numeral. For purposes of clarity, not every component is labeled in every figure, nor is every component of each embodiment of the invention shown where illustration is not necessary to allow those of ordinary skill in the art to understand the invention. In the figures:

[0018] FIG. 1 illustrates the production of fluidic droplets, in accordance with one embodiment of the invention;

[0019] FIG. 2 illustrates a method of sorting fluidic droplets containing cells, according to another embodiment of the invention;

[0020] FIG. 3 illustrates a method of fusing fluidic droplets containing cells, according to yet another embodiment of the invention;

[0021] FIG. 4 illustrates a method of forming and fusing fluidic droplets, according to one embodiment of the invention;

[0022] FIG. 5 illustrates a method of forming and fusing fluidic droplets, according to one embodiment of the invention;

[0023] FIGS. 6A-6I include, according to one set of embodiments, (a) a schematic illustration of single-inlet (left) and double-inlet (right) encapsulation devices; (b) a micrograph of a single-inlet encapsulation device; (c) a micrograph of a double-inlet encapsulation device; (d) a schematic illustration of a serpentine incubation channel (top), a close-up of a serpentine incubation channel (bottom left), and a close-up of an incubation channel for time resolved studies (bottom right); (e) a micrograph of a serpentine incubation channel, (f) a micrograph of a serpentine incubation channel, (g) a schematic illustration of a reinjection device, (h) a micrograph of reinjection for further drop handling, and (i) a micrograph of an incubation channel;

[0024] FIGS. 7A-7B include, according to one set of embodiments, (a) a micrograph of single cells encapsulated in drops (with cell-bearing drops highlighted by arrows) and (b) the Poisson distribution for 3 different cell densities where open symbols indicate predicted values from Poisson statistics and solid symbols indicate experimental results;

[0025] FIGS. 8A-8C include, according to one set of embodiments, plots of cell survival during incubation in drops. (a) Comparison for survival on chip (6 h, 33 pL drops, n=1167 cells) compared to survival in a culture dish (6 h, n=3681). (b) Survival in a syringe for different drop sizes (3 h, 33 pL: n=319, 21 pL: n=301, 12 pL: n=426). In larger drops survival is increased. On chip survival rates similar to bulk incubation were obtained. (c) Time dependence of cell survival in small drops (12 pL volume, in syringe, 0 h: n=84, 1 h: n=63, 2 h: n=161, 3 h: n=426);

[0026] FIGS. 9A-9D include, according to one set of embodiments: (a) A micrograph showing drops containing cells that were encapsulated, incubated for 6 h on chip, recovered from the emulsion and plated. Image was taken after 2 days. (b) A micrograph showing the Control, where cells were grown directly on culture dish. (c) A plot of antibody production in drops. Gray: after three days on culture dish, light green: after first wash, dark green after second wash, orange: encapsulated cells with no incubation time, red: encapsulated cells with 6 h incubation time, blue: cells incubated for 6 h on a culture dish, error bars correspond to the uncertainty in the linear fit to the initial enzyme reaction rate in the kinetic ELISA; and (d) Initial rates of the ELISA for different dilutions of culture supernatant. Color code as in (c). Additional controls (purple, pink): empty emulsion drops, 0 and 6 h incubation time;

[0027] FIGS. 10A-10C include a) a schematic illustration of a microfluidic device with a rectangle indicating the section shown in FIG. 10b; (b) a micrograph of drops with encapsulated cells (white scale bar=100 μm); (c) a plot of the experimentally determined probability (p, y axis) for the number of cells per drop (k, x axis). The plot is in good agreement with a Poisson distribution (dashed lines) for various cell densities (resulting from on-chip dilution); and (d) the average number of cells per drop (l) plotted against the cell density for the experimental data (Exp.) and the Poisson