

CLAIMS

What is claimed is:

1. A method for separating biological cells of a first cell type from biological cells of a second cell type using a bead processing system, the method comprising:

contacting a sample comprising the biological cells of the first cell type and the second cell type with magnetic beads so that the magnetic beads attach to the biological cells of the first cell type through an antibody linkage, the sample and magnetic beads being disposed within a processing bag resting on a platform;

raising a magnet relative to the platform so that the magnet produces a magnetic field that securely fixes in place the magnetic beads relative to the platform, the magnetic beads having the biological cells of the first cell type attached thereto;

passing a fluid through the sample and the magnetic beads while the magnetic field is applied thereto, the fluid passing with a force sufficiently strong to wash away the biological cells of the second cell type from the biological cells of the first cell type; and

lowering the magnet relative to the platform so that the magnetic beads having the biological cells of the first cell type attached thereto are no longer securely fixed in place relative to the platform by the magnetic field of the magnet.

2. The method as recited in claim 1, wherein the antibody has a binding affinity for a protein comprising CD56.

3. The method as recited in claim 1 or claim 2, wherein the first cell type is natural killer (NK) cells.

4. The method as recited in claim 1, wherein the antibody has binding affinity for a protein selected from the group consisting of CD3, CD4, CD5, CD6, CD8, CD25, CD27, CD28, CD137, and CD278.

5. The method as recited in claim 4, wherein the first cell type is a T cell.

6. The method as recited in any one of the preceding claims, further comprising:

detaching at least a majority of the biological cells of first cell type from the magnetic beads;

applying a magnetic field to the magnetic beads so as to securely fix the magnetic beads in place; and

passing a fluid through the magnetic beads and the separated biological cells of first cell type while the magnetic field is being applied, the fluid passing with a force sufficiently strong to wash away at least a majority of the biological cells of the first cell type from the magnetic beads while at least a majority of the magnetic beads remain fixed in place by the magnetic field.

7. The method as recited in claim 6, wherein greater than 95% of the magnetic beads are retained in place by the magnetic field while the at least a majority of the biological cells of the first cell type are washed away from the magnetic beads.

8. The method as recited in claim 7, wherein greater than 95% of the magnetic beads are separated from the biological cells of the first cell type.

9. The method as recited in any one of the preceding claims, wherein greater than 95% of the magnetic beads detached from the biological cells of first cell type are separated from the biological cells of first cell type.

10. The method as recited in any one of the preceding claims, wherein the magnetic beads are from about 0.5 μm to about 3 μm in diameter.

11. The method as recited in claim 1, further comprising tilting the platform on which the processing bag is resting in a first direction relative to horizontal, the magnetic field being applied to the magnetic beads within the processing bag while the platform is tilted in the first direction.

12. The method as recited in claim 11, wherein the magnet is raised after the platform is tilted in the first direction.

13. The method as recited in claim 11 or claim 12, further comprising injecting a gas or a liquid through a port of the processing bag while the platform is tilted in the first direction.

14. The method as recited in any one of claims 11-13, further comprising:
tilting the platform in a second direction opposite to the first direction so that the platform on which the processing bag is resting is angled relative to horizontal; and
withdrawing liquid from the processing bag while the platform is tilted in the second direction.

15. A bead processing assembly for use in attaching magnetic beads to biological cells and/or separating magnetic beads from biological cells, the bead processing assembly comprising:

a base assembly comprising:

a housing;

a support panel disposed on the housing and having a front face;

a first pinch valve at least partially outwardly projecting from the front face of the support panel; and

a first pump at least partially outwardly projecting from the front face of the support panel; and

a rocker assembly supported on the base assembly, the rocker assembly comprising:

a mount assembly supported on the base assembly;

a platform assembly pivotably secured to the mount assembly; and

a rocker driver configured for rocking the platform assembly relative to the mount assembly.

16. The bead processing assembly of claim 15, wherein the platform assembly comprises:
a housing assembly bounding a compartment; a platform mounted to the housing assembly;

a magnet assembly disposed between the housing assembly and the platform, the magnet assembly comprising:

a top surface and an opposing bottom surface; and

a lift configured for selectively raising and lowering the magnet assembly relative to the platform between an activation position and a deactivation position.

17. The bead processing assembly of claim 15 or claim 16, wherein the platform assembly comprises a plurality of separate and discrete magnets being disposed in a plurality of alternating orientations so as to produce a Halbach array.

18. A consumable kit for use with a magnetic bead processing assembly, the consumable kit comprising:

a tray having a front face and an opposing back face, wherein the tray is configured to be removably fitted on a support of the magnetic bead processing assembly; and

a line set secured to the front face of the tray, the line set comprising:

tubing, the tubing comprising an inlet configured to be fluid coupled to the magnetic bead processing assembly and at least one output;

at least one flexible bag fluid coupled with the tubing; and

an air filter fluid coupled with the tubing.

19. The consumable kit of claim 18, wherein the tray comprises a plurality of tubing restraints configured to secure at least a portion of the tubing to the tray.

20. The consumable kit of claim 19, wherein the tray comprises a plurality of openings extending between the front face and the back face, and the tubing is secured to the front face of the tray so as to align with at least some of the plurality of openings.