

Claims

1. A method for detecting fetal cells in a sample from a pregnant subject, comprising:
 - (a) contacting the sample with a first antibody, wherein the sample comprises a plurality of cells;
 - (b) isolating cells bound to the first antibody to produce an enriched sample;
 - (c) contacting the enriched sample with a second antibody; and
 - (d) identifying a cell that is bound to the second antibody as a fetal cell,wherein the first antibody or the second antibody:
 - (i) is an antibody that binds to a Triggering Receptor Expressed on Myeloid Cells Like 2 (TREML2) protein; or
 - (ii) comprises an antigen binding fragment that binds to a TREML2 protein.
2. The method of claim 1, wherein the fetal cell is a fetal nucleated red blood cell (fnRBC).
3. The method of claim 1 or 2, wherein the first antibody is conjugated to one or more magnetic particles.
4. The method of claim 3, wherein the magnetic particles are colloidal magnetic particles.
5. The method of claim 4, wherein the colloidal magnetic particles are ferrofluid magnetic particles.
6. The method of any one of claims 3-5, wherein step (b) comprises subjecting the sample to a magnetic field.
7. The method of claim 6, wherein the magnetic particles are coupled to a first exogenous aggregation enhancing factor (EAEF), the first EAEF comprising one member of a specific binding pair selected from the group comprising biotin-streptavidin, antigen-antibody, receptor-hormone, receptor-ligand, agonist-antagonist, lectin-carbohydrate, Protein A- antibody Fc, and avidin-biotin, biotin analog-avidin, desthiobiotin-streptavidin, desthiobiotin-avidin, iminobiotin-streptavidin, and iminobiotin-avidin.
8. The method of claim 7, wherein step (a) comprises adding a second EAEF to induce aggregation of the magnetic particles, the second EAEF comprising the other member of the specific binding pair.
9. The method of claim 8, wherein step (b) comprises adding to the enriched sample a member of the specific binding pair in order to reverse aggregation of the magnetic particles in the enriched sample.

10. The method of any one of the preceding claims, further comprising, prior to step (a), adding to the sample at least one aggregation inhibiting agent selected from the group consisting of a reducing agent, an immune-complex, a chelating agent, and a diamino butane.
11. The method of claim 10, wherein the aggregation inhibiting agent is a chelating agent, and wherein the chelating agent is EDTA.
12. The method of any one of the preceding claims, wherein the second antibody is an antibody that binds to TREML2 protein or comprises an antigen binding fragment that binds to a TREML2 protein.
13. The method of claim 12, further comprising, prior to step (d), isolating single fetal cells.
14. The method of claim 13, wherein isolating single fetal cells is carried out by isolating single fetal cells that are bound to the second antibody.
15. The method of claim 14, wherein the second antibody which is conjugated to a label.
16. The method of claim 15, wherein the label is a fluorescent label.
17. The method of claim 16, wherein isolating single fetal cells is based on immunofluorescent technology.
18. The method of claim 17, wherein isolating single fetal cells is carried out by fluorescence activated cell sorting (FACS).
19. The method of claim 17, wherein isolating single cells is carried out with a DEP Array.
20. The method of any one of the preceding claims, wherein step (d) comprises performing a sequencing analysis.
21. The method of claim 20, wherein the sequencing analysis comprises short tandem repeat (STR) analysis.
22. The method of any one of the preceding claims, further comprising analyzing the fetal cell.
23. The method of claim 22, wherein analyzing the fetal cell comprises performing a genomic or a genetic analysis.
24. The method of claim 23, wherein performing a genetic analysis comprises detecting the presence or absence of one or more genetic abnormalities in the fetal cell.
25. The method of any one of the preceding claims, wherein the first antibody is an antibody that binds to a TREML2 protein or comprises an antigen binding fragment that binds to a TREML2 protein.
26. The method of any one of claims 1-24, wherein the first antibody binds to a protein selected from EpCAM, CD105, and CD71, and the second antibody is an antibody that binds to a TREML2 protein or comprises an antigen binding fragment that binds to a TREML2 protein.

27. The method of any one of the preceding claims, wherein the antibody that binds to a TREML2 protein or an antigen binding fragment that binds to a TREML2 protein comprises one or more CDRs selected from:

- (i) a heavy chain variable region (HCVR) complementarity determining region (CDR) 1 comprising the amino acid sequence of SEQ ID NO: 6;
- (ii) a HCVR CDR2 comprising the amino acid sequence of SEQ ID NO: 7;
- (iii) a HCVR CDR3 comprising the amino acid sequence of SEQ ID NO: 8;
- (iv) a light chain variable region (LCVR) CDR1 comprising the amino acid sequence of SEQ ID NO: 9;
- (v) a LCVR CDR2 comprising the amino acid sequence of SEQ ID NO: 10; and
- (vi) a LCVR CDR3 comprising the amino acid sequence of SEQ ID NO: 11.

28. The method of any one of the preceding claims, wherein the antibody that binds to a TREML2 protein is selected from sc-109096, ARP49877_P050, OACA04996, AF3259, MA5-30973, PA5-47471, ABIN634968, ABIN928294, 30-552, ABIN2463297, ABIN19999041, 11655-r001, ABIN749888, bs-2737r, ABIN1999045, 11655-rp02, ABIN293207, ABIN2387613, t8282- 40, ABIN4249314, nbp1-70737-20ul, and BD563661.