CLAIMS

1. A method of detecting a precursor of conventional dendritic cell (cDC) (pre-DC), comprising (i) determining the presence of a biomarker selected from a group consisting of:

(a) CD169 in combination with one or more biomarker(s) selected from a group consisting of AXL, CD271 and CD324;

(b) CD327 in combination with one or more biomarker(s) selected from a group consisting of AXL, CD271 and CD324; and

(c) CD169 and CD327 in combination with one or more biomarker(s) selected from a group consisting of AXL, CD271 and CD324.

2. The method of claim 1, wherein the biomarker(s) is selected from a group consisting of:

(a) a combination of CD169, and AXL;

(b) a combination of CD169, and CD271;

(c) a combination of CD169, and CD324;

(d) a combination of CD327, and AXL;

(e) a combination of CD327, and CD271;

(f) a combination of CD327, and CD324;

(g) a combination of CD169, CD327, and AXL;

(h) a combination of CD169, CD327, and CD271;

(i) a combination of CD169, CD327, and CD324;

(j) a combination of CD169, AXL, and CD271;

(k) a combination of CD169, AXL, and CD324;

(l) a combination of CD169, CD271, and CD324;

(m) a combination of CD327, AXL, and CD271;

(n) a combination of CD327, AXL, and CD324;

(o) a combination of CD327, CD271, and CD324;

(p) a combination of CD169, CD327, AXL, and CD271;

(q) a combination of CD169, CD327, AXL, and CD324;

(r) a combination of CD169, CD327, CD271, and CD324;

(s) a combination of CD169, AXL, CD271, and CD324;

(t) a combination of CD327, AXL, CD271, and CD324; and

(u) a combination of CD169, CD327, AXL, CD271, and CD324.

3. The method of claim 1 or 2, wherein step (i) comprises determining the presence of:

(A) CD169 and AXL to detect the early pre-DC cell population within the pre-DC cell population;

(B) CD169, CD271 and CD324, and wherein the method further comprises determining the presence of cell adhesion molecule 1 (CADM1) to detect pre-cDC1; or

(C) CD327, CD271 and CD324, and wherein the method further comprises determining the presence of a CD1c to detect pre-cDC2.

4. The method of claim 3, wherein (A) further comprises:

(ii) determining for the presence of one or more biomarkers selected from a group consisting of: HLA-DR, CD123, CD45RA, CD45, CD303, CD304, CD33, CD5, CX3CR1, CD2, and combinations thereof; and

(iii) determining for the absence of one or more biomarkers selected from a group consisting of: CD34, CD3, CD19/CD20, CD14, CD16, and combinations thereof,

prior to step (i) of claim 1.

5. The method of claim 3, wherein (B) further comprises:

(ii) determining for the presence of one or more biomarkers selected from a group consisting of: HLA-DR, CD123, CD45RA, CD45, CD303, CD304, CD33, CX3CR1, CD2, CD5, and combinations thereof; and

(iii) determining for the absence of one or more biomarkers selected from a group consisting of: CD34, CD3, CD19/CD20, CD14, CD16, CD1c, and combinations thereof,

prior to step (i) of claim 3 part (B).

6. The method of claim 3, wherein (C) further comprises:

(ii) determining for the presence of one or more biomarkers selected from a group consisting of: HLA-DR, CD123, CD45RA, CD45, CD33, CX3CR1, CD2, CD5, and combinations thereof; and

(iii) determining for the absence of one or more biomarkers selected from a group consisting of: CD34, CD3, CD19/CD20, CD14, CD16, CADM1, and combinations thereof,

prior to step (i) of claim 3 part (C).

7. The method of any one of claims 1, 3 part (A), 3 part (B) or 3 part (C), further comprising determining the level of expression of any one or more of the biomarkers, wherein:

(I) (a) an increased expression level of any one or more biomarkers in any one of claims 1 or 4(ii) relative to a control indicates that the cell is an early pre-DC; and/or

(b) a decreased expression level of any one or more biomarkers in claim 4(iii) relative to a control indicates that the cell is an early pre-DC;

or

(II) (a) an increased expression level of any one or more biomarkers in any one of claims 1 or 5(ii) relative to a control indicates that the cell is a pre-cDC1; and/or

(b) a decreased expression level of any one or more biomarkers in claim 5(iii) relative to a control indicates that the cell is a pre-cDC1;

or

(III) (a) an increased expression level of any one or more biomarkers in any one of claims 1 or 6(ii) relative to a control indicates that the cell is a pre-cDC2; and/or

(b) a decreased expression level of any one or more biomarkers in claim 6(iii) relative to a control indicates that the cell is a pre-cDC2;

wherein the control comprises other cellular populations present or a pDC population that does not express CD169, CD327, AXL, CD271 and/or CD324.

8. The method of claim 7, further comprising determining the change in the level of expression of any one or more of the biomarkers, wherein:

a) a change in the level of expression of any one or more of the biomarkers compared to the level of expression of any one or more of the biomarkers in a control indicates that the cell is an early pre-DC, pre-cDC1 or pre-cDC2; and

b) no change in the level of expression of any one or more of the biomarkers compared to the level of expression of any one or more of the biomarkers in a control indicates that the cell is not an early pre-DC, pre-cDC1 or pre-cDC2,

wherein the control comprises other cellular populations present or a pDC population that does not express CD169, CD327, AXL, CD271 and/or CD234.

9. The method of any one of claims 1 to 8, wherein the detecting comprises contacting a sample suspected of containing pre-DC, comprising early pre-DC, pre-cDC1 and/or pre-cDC2 cells, with one or more binding molecule specific for the biomarkers as defined in any one of claims 1 to 8, selected from a group consisting of: an antibody, an antigen-binding fragment of an antibody, an aptamer and a ligand.

10. The method of claim 9, wherein the binding molecule is coupled to a detectable label selected from a group consisting of: a fluorescent label, a radioactive label, a chemical label, an enzymatic label, a protein label, a magnetic label and a heavy metal.

11. The method of any one of claims 1 to 10, wherein the detecting comprises mass cytometry or flow cytometry.

12. The method of any one of claims 9 to 11, wherein the sample is selected from a group consisting of: a blood sample; a tissue sample selected from a group consisting of bone marrow, lung, spleen, liver, heart, bone, skin, adipose tissue, dermis, intestine, urinary bladder, tendon, ligament, muscle, fascia, neurologic tissue, vessel, kidney, cartilage, sections of tissues such as biopsy and autopsy samples, frozen sections of tissues taken for histologic purposes, archival samples, explants and primary and/or transformed cell

cultures derived from patient tissues and/or any other suitable tissue; a cell sample selected from a group consisting of peripheral blood mononuclear cells; and a bodily fluid sample selected from a group consisting of lymph fluids, cystic fluids, sputum, stool, tears, mucus, ascitic fluid, cystic fluid, urine, nipple exudates and nipple aspirates.

13. The method of any one of claims 9 to 12, wherein the sample is from a human subject.

14. The method of any one of claims 1 to 13, further comprising the step of isolating the pre-DC cells detected using the method of any one of claims 1 to 13.