sorting may be performed through a technique known or to be developed in the art, for example, an antibody-based or a nucleotide-based isolation method. Preferably, the cell sorting is performed by an antibody-based magnetic cell sorting. For example, the MACS method (MACS® Technology, Miltenyi Biotec). In addition, the cell sorting may be preform through a flow cytometry method, e.g. an antibody-based or a nucleotide-based flow cytometry.

**[0040]** As used herein, the term "more responsive" refers to MSCs' cellular behaviors (e.g. mobility) responding to an inflammatory related signaling pathway, including but not limited to a TNF-α signaling or a TNF-α-dependent signaling.

**[0041]** The present invention is further illustrated by the following examples, which are provided for the purpose of demonstration rather than limitation.

**[0042]** **Examples**

**[0043]** **Example 1: The immunophenotypic characterization of the placenta-derived mesenchymal stem cells (MSCs) and fibroblasts**

**[0044]** Full-term placentas (n = 8) were collected after obtaining written informed consent from donors. MSCs were derived from amniotic membrane (AM), chorionic disk (CD), chorionic membrane (CM), and umbilical cord (UC). Placenta-derived cells were cultured, expanded and maintained in α-MEM with FBS and basic FGF at 37 °C, saturating humidity and 5% $CO_2$, and were sub-cultured when cells reached 80% confluence, later phenotypically characterized by flow cytometry. In the process of immunostaining subject to flow cytometry, cells were incubated with the antibodies following manufacturer's instructions. Nonspecific IgG of the corresponding class served as the negative control. Cell suspensions were analyzed on a flow cytometer (BD Biosciences FACSCanto II) with Flowjo 7.6.1 software.

**[0045]** We assessed expression of CD11b, CD19, CD34, CD45, CD73, CD90, CD105, HLA-DR, and EphA2. Flow cytometry analysis of all MSCs isolated from the various locations of a placenta were positive for the CD73, CD90, CD105, EphA2, and negative for CD11b, CD19, CD34, CD45, HLA-DR. Flow cytometry analysis of fibroblasts (Human Foreskin Fibroblasts, neonatal, PC501A-HFF, SBI) was positive for the CD73, CD90, CD105, negative for CD11b, CD19, CD34, CD45, HLA-DR, and negative or low for EphA2. A distinct pattern was noted for EphA2 between placenta-derived MSCs and fibroblasts: MSCs showed high percentage of EphA2-positive cells, whereas fibroblasts showed the inverse. The results are shown in **Table 1** below.

## CLAIMS

What is claimed is:

1. A method of distinguishing mesenchymal stem cells (MSCs) from fibroblast, comprising:

isolating the MSCs from the fibroblasts using a marker EphA2 expressed on the MSCs so as to distinguish the MSCs from the fibroblasts,

wherein the MSCs and fibroblasts are from a primary culture of cells derived from a placenta-related tissue.

2. The method of claim 1, wherein the placenta-related tissue is selected from the group consisting of amniotic membrane, chorionic disk, chorionic membrane, and umbilical cord.

3. The method of claim 1, wherein the isolating step is performed through an antibody-based or a nucleotide-based isolation method.

4. The method of claim 1, further comprising the preliminary step of:

collecting the MSCs and the fibroblasts from the placenta-related tissue;

culturing the MSCs and the fibroblasts in a culture medium to prepare the primary culture.

5. The method of claim 3, wherein the antibody-based isolation method is an antibody-based magnetic cell sorting or an antibody-based flow cytometry.

6. The method of claim 3, wherein the nucleotide-based isolation method is a nucleotide-based flow cytometry.

7. A method of increasing a purity of mesenchymal stem cells (MSCs) population, comprising:

isolating and collecting MSCs using a marker EphA2 expressed on the MSCs, wherein the MSCs are from a primary culture of cells derived from a placenta-related tissue; and

culturing the MSCs.

8. The method of claim 7, wherein the placenta-related tissue is selected from the group consisting of amniotic membrane, chorionic disk, chorionic membrane, and umbilical cord.

9. The method of claim 7, wherein the isolating step is performed through an antibody-based or a nucleotide-based isolation method.

10. The method of claim 7, wherein the cells derived from a placenta-related tissue are cultured in a culture medium for MSC.

11. The method of claim 7, wherein the purity of the MSCs population is at least 95% at P0 after the isolating step.

12. The method of claim 9, wherein the antibody-based isolation method is an antibody-based magnetic cell sorting or an antibody-based flow cytometry.

13. The method of claim 9, wherein the nucleotide-based isolation method is a nucleotide-based flow cytometry.

14. A method of isolating a population of mesenchymal stem cells (MSCs) which is more responsive in an inflammatory environment, comprising:

isolating and collecting MSCs using a marker EphA2 expressed on the MSCs, wherein the MSCs are from a primary culture of cells derived from a placenta-related tissue, and the population of MSCs is more responsive in an inflammatory environment.

15. The method of claim 14, wherein the isolating step is performed through an antibody-based or a nucleotide-based isolation method.

16. The method of claim 14, wherein the MSC population is more responsive to a TNF-α signaling or a TNF-α-dependent signaling.

17. The method of claim 15, wherein the antibody-based isolation method is an antibody-based magnetic cell sorting or an antibody-based flow cytometry.

18. The method of claim 15, wherein the nucleotide-based isolation method is a nucleotide-based flow cytometry.