CLAIMS:

1. A method of enriching a population of cells for cardiomyocyte cells and cardiomyocyte progenitor cells comprising:

(a) providing the population of cells from which cardiomyocyte cells and cardiomyocyte progenitor cells are to be isolated; and

(b) isolating from the population, cells expressing SIRPA;

wherein the population of cells comprises a population of human pluripotent stem cells induced to differentiate into cardiomyocyte cells and cardiomyocyte progenitor cells.

2. The method of claim 1, wherein the human pluripotent stem cells are embryonic stem cells.

3. The method of claim 1, wherein the human pluripotent stem cells are induced pluripotent stem cells.

4. The method of any one of claims 1-3, wherein the human pluripotent stem cells are exposed to an amount of at least one inducing agent effective to induce cell differentiation.

5. The method of claim 4, wherein the amount of the at least one inducing agent is optimized based on the concentration SIRPA in the population.

6. The method of any one of claims 4 and 5 wherein the at least one inducing agent comprises a cytokine.

7. The method of any one of claim 4-6, wherein the at least one inducing agent comprises activin A, preferably at a concentration of up to 40ng/ml, further preferably at a concentration of about 6ng/ml or about 30ng/ml.

8. The method of any one of claims 4-7, wherein the at least one inducing agent comprises bone morphogenetic protein 4, preferably at a concentration of up to 40ng/ml, further preferably at a concentration of about 10ng/ml.

9. The method of any one of claims 4-8, wherein the human pluripotent stem cells are further exposed to a bone morphogenetic protein inhibitor.

10. The method of claim 9, wherein the bone morphogenetic protein inhibitor is selected from the group consisting of Dorsomorphin, Noggin and soluble bone morphogenetic protein receptors.

11. The method of any one of claims 4-10, wherein the human pluripotent stem cells are further exposed to at least one of VEGF, DKK and bFGF.

12. The method of any one of claims 4-11, wherein the human pluripotent stem cells are exposed to the inducing agent for between about 1 and about 5 days, preferably about 3 days.

13. The method of any one of claims 1-12, wherein the time between the initiation of induction of the human pluripotent stem cells and isolating the cells expressing SIRPA is between about five days and about forty-five days, preferably between about 8 and about 25 days.

14. The method of any one of claims 1-13, wherein the cells expressing SIRPA are isolated after the onset of SIRPA expression by the cells, which appears around the time of onset of Nkx2.5 expression by the cells.

15. The method of any one of claims 1-13, wherein the cells having the SIRPA cell surface antigen are isolated between the time of the onset of Nkx2.5 expression by the cells and the time of the onset of contraction and expression of the cardiac-specific structural proteins by the cells.

16. The method of any one of claims 1-15, further comprising depleting from the population, cells expressing at least one of CD90, CD31, CD140B and CD49A.

17. The method of claim 16, wherein the cells expressing one of CD90, CD31, CD140B and CD49A are depleted using a corresponding antibody.

18. The method of any one of claims 1 to 17, wherein the cells expressing SIRPA are isolated using a SIRPA-specific ligand.

19. The method of claim 18, wherein the cells expressing SIRPA are isolated using an anti-SIRPA antibody or antibody fragment, or antibody-like molecule, preferably an anti-SIRPA antibody.

20. The method of claims 18 or 19, wherein the cells expressing SIRPA are isolated using magnetic beads.

21. The method of any one of claims 1-20, wherein the cells expressing SIRPA are isolated using flow cytometry.

22. The method of any one of claims 1-17, wherein the cells in the population comprise a reporter gene operably linked to regulatory control elements of the SIRPA locus whereby the reporter gene is expressed in cells that express SIRPA and the step of isolating the cells expressing SIRPA comprises isolating cells expressing the reporter gene.

23. The method of claim 22, wherein the reporter gene confers resistance to a cytotoxic agent.

24. The method of claim 22, wherein the reporter gene is a cell surface tag.

25. The method of any one of claims 1 to 24, wherein the enriched population of cells comprises at least 60%, preferably at least 90%, further preferably 98%, cardiomyocyte cells and cardiomyocyte progenitor cells.

26. An enriched population of cardiomyocyte cells and cardiomyocyte progenitor cells obtained using any one of the methods of claims 1 to 24.

27. An isolated population of cells enriched for cardiomyocyte cells and cardiomyocyte progenitor cells, wherein the population of cells comprises at least 60%, preferably at least 90%, further preferably 98%, cardiomyocyte cells and cardiomyocyte progenitor cells.

28. The use of SIRPA for isolating cardiomyocyte cells and cardiomyocyte progenitor cells from a population of cells, wherein the population of cells comprise a population of human pluripotent stem cells induced to differentiate into cardiomyocyte cells and cardiomyocyte progenitor cells.

29. A method of depleting a population of cells for cardiomyocyte cells and cardiomyocyte progenitor cells comprising:

(a) providing the population of cells from which cardiomyocyte cells and cardiomyocyte progenitor cells are to be depleted; and

(b) depleting from the population, cells expressing SIRPA;

wherein the population of cells comprises a population of human pluripotent stem cells induced to differentiate into cardiomyocyte cells, cardiomyocyte progenitor cells, and non-cardiomyocytes.

30. A method of enriching a population of cells for cardiomyocyte cells and cardiomyocyte progenitor cells comprising:

(a) providing the population of cells from which cardiomyocyte cells and cardiomyocyte progenitor cells are to be isolated; and

(b) depleting from the population, cells expressing at least one of CD90, CD31, CD140B and CD49A;

wherein the population of cells comprise a population of human pluripotent stem cells induced to differentiate into cardiomyocyte cells, and cardiomyocyte progenitor cells, and non-cardiomyocytes.

CLAIMS:

1. A method of enriching a population of cells for cardiomyocyte cells and cardiomyocyte progenitor cells comprising:

(a) providing the population of cells from which cardiomyocyte cells and cardiomyocyte progenitor cells are to be isolated; and

(b) isolating cells expressing SIRPA from the population using a SIRPA-specific ligand;

wherein the population of cells comprises a population of human pluripotent stem cells induced to differentiate into cardiomyocyte cells and cardiomyocyte progenitor cells.

2. The method of claim 1, wherein the human pluripotent stem cells are embryonic stem cells.

3. The method of claim 1, wherein the human pluripotent stem cells are induced pluripotent stem cells.

4. The method of any one of claims 1-3, wherein the human pluripotent stem cells are exposed to an amount of at least one inducing agent effective to induce cell differentiation.

5. The method of claim 4, wherein the amount of the at least one inducing agent is optimized based on the concentration of SIRPA in the population.

6. The method of any one of claims 4 and 5 wherein the at least one inducing agent comprises a cytokine.

7. The method of any one of claims 4-6, wherein the at least one inducing agent comprises activin A at a concentration of up to 40ng/ml.

8. The method of claim 7, wherein the at least one inducing agent comprises activin A at a concentration of 30 ng/ml.

9. The method of claim 7, wherein the at least one inducing agent comprises activin A at a concentration of 6 ng/ml.

10. The method of any one of claims 4-9, wherein the at least one inducing agent comprises bone morphogenetic protein 4 at a concentration of up to 40ng/ml.

11. The method of claim 7, wherein the at least one inducing agent comprises bone morphogenetic protein 4 at a concentration of 10ng/ml.

12. The method of any one of claims 4-11, wherein the human pluripotent stem cells are further exposed to a bone morphogenetic protein inhibitor.

13. The method of claim 12, wherein the bone morphogenetic protein inhibitor is selected from the group consisting of Dorsomorphin, Noggin and soluble bone morphogenetic protein receptors.

14. The method of any one of claims 4-13, wherein the human pluripotent stem cells are further exposed to at least one of VEGF, DKK and bFGF.

15. The method of any one of claims 4-14, wherein the human pluripotent stem cells are exposed to the inducing agent for between 1 and 5 days.

16. The method of any one of claims 4-15, wherein the human pluripotent stem cells are exposed to the inducing agent for 3 days.

17. The method of any one of claims 1-16, wherein the time between the initiation of induction of the human pluripotent stem cells and isolating the cells expressing SIRPA is between five days and forty-five days.

18. The method of any one of claims 1-17, wherein the time between the initiation of induction of the human pluripotent stem cells and isolating the cells expressing SIRPA is between 8 and 25 days.

19. The method of any one of claims 1-18, wherein the cells expressing SIRPA are isolated after the onset of SIRPA expression by the cells, which appears around the time of onset of Nkx2.5 expression by the cells.

20. The method of any one of claims 1-18, wherein the cells having the SIRPA cell surface antigen are isolated between the time of the onset of Nkx2.5 expression by the cells and the time of the onset of contraction and expression of the cardiac-specific structural proteins by the cells.

21. The method of any one of claims 1-20, further comprising depleting from the population, cells expressing at least one of CD90, CD31, CD140B and CD49A.

22. The method of claim 21, wherein the cells expressing one of CD90, CD31, CD140B and CD49A are depleted using a corresponding antibody.

23. The method of any of claims 1-22, wherein the cells expressing SIRPA are isolated using an anti-SIRPA antibody or antibody fragment, or antibody-like molecule.

24. The method of claim 23, wherein the cells expressing SIRPA are isolated using magnetic beads.

25. The method of any one of claims 1-24, wherein the cells expressing SIRPA are isolated using flow cytometry.

26. The method of any one of claims 1-22, wherein the cells in the population comprise a reporter gene operably linked to regulatory control elements of the SIRPA locus whereby the reporter gene is expressed in cells that express SIRPA and the step of isolating the cells expressing SIRPA comprises isolating cells expressing the reporter gene.

27. The method of claim 26, wherein the reporter gene confers resistance to a cytotoxic agent.

28. The method of claim 26, wherein the reporter gene is a cell surface tag.

29. The method of any one of claims 1 to 28, wherein the enriched population of cells comprises at least 60% cardiomyocyte cells and cardiomyocyte progenitor cells.

30. The method of any one of claims 1 to 28, wherein the enriched population of cells comprises at least 90% cardiomyocyte cells and cardiomyocyte progenitor cells.

31. The method of any one of claims 1 to 28, wherein the enriched population of cells comprises at least 98% cardiomyocyte cells and cardiomyocyte progenitor cells.

32. An enriched population of cardiomyocyte cells and cardiomyocyte progenitor cells obtained using any one of the methods of claims 1 to 28.

33. The use of SIRPA for isolating cardiomyocyte cells and cardiomyocyte progenitor cells from a population of cells, wherein the population of cells comprise a population of human pluripotent stem cells induced to differentiate into cardiomyocyte cells and cardiomyocyte progenitor cells.

34. A method of depleting a population of cells for cardiomyocyte cells and cardiomyocyte progenitor cells comprising:

(a) providing the population of cells from which cardiomyocyte cells and cardiomyocyte progenitor cells are to be depleted; and

(b) depleting from the population, cells expressing SIRPA;

wherein the population of cells comprises a population of human pluripotent stem cells induced to differentiate into cardiomyocyte cells, cardiomyocyte progenitor cells, and non-cardiomyocytes.