conditions has not yet yielded strategies for the generation of pure populations of cardiomyocytes from a broad range of hPSC lines.

To enrich for cardiomyocytes from the differentiation cultures, cardiomyocyte-specific fluorescent reporters or drug selectable elements have been introduced into hPSCs [6-8]. Following differentiation, cardiomyocytes can be enriched either by fluorescent-activated cell sorting (FACS) or the addition of appropriate selection drugs. Although these strategies do allow for the generation of enriched cardiomyocyte populations, they suffer from a major drawback as a reporter vector must be introduced into each hPSC line used, resulting in genetically modified cardiomyocytes, thus reducing their utility for clinical applications. In a more recent study, Hattori et al. demonstrated that it was possible to isolate cardiomyocytes by FACS, based on their high mitochondrial content [9]. While this approach appears to be useful for isolating mature cardiomyocytes, cells with fewer mitochondria, such as immature hPSC-derived cardiomyocytes, may be more difficult to distinguish from other cell types.

SUMMARY ~~OF THE INVENTION~~

Disclosed is~~In an aspect, there is provided~~ a method of enriching a population of cells for cardiomyocyte cells and cardiomyocyte progenitor cells comprising providing the population of cells from which cardiomyocyte cells and cardiomyocyte progenitor cells are to be isolated; and 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.

In one aspect, there is provided 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.

In a further aspect, there is provided an enriched population of cardiomyocyte cells and cardiomyocyte progenitor cells obtained using any one of the methods described herein.

Also disclosed is~~In a further aspect, there is provided~~ 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%, cardiomyocyte cells and cardiomyocyte progenitor cells.

In a further aspect, there is provided 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.

Further disclosed isIn a further aspect, there is provided a method of depleting a population of cells for cardiomyocyte cells and cardiomyocyte progenitor cells comprising: providing the population of cells from which cardiomyocyte cells and cardiomyocyte progenitor cells are to be depleted; and 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.

Yet further disclosed isIn a further aspect, there is provided a method of enriching a population of cells for cardiomyocyte cells and cardiomyocyte progenitor cells comprising: providing the population of cells from which cardiomyocyte cells and cardiomyocyte progenitor cells are to be isolated; and 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.

DESCRIPTION OF THE DRAWINGS

Embodiments of the invention may best be understood by referring to the following description and accompanying drawings. In the drawings:

Figure 1 shows specification of the cardiovascular lineage from hESCs. **(a)** Outline of the protocol used to differentiate hESCs to the cardiac lineage (modified from Yang et al., 2008). **(b)** Quantitative PCR (QPCR) analysis of *BRACHURY* (*T*), *MESP1*, *ISLET1* (*ISL1*), *NKX2-5*, *MYH6* (*αMHC*), *MYH7* (*βMHC*), *MYL2* (*MLC2v*), *MYL7* (*MLC2a*), *NEUROD1* and *FOXA2* in HES2-derived embryoid bodies (EBs) at different stages during differentiation. *Day 0*, hES cells; *LV,* human fetal left ventricle; *LA,* human fetal left atria; *AH,* human adult heart, *Ed*, hESC-derived endoderm [13]. Bars represent mean ± standard error of the mean, n=3.

Figure 2 shows expression of the cell surface receptor SIRPA during hESC differentiation. **(a)** Flow cytometric analysis of SIRPA (SIRPA) on EBs derived from

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 according to claim 1, wherein $SIRPA^-$ cells are collected.~~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.~~