Claims

1. A method of differentiating CD34$^+$ hematopoietic progenitor cells, comprising culturing a population of early mesoderm cells in a first medium, wherein the first medium comprises a basal medium supplemented with one or more of thrombopoeitin (TPO), stem cell factor (SCF) and FMS-like tyrosine kinase 3 ligand (FLT3L), and excludes any combination of exogenously added agonists selected from the group consisting of an agonist of BMP signaling, an agonist of fibroblast growth factor (FGF) signaling, and an agonist of vascular endothelial growth factor (VEGF) signaling.

~~2. The method according to claim 1, wherein the agonist of BMP signaling is a bone morphogenic protein, and optionally the bone morphogenic protein is BMP4.~~

~~3. The method according to claim 1, wherein the agonist of FGF signaling is a fibroblast growth factor, and optionally the fibroblast growth factor is FGF2.~~

~~4. The method of claim 1, wherein the agonist of VEGF signaling is a vascular endothelial growth factor.~~

~~5.~~2 The method according to claim 1, wherein the first medium is serum-free.

~~6.~~3 The method according to claim 1, further comprising culturing the population of early mesoderm cells in the absence of exogenously added stroma- and/or feeder-cells.

~~7~~4. The method according to claim 1, wherein culturing the population of early mesoderm cells in the first medium is for between 3 and 15 days.

~~8. The method according to any one of claims 1 to 7, wherein the hematopoietic progenitor cells are CD34$^+$.~~

~~9. The method according to any one of claims 1 to 8, wherein the hematopoietic progenitor cells have myeloid, erythroid, and lymphoid potential.~~

~~10~~5. The method according to ~~any one of~~ claim~~s~~ 1 ~~to 9~~, further comprising deriving the population of early mesoderm cells from a population of pluripotent stem cells (PSC).

~~11~~6. The method according to claim ~~10~~5, further comprising culturing the population of PSC in a derivation medium, wherein the derivation medium comprises a second basal medium supplemented with one or more of the agonist of BMP signaling, the agonist of FGF signaling, and the agonist of VEGF signaling to obtain a differentiated population of PSC-derived early mesoderm cells.

~~12~~7. The method according to claim ~~11~~6, wherein the agonist of BMP signaling is a bone morphogenic protein, and optionally the bone morphogenic protein is BMP4.

~~13~~8. The method according to claim ~~11~~6, wherein the agonist of FGF signaling is a fibroblast growth factor, and optionally the fibroblast growth factor is FGF2.

~~14~~9. The method according to claim ~~11~~6, wherein the agonist of VEGF signaling is a vascular endothelial growth factor.

~~15~~10. The method according to ~~any one of~~ claim~~s 11 to 14~~ 6, wherein the derivation medium is serum-free.

~~16~~11. The method according to ~~any one of~~ claim~~s 11 to 15~~ 6, further comprising culturing the PSC in the absence of exogenously added stroma- and/or feeder-cells.

~~17~~12. The method according to ~~any one of~~ claim~~s 11 to 16~~ 6, wherein culturing the PSC in the derivation medium is for between 1 and 7 days.

~~18~~13. The method according to ~~any one of~~ claim~~s 11 to 17~~ 6, further comprising forming the PSC into aggregates in the derivation medium or prior to culturing the PSC in the derivation medium.

~~19. The method according to any one of claims 11 to 17, further comprising forming the PSC into aggregates in the derivation medium.~~

~~20~~14. The method according to claim ~~18 or 19~~13, wherein the aggregates are formed in a microwell device.

~~21~~15. The method according to ~~any one of~~ claim~~s~~ 1 ~~to 20~~, further comprising obtaining a multi-potent lymphoid progenitor cells after culturing the differentiated hematopoietic progenitor cells in a

lymphoid differentiation medium under serum-free conditions and/or in the absence of exogenously added stroma- and/or feeder cells.

~~22. The method according to claim 21, wherein the lymphoid progenitor cells have multi-lineage potential~~

~~23. The method according to claim 22, wherein the lymphoid progenitor cells have T cells and NK cells potential.~~

~~24. The method according to claim 23, wherein the T cells and NK cells are functional.~~

~~25~~16. A medium for differentiating hematopoietic progenitor cells from a population of early mesoderm cells, the media comprising a basal medium supplemented with one or more of thrombopoeitin (TPO), stem cell factor (SCF) and FMS-like tyrosine kinase 3 ligand (FLT3L), and excludes any combination of exogenously added agonists selected from the list consisting of an agonist of BMP signaling, an agonist of fibroblast growth factor (FGF) signaling, and an agonist of vascular endothelial growth factor (VEGF) signaling.

~~26. The medium according to claim 25, wherein the population of early mesoderm cells is derived from pluripotent stem cells.~~

~~27. The medium according to claim 26, wherein the pluripotent stem cells are mammalian.~~

~~28~~17. The medium according to ~~any one of~~ claim~~s 25 to 27~~ 16, wherein the medium is serum-free.

~~29. The medium according to any one of claims 25 to 28, wherein the medium is effective in stroma- and/or feeder cell-free workflows.~~

~~30~~18. The medium according to ~~any one of~~ claim~~s 25 to 29~~ 16, wherein the agonist of fibroblast growth factor (FGF) signaling is a fibroblast growth factor, and optionally FGF2.

~~31~~19. The medium according to ~~any one of~~ claim~~s 25 to 30~~ 16, wherein the agonist of BMP signaling is a bone morphogenic protein, and optionally BMP4.

~~32~~20. The medium according to ~~any one of~~ claim~~s 25 to 31~~ 16, wherein the agonist of vascular endothelial growth factor (VEGF) signaling is VEGF.

~~33. The medium according to any one of claims 25 to 32, wherein the hematopoietic progenitor cells have lymphoid, myeloid, and erythroid potency.~~