Washington University in St. Louis
Office of Technology Management

SCALABLE GENERATION OF HEMATOPOIETIC PROGENITORS FROM HUMAN PLURIPOTENT STEM CELLS

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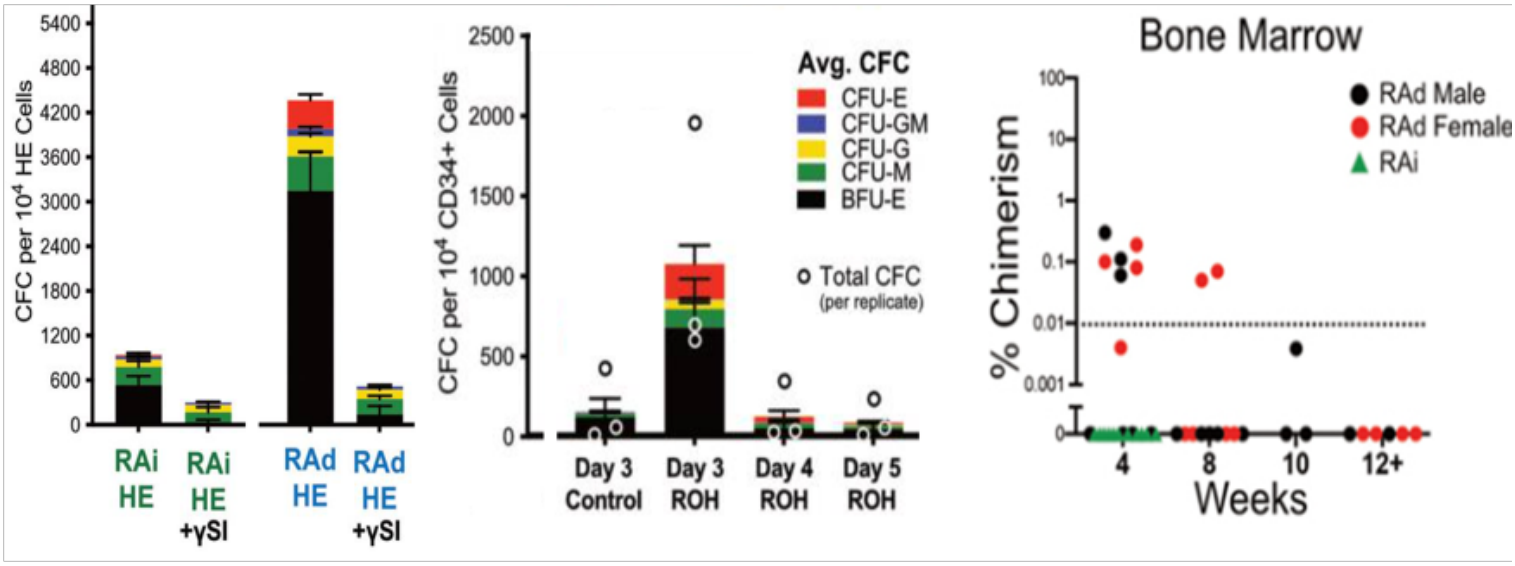
T-018886 — Scalable Generation of Hematopoietic Progenitors from Human Pluripotent Stem Cells

Technology Description

In vitro generation of CD34$^+$ hematopoietic progenitor cells (HPC) that faithfully recapitulate in vivo behavior is an area of ongoing research. A key characteristic of CD34$^+$ HPCs obtained from both embryos and adults is their dependence on retinoic acid (RA) signaling. However, HPCs obtained by existing *in vitro* methods from human pluripotent stem cells (hPSCs) are RA-independent. Researchers at Washington University and San Raffaele Telethon Institute have discovered a novel *in vitro* method for the generation of RA-dependent HPCs from hPSCs. RA supplementation to a critical sub-population and a temporally restricted stage of hPSC differentiation was found to significantly enhance hematopoiesis potential, and suggested the presence of a CD34$^+$, HSC-competent population in the bulk culture.



Left: Hematopoiesis potential of RA-dependent (RAd) hemogenic endothelium was significantly higher than RA-independent (RAi) HE. Middle: Supplementation of RA (ROH) at Day 3 of hPSC differentiation resulted in significantly more multi-lineage hematopoiesis. Right: Murine

xenografts showed that CD34^{+} cells (RAd) obtained by this method could persist temporary *in vivo* whereas conventional RAi cells completely failed to graft in neonatal mice.

Stage of Research

Validated protocol/culture media for commonly used hPSC lines, such as H1, H9, and iPSC1.

Applications

- Generation of *CD34*$^{+}$, RA-responsive HPCs that harbor definitive erythroid, myeloid, and lymphoid hematopoietic potential.
- Synthetic blood cell production for replacement therapy or off-the-shelf immunotherapy, as well as for research use only purposes.

Key Advantages

- High yield, scalable production of synthetic blood products from hPSCs compared to other published methods.

Patents: Patent pending, EU, CA and US rights available; see WO2020154412A1.

Related Web Links: Nat Cell Biol. 2022 May; 24(5): 616–624

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