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Modeling human hematopoietic and cardiac co-development in hPSC-derived organoids

Human pluripotent stem cells (hPSCs) are used to generate a broad range of organoids; self-organized, complex 3D structures resembling aspects of the architecture, cell composition and function of tissues found in embryogenesis or adult organs. By modulating our hPSC-based heart-forming organoid (HFO) model via stage-specific supplementation of hemato-endothelial factors, we have recently established the novel, so-called blood-generating (BG)-HFO. BG-HFOs comprise functional cardiac tissue with a ventricular-like phenotype, while featuring distinct endothelial subtypes, including a mesenchyme-embedded endothelial layer that generates hematopoietic cells possessing erythroid, myeloid and lymphoid potential. The morphological structure of BG-HFOs reflects aspects of cardiogenesis and hematopoiesis in vivo. BG-HFOs provide a platform for pharmacological testing, disease modeling and developmental studies, overcoming the limitations of studying these processes in human embryos.

