Hematopoietic cell development in the zebrafish embryo.

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Public Summary:
A precise understanding of how hematopoietic stem cells are patterned during development has important implications for both developmental biology and regenerative medicine. Since hematopoietic stem cells are the only hematopoietic cells capable of lifelong, multilineage blood cell production, understanding the stepwise, molecular processes of their instruction from mesoderm is key to replicating these events in vitro from pluripotent embryonic stem cells. The current understanding of hematopoietic stem cell specification is presented, with an outlook on future regenerative medicine approaches.

Scientific Abstract:
PURPOSE OF REVIEW: A wealth of new experimental evidence has been published over the past year that has helped refine our models of blood cell development. We will review this information, discuss the current models of hematopoietic ontogeny and provide perspective on current and future research directions, with an emphasis on how studies in the zebrafish are helping us better understand how hematopoietic stem cells are formed in the vertebrate embryo. RECENT FINDINGS: Several important studies have been published recently addressing the embryonic development of hematopoietic stem cells. These studies have helped clarify several controversial topics in developmental hematopoiesis, including the concepts of the hemangioblast and hemogenic endothelium. In particular, the postulate that hematopoietic stem cells arise through hemogenic endothelial intermediates has been greatly strengthened by a collection of convincing publications reviewed below. SUMMARY: A precise understanding of how hematopoietic stem cells are patterned during development has important implications for both developmental biology and regenerative medicine. Since hematopoietic stem cells are the only hematopoietic cells capable of lifelong, multilineage blood cell production, understanding the stepwise, molecular processes of their instruction from mesoderm is key to replicating these events in vitro from pluripotent embryonic stem cells.