

# Blood and bone: two tissues whose fates are intertwined to create the hematopoietic stem-cell niche

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The mechanisms of bone and blood formation have traditionally been viewed as distinct, unrelated processes, but compelling evidence suggests that they are intertwined. Based on observations that hematopoietic precursors reside close to endosteal surfaces, it was hypothesized that osteoblasts play a central role in hematopoiesis, and it has been shown that osteoblasts produce many factors essential for the survival, renewal, and maturation of hematopoietic stem cells (HSCs). Preceding these observations are

studies demonstrating that the disruption or perturbation of normal osteoblastic function has a profound and central role in defining the operational structure of the HSC niche. These observations provide a glimpse of the dimensions and ramifications of HSC-osteoblast interactions. Although more research is required to secure a broader grasp of the molecular mechanisms that govern blood and bone biology, the central role for osteoblasts in hematopoietic stem cell regulation is reviewed herein from the perspec-

tives of (1) historical context; (2) the role of the osteoblast in supporting stem cell survival, proliferation, and maintenance; (3) the participation, if any, of osteoblasts in the creation of a stem cell niche; (4) the molecules that mediate HSC-osteoblast interactions; (5) the role of osteoblasts in stem cell transplantation; and (6) possible future directions for investigation. (Blood. 2005;105:2631-2639)