University of Utah
UNDERGRADUATE RESEARCH JOURNAL

CHARACTERIZATION OF THE HEMATOPOIETIC STEM CELL MICROENVIRONMENT: UNDERSTANDING THE ROLE OF THE EXTRACELLULAR MATRIX

Jenna Langford, Tara Deans, PhD
Department of Biomedical Engineering

Hematopoietic stem cells (HSCs) are the stem cells of the bone marrow that proliferate to make the majority of blood cell types, including leukemic blood cells. HSCs are difficult to grow in vitro, but better HSC cultures could lead to therapies for abnormal HSC proliferation diseases such as leukemia. Hematopoiesis is the process whereby HSCs proliferate and differentiate to maintain appropriate levels of blood and immune cells. Understanding what influences hematopoiesis would allow for advancements in growing HSCs in vitro. However, it is not currently well understood what factors directly impact hematopoiesis [3].

We are interested in identifying the roles of the extracellular matrix (ECM) and its associated proteins in the bone marrow microenvironment. The HSC microenvironment is most directly influenced by the interplay of localized niches, which are heterogenous populations of cells that organize into functionally distinct regions in the bone marrow [2]. These regions signal to HSCs and guide progenitors for renewal, proliferation, and localization [1]. ECM molecules play an integral role in composing niches. Studies have shown that ECM within the niche can mediate functions of hematopoiesis [4]. Determining which components of the ECM are essential to the microenvironment is fundamental to understanding hematopoiesis and creating an effective HSC culture in vitro.

The Hematopoietic Stem Cell Niche, in Watercolor.

REFERENCES

[1] Calvi LM, Link DC. (2015, Jul.). The hematopoietic stem cell niche in homeostasis and disease. *Blood*. [Online]. *126(22),* pp. 2443-2451. Available: http://www.bloodjournal.org/content/126/22/2443

[2] Lo Celso C, Fleming H, Wu J. (2009, Jan). Live-animal tracking of individual haematopoietic stem/progenitor cells in their niche. *Nature* [Online]. *457 (7225),* pp. 92-96. Available: https://www.nature.com/articles/nature07434

[3] Sarkaria S, Decker M, Ding L. (2018, Mar.). Bone Marrow Micro-Environment in Normal and Deranged Hematopoiesis: Opportunities for Regenerative Medicine and Therapies. *BioEssays* [Online]. *40(3).* Available: https://onlinelibrary.wiley.com/doi/abs/10.1002/bies.201700190

[4] Muth C, Steinl C, Klein G, Lee-Thedieck C. (2013, Feb.). Regulation of Hematopoietic Stem Cell Behavior by the Nanostructured Presentation of Extracellular Matrix Components. *PLOS ONE* [Online]. *8(2),*e54778. Available: https://doi.org/10.1371/journal.pone.0054778