Project Summary:

Cell development and differentiation is controlled by transcription factors; however, DNA is wrapped around histones to create nucleosomes, which are further wrapped to compact, higher order structures occluding transcription factor binding sites. Certain transcription factors known as pioneer factors are able to bind wrapped DNA and mediate unwrapping of DNA and the assembly of transcription complexes for gene transcription and expression. Rare, quiescent, hematopoietic cells in the bone marrow contain genomes that are poised for activation to proliferate and generate all erythroid, myeloid, and lymphoid lineages. This hematopoietic process provides us an opportunity to understand the transcription factors needed to immune cell development. ATAC-seq allows us to probe the genome for unwrapped sections of DNA. By measuring the accessibility of DNA during differentiation we can determine at which step in the differentiation process that sections of the genome become accessible to gene transcription leading to cell differentiation. Motif analysis of these stretches of DNA will allow us to determine which transcription factors are the initial factors that are present during these crucial differentiation stages.

Successful completion of these studies could reveal novel pioneer transcription factors during immune cell development.