SINGLE-CELL TRANSCRIPTOME AND MASS CYTOMETRY PROFILING REVEALS THE MECHANISMS OF EMBRYONIC LEUKOCYTE MIGRATION

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Macrophages are one of the white blood, or leukocyte, cell types of the immune system. The majority of tissues in the body contain tissue-resident macrophages and they represent interesting targets for modern medicine, as a wide spectrum of diseases has been linked to their dysfunctions. Recent studies have revealed that tissue-resident macrophages in many adult tissues are established during development by embryonic precursors that seed the tissues during embryonic development. These cells persisting in the adulthood are maintained locally and independently of bone marrow cells at homeostasis. Each tissue has its own composition of embryonically derived and adult bone marrow-derived macrophages. Currently, it is still not known whether macrophages of distinct origins are functionally similar or do they have unique roles in tissue homeostasis or in disease processes.

Despite the growing knowledge of the mechanisms involved in leukocyte migration in adulthood, the role of individual molecules and mechanisms that mediate and regulate leukocyte migration during fetal ontogeny is still unknown. Correct distribution and migration of leukocytes during the embryonic development are critical as they have a central part in normal development, tissue homeostasis and immunological defense. The mobilization of embryonic leukocytes from the site of origin to peripheral tissues via the blood circulation requires pathways involving molecular and cellular signals that control and fine-tune the trafficking of leukocytes and/or their progenitors during embryogenesis. There is currently no information on the molecular players that are involved in this leukocyte migration during embryogenesis. In this project, we will combine in vivo models with novel single-cell approaches and combine single-cell genomics with single-cell proteomics to understand the biomolecular interactions behind the embryonic leukocyte migration. Understanding mechanisms underlying the migration of macrophages, or their precursors, in embryo could be useful for manipulating macrophage function and exploring the possibility of tissue-resident macrophages being therapeutic targets in relevant diseases in the future.

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