Myeloid cells

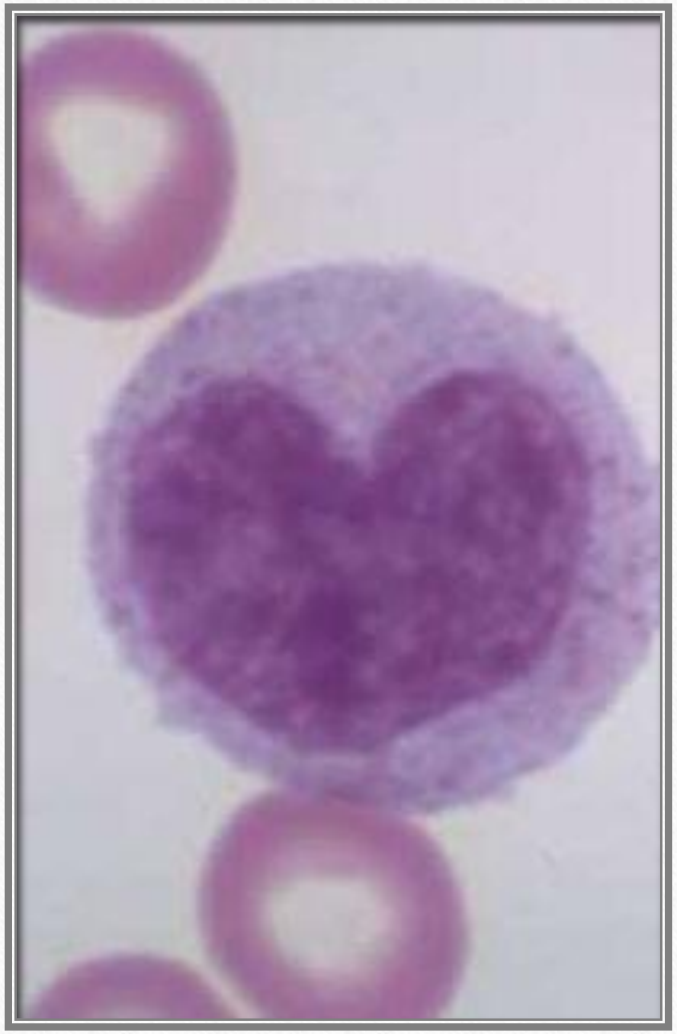
Things to be learned in this lecture

- Development of myeloid cells.
- Types and function of myeloid cells

- Monocytes, macrophages, and dendritic cells (DCs) constitute a group of myeloid cells which share common hematopoietic origins and express related functions in host homeostasis and innate and acquired immunity.
- They develop in hematopoietic organs, enter the circulation, and are widely distributed throughout almost all tissues.

Monocyte

Monocytes are rounded cells, with oval, kidney-shaped, or indented nuclei, a rim of heterochromatin, and mostly euchromatic nucleoplasm. Their cytoplasm is relatively abundant, compared with non activated lymphocytes, containing myeloperoxidase+ and rudimentary lysozyme+ granules, nonspecific esterases, and lysosomes.

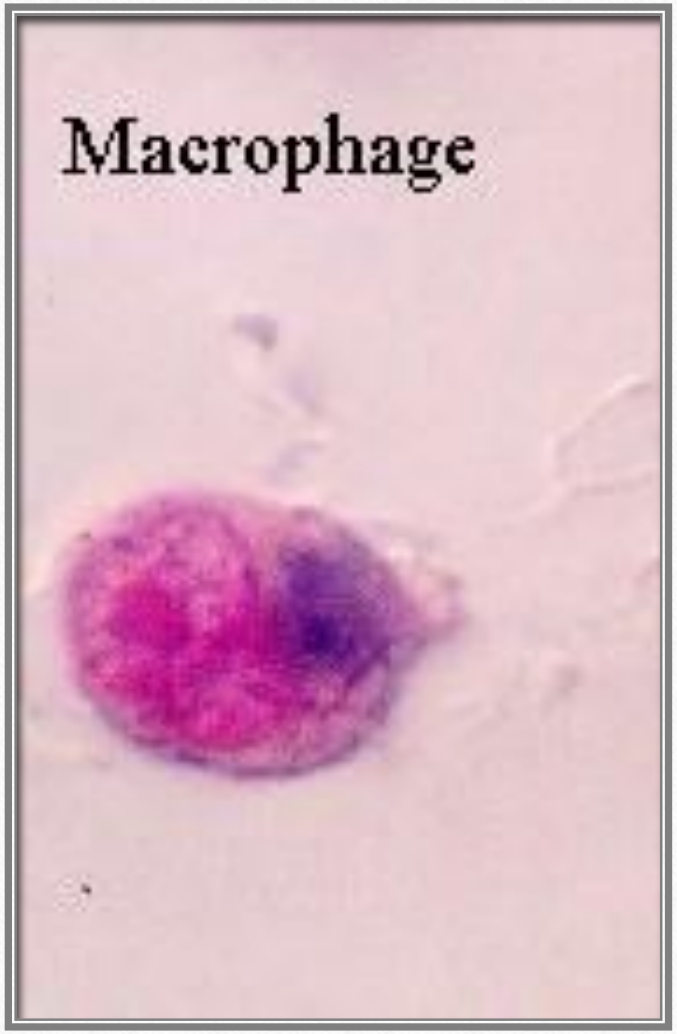


Monocyte Subset

- Monocytes may be divided into two or more subsets based on the expression of phenotypic properties and differentiation potential.
- The major “classical” subset in humans expresses high CD14 and variable CD16 and comprises 90% of circulating monocytes.
- The remaining 10% express high CD16 and moderate CD14 and are known as “nonclassical.”

Macrophage

Macrophages are larger, rounded with two or more processes, sticky and sluggish though motile, and with extensive, dynamic plasma membrane processes and filopodia. Podosomes have been observed. It is rich in synthetic organelles and endocytic vesicles, often containing debris and residues of phagocytosis in abundant lysosomes.



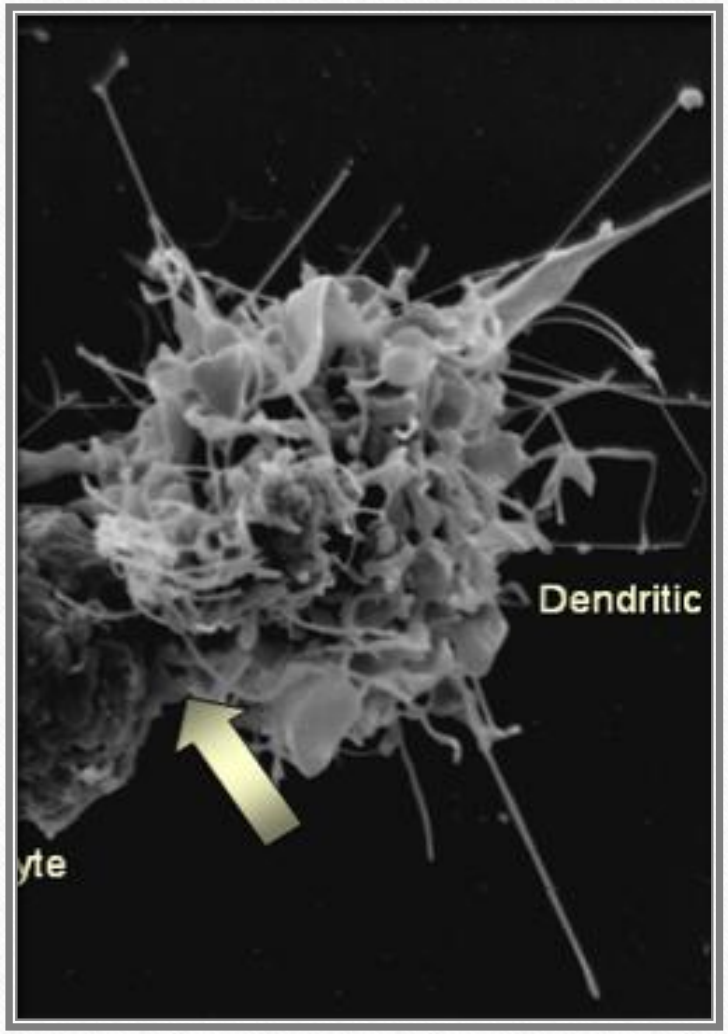
Macrophages subsets

- M1 macrophages, as mentioned earlier, M1 "killer" macrophages are activated by LPS and IFN-gamma, and secrete high levels of IL-12 and low levels of IL-10.
- M2 "repair" designation broadly refers to macrophages that function in constructive processes like wound healing and tissue repair, and those that turn off damaging immune system activation by producing anti-inflammatory cytokines like IL-10, high levels of IL-10, TGF-beta and low levels of IL-12.

Dendritic cell

DCs in the blood are smaller than monocytes .During migration through the afferent lymph they mature into “veiled cells” with extensive macropinocytic processes.

In lymph nodes they are highly motile and transit rapidly between T cells until a cognate antigen interaction is detected by the T cell



Dendritic cell subsets

- Human and mouse DCs fall into two principal categories, myeloid or “classical” (in mice) and plasmacytoid.
- Blood myeloid DCs have a pale-staining monocytoid morphology and also bear CD11c, in common with monocytes.
- Plasmacytoid DCs are more basophilic, reflecting their secretory capacity, and may express a number of lymphoid markers including CD2 and CD7.

Chemotaxis

- Chemotaxis of MPs to inflammatory sites is stimulated by factors such as complement component C5a, *N*-formylated oligopeptides, fragments of fibronectin, elastin, and collagen; and by secreted proteins called chemokines.
- Stimulation by chemotactic factors results in increased integrin affinity and therefore binding to the endothelium at the same time as formation of lamellipodia and actin polymerization, resulting in cell movement.
- Three families of cell surface glycoproteins mediate most cell adhesion: integrins, immunoglobulin-related molecules, and selectins.

- The process involves monocyte tethering and rolling on the surface of activated endothelial cells mediated mainly by activated selectins; firm adhesion is mediated by VCAM-1 and ICAM-1 on the endothelium, binding to *b*1 and *b*2 integrins expressed on leukocytes.

Endocytosis and Phagocytosis

- Monocytes and macrophages are able to internalize and ingest soluble and particulate ligands, including apoptotic cells and micro-organisms, with variable efficiency.