

Sights to Macrophages

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Received: January 01, 2021; **Accepted:** January 15, 2021; **Published:** January 22, 2021

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1. Editorial

Macrophages are essential immune system cells that are produced in response to an infection or when damaged or dead cells accumulate. Big, specialized cells that identify, engulf and kill target cells are macrophages. The term macrophage is produced by the mixture of the Greek words "makro" meaning big and "phagein" meaning eat. Macrophages also play a significant anti-inflammatory function, in addition to increasing inflammation and stimulating the immune system, and can minimize immune reactions through cytokine release. Macrophages that promote inflammation are called M1 macrophages, while M2 macrophages are called those that reduce inflammation and facilitate tissue repair.

1.1 Formation: By the differentiation of monocytes, one of the major groups of white blood cells of the immune system, macrophages are produced. The monocytes exit the bloodstream when there is tissue damage or infection and enter the infected tissue or organ and undergo a series of modifications to become macrophages. In order to combat various different microbes and invaders, these macrophages may change themselves to form different structures. In this way, in defending the host from infection, macrophages provide the first line of protection. Chemical substances are attracted by chemotaxis to the damaged site by monocytes, caused by a variety of stimuli, including damaged cells, pathogens and cytokines produced by macrophages already at the site. Macrophages have been shown to populate the organ by proliferation at certain locations, such as the testis. On the cell surface, each of the macrophages has unique protein markers. CD14, CD11b, EMR1, MAC-1/MAC-3, Lysozyme M, and CD68 are just some examples. It is possible to

1.2 Function: Ingesting and destroying microbes is a significant role of macrophages in host defense. Killing processes include the enzymatic generation and proteolytic digestion of reactive oxygen and nitrogen species that are toxic to microbes. The most significant feature of macrophages is the phagocytosis of bacteria, viruses, and other foreign particles. The macrophages have Fc receptors on their cell surfaces that communicate with the Fc portion of the IgG, thus facilitating the opsonized organisms to be ingested. To a greater degree, the elimination of dying cells is done by fixed macrophages that remain in strategic positions such as the lungs, liver, neural tissue, bone, spleen and connective tissue, ingesting foreign materials such as pathogens and, if necessary, recruiting additional macrophages. The presentation of antigen on the surface of infected macrophages in the lymph node (in the sense of MHC class II) promotes the proliferation of TH1 (type 1 helper T cells) (mainly due to IL-12 secretion from the macrophage). If the same unprocessed surface antigen on the bacterium with its surface attached antibody is recognized by a B-cell in the lymph node, the antigen is endocytosed and processed. As APCs that display antigens and activate T lymphocytes, macrophages serve. In the effector process of T cell-mediated immune responses, this role is important. The fragments of antigen are displayed on the macrophage cell surface in combination with class II MHC proteins after ingestion and degradation of foreign materials for interaction with the TCR of CD4⁺ helper T cells. By inducing new blood vessel development (angiogenesis) and collagen-rich extracellular matrix synthesis, macrophages facilitate the repair of damaged tissues (fibrosis). These functions are regulated by macrophage-secreted cytokines that work on different tissue cells.

