

# Macrophages

Macrophages are cells of the immune system that arise from monocytes by traveling into tissues. [1] They are professional **phagocytes**, i.e. cells capable of phagocytosis. They are part of non-specific immunity. It participates in the inflammatory reaction.

## Development series

The myeloid progenitor in the bone marrow turns into a myeloid precursor. From marrow to blood, they pass as immature cells destined to migrate from the blood to tissues and body cavities, where they are converted into **tissue macrophages**.

Tissue macrophages include:[1]

- Kupffer cells;
- histiocytes;
- osteoclasts
- microglia.

Some macrophages become **dendritic cells**. Macrophages live a long time and go to different activation stages.

## Function

They phagocytize the remains of their own cells killed by apoptosis and necrosis. They kill both intracellular and extracellular bacteria. Macrophages are fully functional only after activation of the signals given to them by T-lymphocytes in the form of cytokines (interferon- $\gamma$ , TNF). Their main functions include:

- **phagocytosis**;
- **antigen presentation** – presentation of antigen to T-lymphocytes;
- **production of cytokines and modulators** – IL-1, IL-8, IL-12, TNF, GM-CSF, interferons.

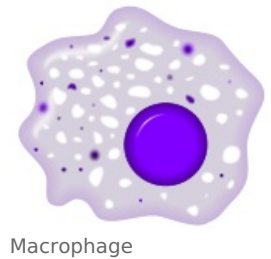
Various **receptors** and macromolecules (HLA I and II classes, receptors for complement, Fc-receptors) are found on the surface of the macrophage.

## Mononuclear phagocytic system (MFS)

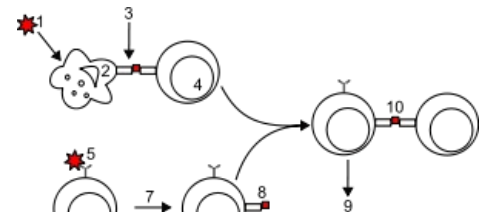
Sometimes also referred to as **RES** (reticuloepithelial system). It is a collection of all macrophages in different tissues. Their coincidence with reticular ligament cells was assumed, but this was not proven.

According to the appearance of the granules that have been phagocytosed, or in which organ the macrophages are found, they are called:

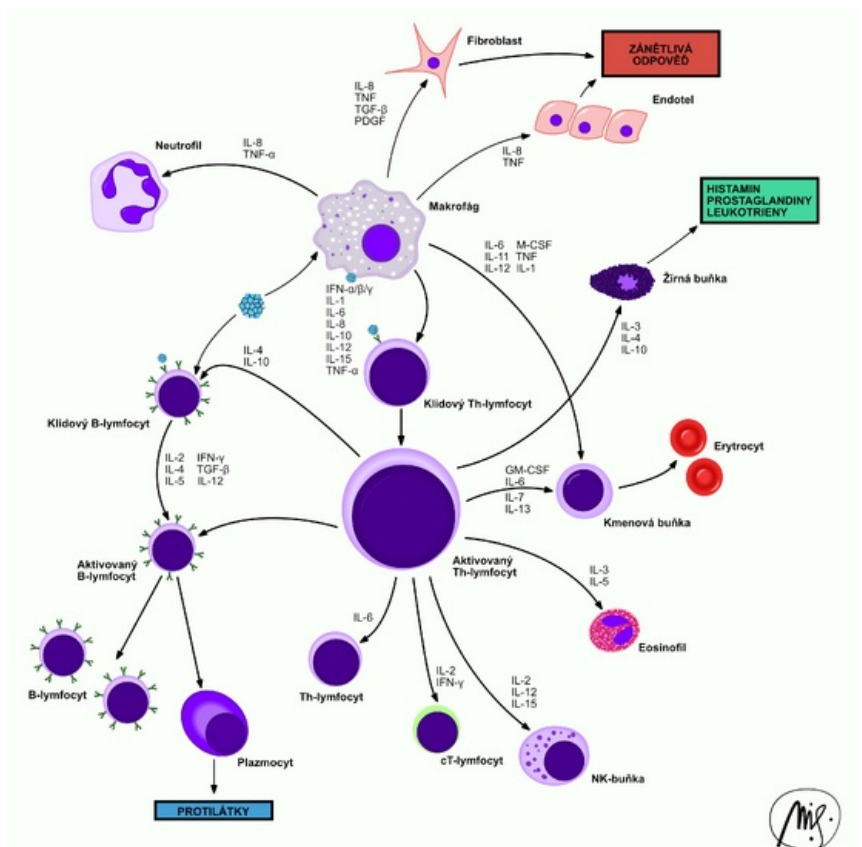
- siderophages – phagocytosed hemoglobin (rusty pigment);
- conioophages – in the lungs, phagocytosed dust (black amorphous pigment);
- Kupffer cells – macrophages of liver sinuses;
- microglia – macrophages in CNS tissues.



Macrophage



The course of phagocytosis and antigen presentation



Cytokine interactions between cells of the immune system

## Links

## Related articles

- Phagocytosis
- Neutrophilic granulocytesphil granulocytes
- Hematopoiesis
- Alveolo-capillary membrane
- Granulomatous inflammation

## Bibliography

- HOŘEJŠÍ, Václav – BARTŮŇKOVÁ, Jiřina. *Základy imunologie*. 3. edition. Triton, 2008. 280 pp. ISBN 80-7254-686-4.

## References

1. ŠVÍGLEROVÁ, Jitka. *Makrofágy* [online]. The last revision 2009-02-19, [cit. 2010-11-11]. <<https://web.archive.org/web/20160306065550/http://wiki.lfp-studium.cz/index.php/Makrofág>>.