

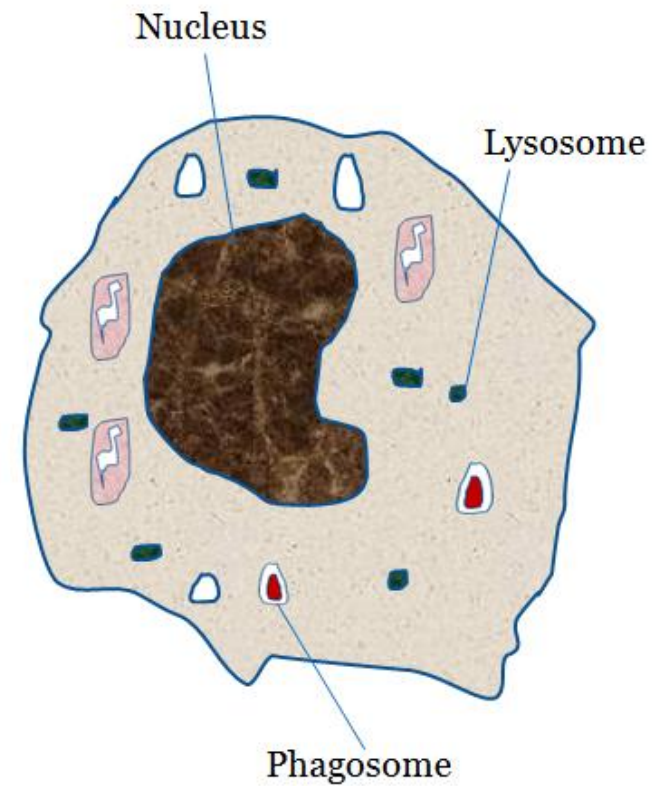
Basis knowledge of monocytes and macrophage in inflammation

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Monocyte

- **Concept:** Monocytes are a type of white blood cell produced by the bone marrow from hematopoietic stem cell precursors. They are the largest of all leucocytes and are part of the innate immune system of vertebrates including all mammals (humans included), birds, reptiles, and fish.
- **Main roles in immune function:** (1) replenishing resident macrophages and dendritic cells under normal states,
- (2) in response to inflammation signals, monocytes can move quickly (approx. 8–12 hours) to sites of infection in the tissues and differentiate into macrophages and dendritic cells to elicit an immune response.
- Half of them are stored in the spleen. Monocytes are usually identified in stained smears by their large kidney shaped or notched nucleus.

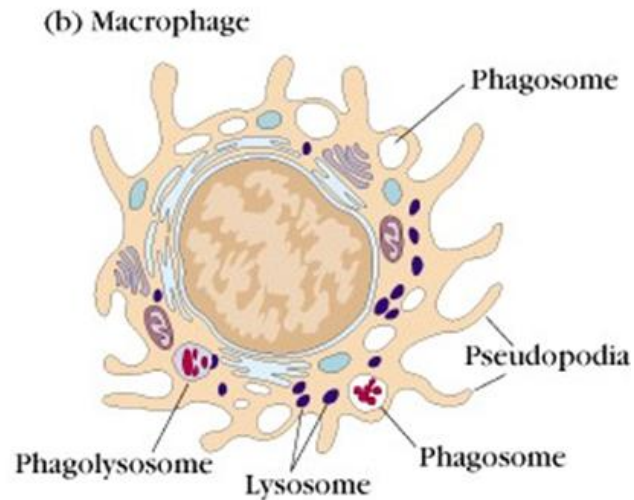


Monocyte subpopulations

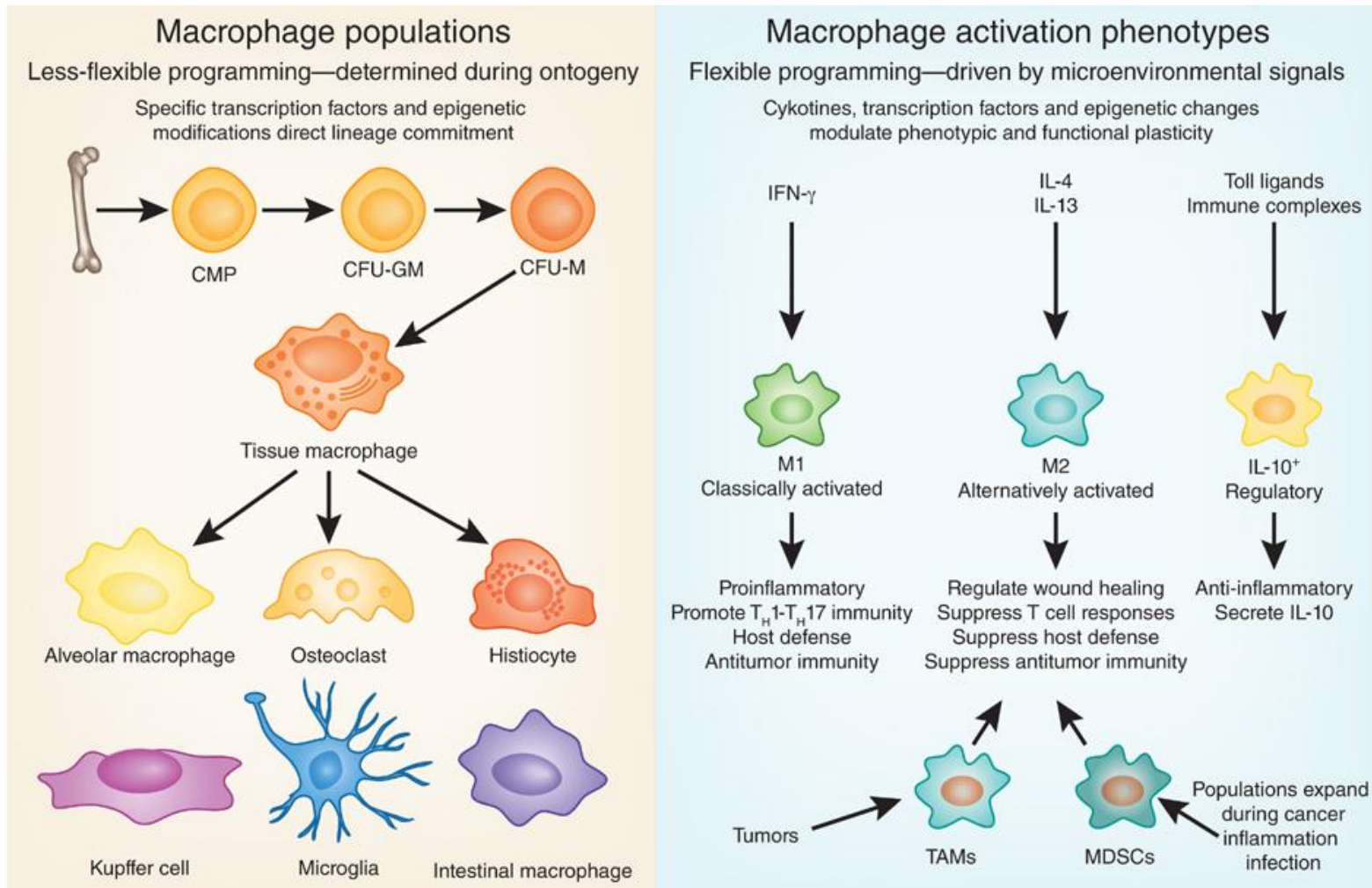
- In human blood:
 - a) Classical monocyte is characterized by high level expression of the CD14 cell surface receptor (CD14⁺⁺ CD16⁻ monocyte)
 - b) Non-classical monocyte shows low level expression of CD14 and with additional co-expression of the CD16 receptor (CD14⁺CD16⁺⁺ monocyte).
 - c) Intermediate monocyte with high level expression of CD14 and low level expression of CD16 (CD14⁺⁺CD16⁺ monocytes).
- In mice blood:
 - a) Inflammatory (LY6C^{hi}) monocytes represent approximately 2–5% of circulating white blood cells in an uninfected mouse and are rapidly recruited to sites of infection and inflammation (CCR2^{hi}, CX₃CR1^{low})
 - b) CX₃CR1^{hi} (LY6C^{low}) monocytes patrol the blood vessel lumen by associating with the vascular endothelium. (CX₃CR1^{hi}, CCR2^{low})

Macrophage

- Macrophages are cells produced by the differentiation of monocytes in tissues.
- Macrophages can be identified by specific expression of a number of proteins including CD14, CD40, CD11b, CD64, F4/80(mice)/EMR1 (human), lysozyme M, MAC-1/MAC-3 and CD68 by flow cytometry or immunohistochemical staining.



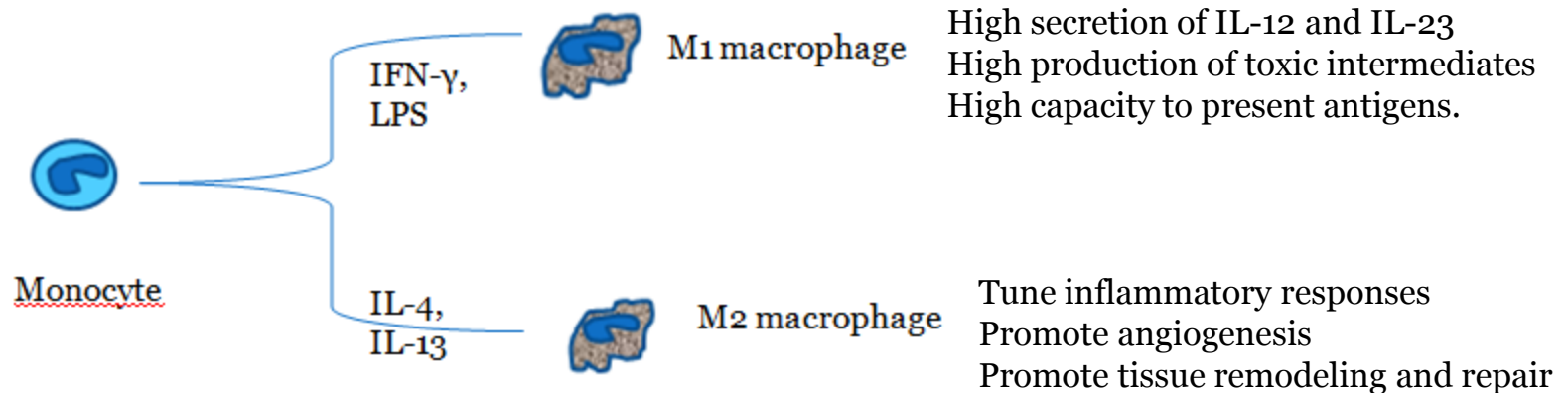
Macrophage populations and functional subsets



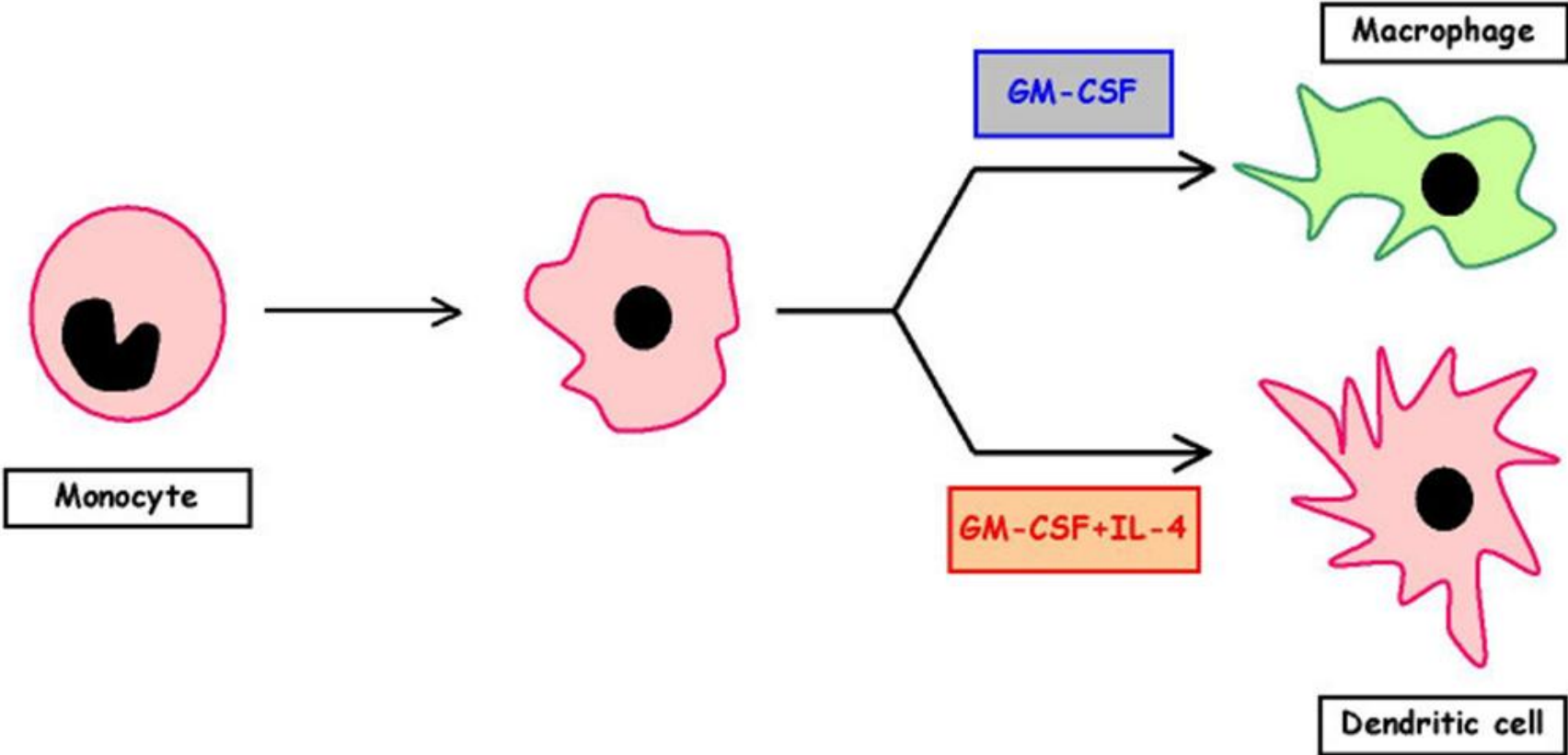
Macrophage subtypes

Classical activated (M1) macrophage: antimicrobial programme of macrophage activation induced by interferon- γ and TLR ligands; product pro-inflammatory cytokines (IL-6, TNF, IL-1); have antigen presentation and microbicidal activity; express MHC class II molecules.

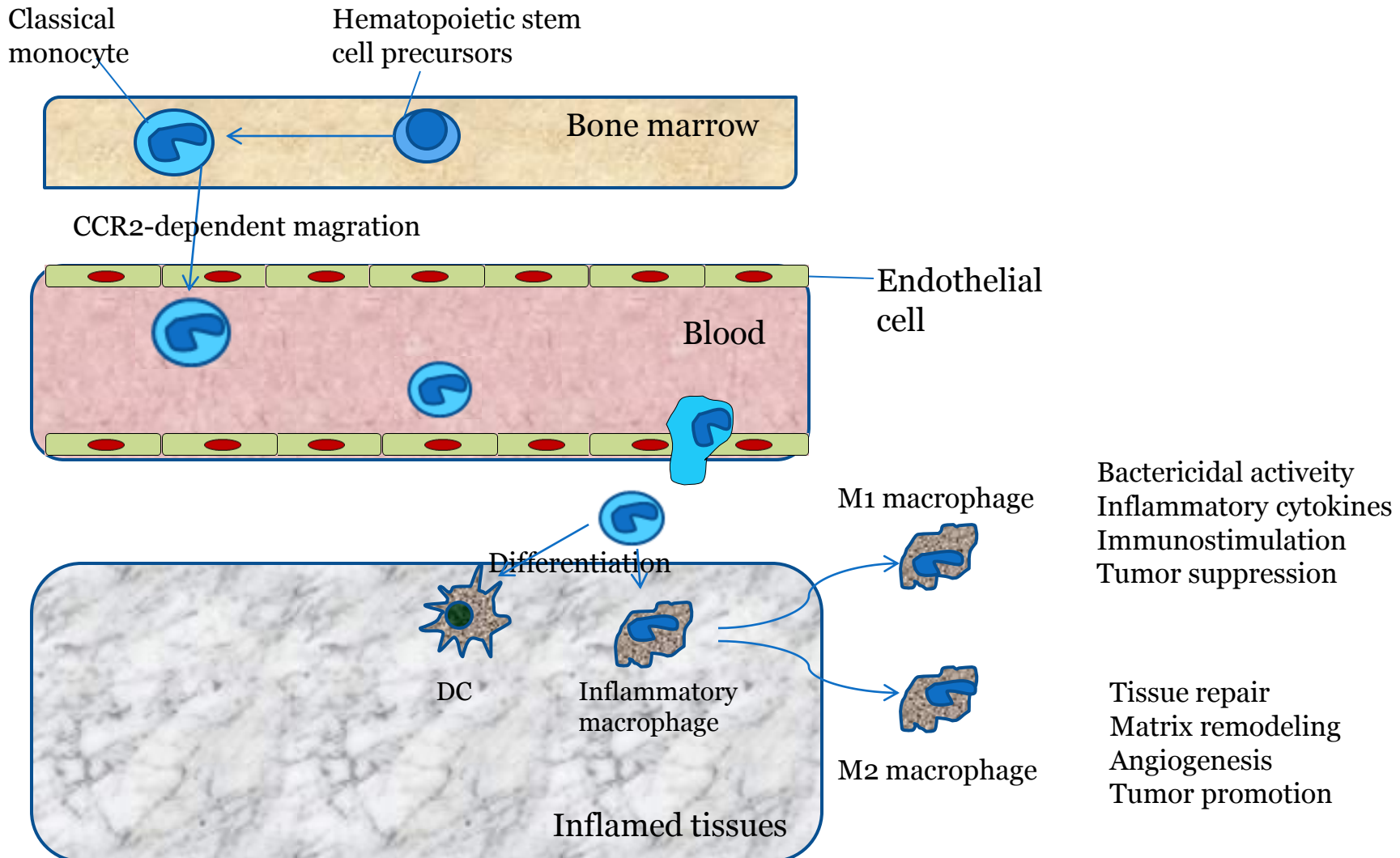
Alternatively activated (M2) macrophage: stimulated by the T_H2 -type cytokines IL-4 and IL-13; produce anti-inflammatory cytokine(IL-10, IL-1Ra); promote cell growth and tissue repair; endocytic activity.



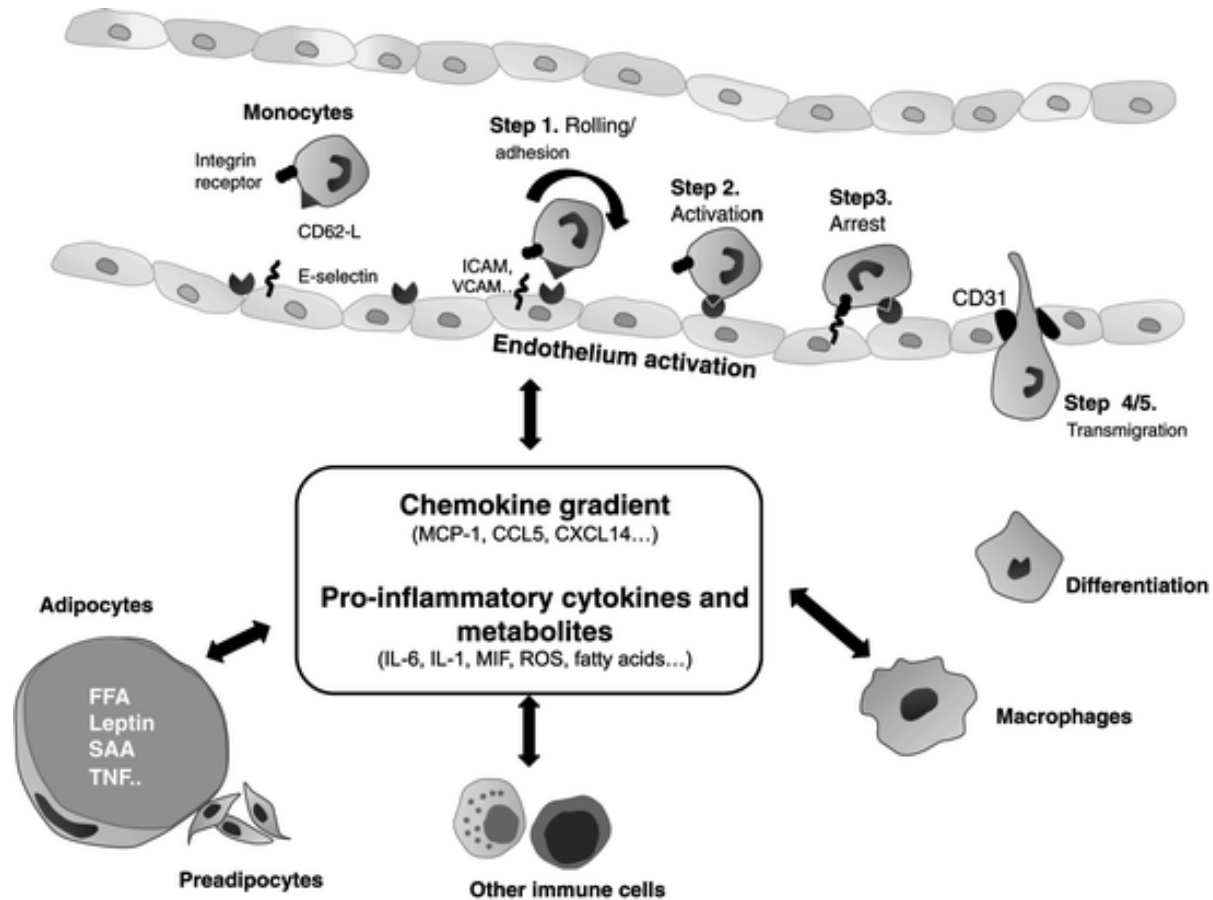
Monocytes differentiate in vitro



Monocyte recruitment to inflamed tissues



Monocyte recruitment in the adipose tissue





Thanks for your attention!