The immune system plays a critical role in maintaining the homeostasis throughout the body, and it is the main responsible for tissue repair and regeneration. Microglia are the immune resident cells of the central nervous system and, despite sometimes being detrimental, they principally exert a beneficial role.

The aim of this work is to review the current knowledge about the role of microglia in the promotion of regeneration, tissue repair and homeostasis restoration in the central nervous system. Specifically focusing in the context of Multiple Sclerosis, the protective roles of microglia are explored.

Macroglia in inflammation and tissue repair

In Multiple Sclerosis and Potential Beneficial Implications of Microglia -

Multiple Sclerosis

- One of the most common causes of neurological disease among young adults, especially affecting females from the northern hemisphere (possible genetic and environmental factors).
- Chronic inflammatory disease, characterized by multifocal demyelination and progressive neurodegeneration affecting the CNS.
- Cause and the exact pathophysiologic mechanisms are not currently known and only disease-modifying drugs are available for therapeutic management.

Th1 responses

Pro-inflammatory cytokines (IL-1, IL-6, TNFα)
ROS, RNS, NO
Killing of intracellular pathogens

Th2 responses

Immunoregulation
Anti-inflammatory cytokines (IL-10, TGFβ)
Wound-healing
Anti-parasitic

Infection (virus, bacteria)
Injury/Tissue damage

MHC II INOS

Classically activated
Alternatively activated

The immune-privilege of the CNS is not absolute and presence of immune cells is not always detrimental but aimed to restore homeostasis.

- Issues to Consider -

- All data come from original research articles and reviews.
- A bibliographic search was performed using PubMed database in order to find relevant articles about the topic that were published in high impact factor journals.
- A posterior selection was done based on the quality of the information and the relevance of the publication.

- Conclusions -

- The behaviour of mononuclear phagocytic cells of the CNS is similar to the behaviour found outside it: regulatory function for tissue homeostasis and repair in healthy and pathologic conditions.
- Although chronic inflammation will always be detrimental; rather than suppressing the immune system, a promising approach would be to modulate it towards its “positive version” (M2-like).
- In MS remyelination occurs spontaneously but fails to complete due to the lack of a regeneration-supportive environment. As inflammatory response perpetuates, remyelination efficiency declines leading to disability progression. Microglia, due to its primary role for tissue repair and homeostasis, promotes remyelination, specially the M2-like phenotype.