



The Role of Macrophage Subsets in Response to *Borrelia burgdorferi*



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Background

Borrelia burgdorferi and Macrophage Cells

- *Borrelia burgdorferi* is the causative agent of Lyme disease, a bacterial infection acquired by being bitten by an infected tick
- Macrophages play a significant role in the spontaneous resolution of arthritis
- Multiple macrophage subsets cooperate at an infection site to fight *Borrelia burgdorferi* and resolve symptoms



Background

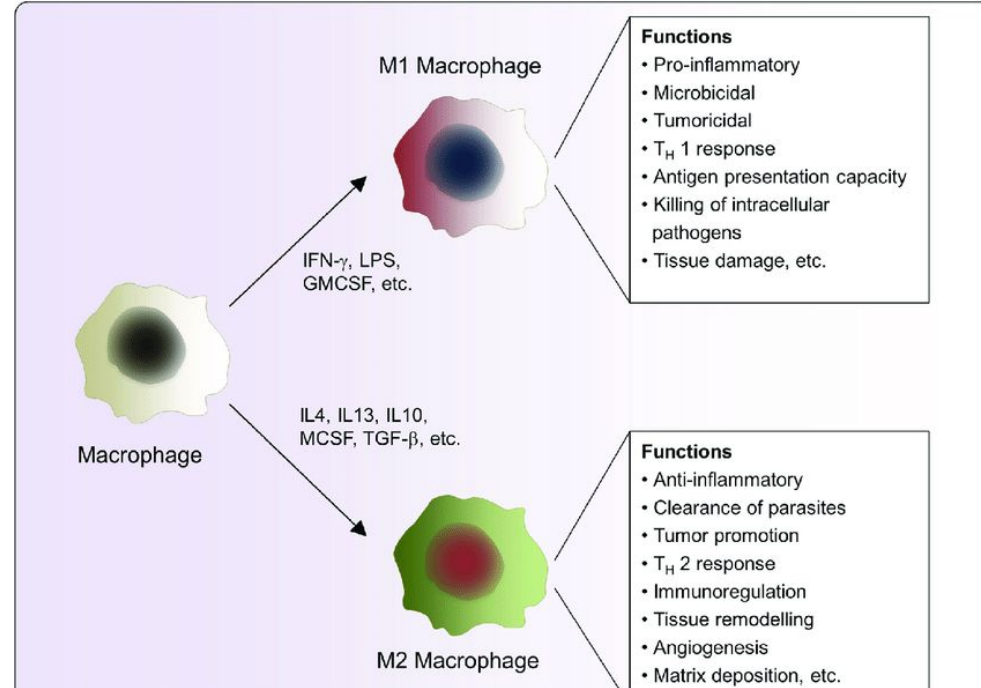
M1

“Classically activated”-polarized to a pro-inflammatory phenotype by lipopolysaccharide or IFN- γ , phagocytose invasive bacteria and produce proinflammatory cytokines

M2

“Alternatively activated”-polarized to a pro resolving phenotype by IL-4, involved in tissue repair and wound healing

The relative contribution of M1 and M2 cells to fight *Borrelia burgdorferi* infection and resolve arthritis symptoms is unclear.



Hypothesis and Goals

HYPOTHESIS:

M2 cells produce cytokine and lipid mediators that inhibit inflammation and allow the *Borrelia burgdorferi* to persist.

GOALS:

I aim to investigate the differences in the response of M1 and M2 when infected with *Borrelia burgdorferi* by measuring cytokine production, lipid mediator production, and bacterial killing.

Methodology

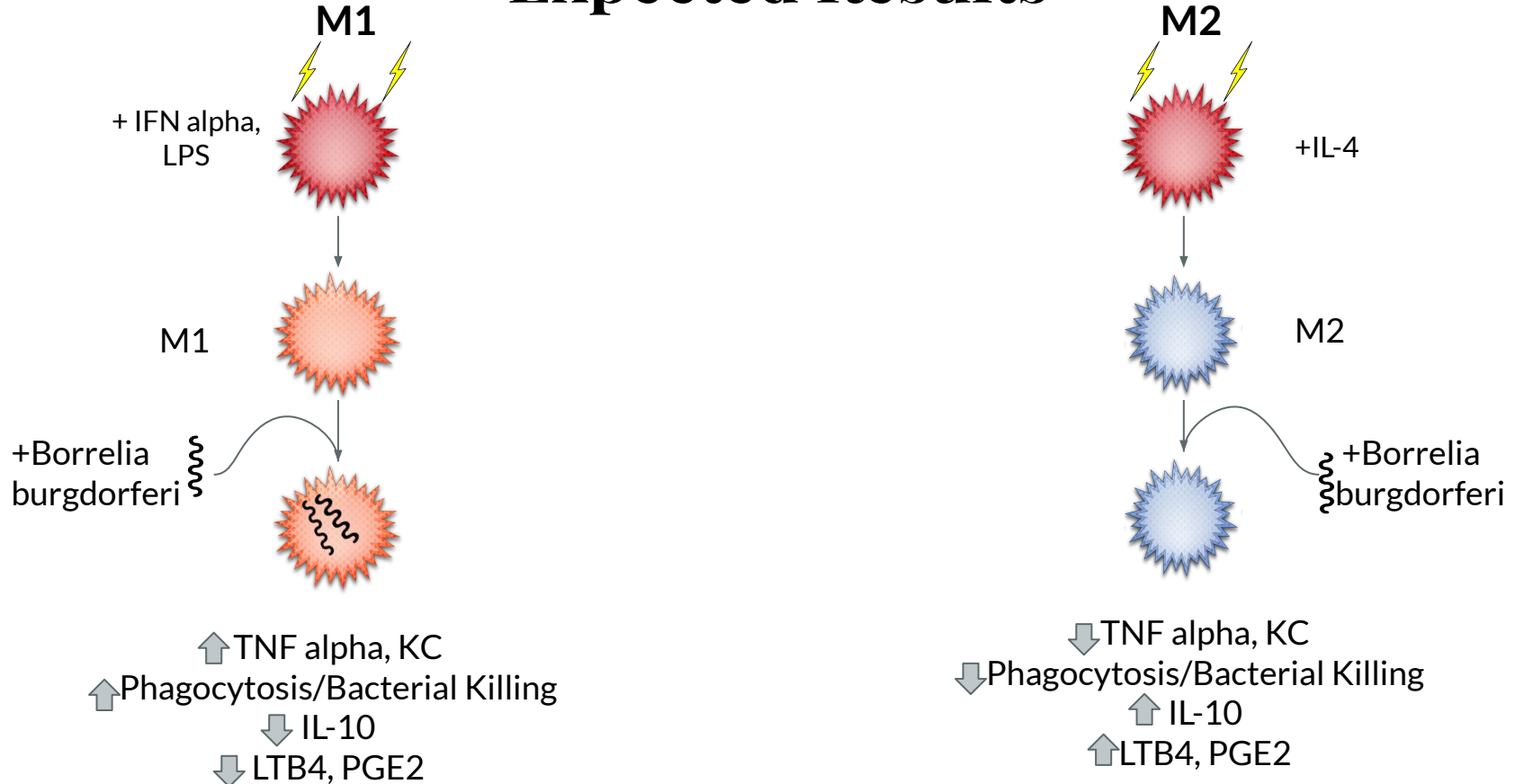
EXPERIMENTAL DESIGN:

- Grow and maintain a macrophage cell line *in vitro*
- Stimulate the macrophages into becoming either M1 or M2 cells.
- Co-culture the M1 and M2 cells with *Borrelia burgdorferi* and measure the cytokine production, lipid mediator production, and bacterial killing.

EXPERIMENTAL READOUT:

- Cytokine Production→ ELISA to measure the cytokines TNF alpha, KC, and IL-10
- Lipid Mediator Production→ EIA or ELISA to measure LTB4 and PGE2.
- Bacterial Killing→ phagocytosis assay to see if *Borrelia burgdorferi* has been taken up by macrophage cells because this demonstrates bacterial killing through phagocytosis

Expected Results



Impact and Relevance

- This study will provide important information regarding the function of M1 and M2 cells during infection with *B. burgdorferi* and may provide clues for development of future therapeutics.
- Research regarding the impact of macrophage phenotype in disease resolution can be applicable to various different disease models, and could be instrumental in the design of new therapeutics

My Research Experience

MARC/IMSD PROGRAM:

Excellent mentorship has helped me to prepare for a doctoral program

Support system and safe space for me to grow academically and socially

LAB IN THE DEPARTMENT OF VETERINARY PATHOLOGY:

Allowed me to grow and develop as a scientist

Encouraged my curiosity and has helped me to understand my goal of attaining a PhD