

Microglia Immunoreactivity: The Regional Heterogeneity of Microglia Cell Responses to a Peripheral Immune Challenge

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Neuroinflammation of the brain plays an important role in many functions of the brain, and also holds a role in many neurodegenerative diseases, such as Alzheimer's and Parkinson's. So far, treatments for these diseases have focused on neuronal death, while previous literature does not focus on glial functioning. Microglia, the innate immune cells of the central nervous system, play an important role in neuroinflammation through a mechanism called activation, where microglia take on an amoeboid morphology and release both pro- and anti-inflammatory cytokines that contribute to inflammation. We looked at differences in activation between MMTV-PyMT mice, with one group injected with lipopolysaccharide (LPS) and the other group injected with a saline control. The MMTV-PyMT mice have a mutation that makes them more susceptible to spontaneous mammary tumors. We stained the microglia from each mouse with an antibody against the Iba-1 protein, found exclusively in microglia. We then imaged microglia using both fluorescent and confocal microscopy, then analyzed several morphometric factors such as soma body area, cell average process length, cell count and proportional area to quantify level of activation. We predicted that microglia in the SN will express greater microglia activation in response to LPS challenge, characterized by differences in soma body area, proportional area of Iba-1 staining, cell counts, and microglia processes length. Based on our results, we concluded that there was no significant difference between LPS-injected and saline-injected MMTV-PyMT mice in their microglial activation, and that there wasn't a difference in activation between both the substantia nigra and basolateral amygdala. Our results play an important role in our understanding of how microglia are activated in response to an immune challenge event, which can then be used to better treat diseases such as Alzheimer's or Parkinson's disease.