Establishing Macrophage-Neuron Co-Culture Systems To Assess Neuronal Dynamics

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Neurons, the cells composing the nervous system, are responsible for sending and receiving signals that result in everything from thoughts to movement. Macrophages, a type of cell in the immune system, are responsible for fighting against pathogens to keep the host healthy. Macrophages are heterogeneous and plastic and exist in one of two polarization states, pro-inflammatory or anti-inflammatory (M1 and M2 respectively). Despite being seemingly unrelated, understanding the interaction between these two types of cells is vital for understanding how they influence neural repair. In the peripheral nervous system macrophages appear to be essential in the regeneration process, but how they affect neuronal growth is not clear. I hypothesized that M2, but not M1 macrophages enhance neuronal growth. To test this, splenic macrophages were cultured and grown in a medium containing the cytokine m-CSF to promote survival. Then they were replated onto a culture with dorsal root ganglion neurons (DRGs) in either medium containing m-CSF (control), IL-4 (anti-inflammatory), or IFN-y (pro-inflammatory). The cultures were allowed to grow for several days, and macrophage morphology and neuronal outgrowth were measured. I successfully grew both macrophages and DRG neurons in culture and found that cytokine treatment affected macrophage morphology. These preliminary data suggest that cytokines directly influence macrophage shape, indicating a change in their function and that DRG neurons can survive in the presence of macrophages regardless of their polarization state. Continuation of this research will further our understanding of how macrophages influence neuronal growth after injury.

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