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EFFECT OF SIMULATED MICROGRAVITY ON THE IMMUNE RESPONSE IN THE CENTRAL NERVOUS SYSTEM, USING AN IN VITRO MODEL OF TRAUMATIC BRAIN INJURY.

Abstract

Introduction: Since the beginning of space travels, it has been investigated about the physiological behavior of the human body in microgravity environments and more specifically the immune system, finding that prolonged exposure to these environments alters the normal function of the immune system, promoting a state of immunosuppression. On the other hand, data has been reported about central nervous system (CNS) and its behaviour in microgravity, however these works are just focused on sensory perception and its adaptation, but the relationship between these two systems is much deeper than it has been investigated. For example microglia, as part of the innate immune system in CNS, shown as an excellent indicator of immune activity in the CNS. Chelyshev et al. described the activation of microglia in spinal cord mice subjected to simulated microgavity, so it will be necessary to investigate its behavior with a noxious stimulus in this enviroment. So far, it has not yet investigated the effect of microgravity on the immune response in the CNS, neither the pathophysiology triggered by a noxious stimulus such as traumatic brain injury (TBI).

Methodology: We propose to use a culture of nerve cells from rat brain, that will be subjected to simulated microgravity on a Rotating Wall Vessel (RWV). They will be divided into 4 groups: Group 1: control gravity; Group 2: injury on gravity; Group 3: control in simulated microgravity; Group 4: damage in simulated microgravity. In the 4 groups two proinflammatory cytokines (IL-1 and TNF-) and two antiinflamatory (IL-10 and IL-13) will be analyzed by ELISA. Also a immunohistoquemical analysis will be used to measure Iba-1+ for microglia, GFAP+ for astrocytes and Fluoro-Jade staining for degenerating neurons. The lesion will be performed by the method of tearing in neuronal cultures with a needle of 1cm long.

Conclusions: Currently there are no protocols that focus on investigating the immune response in CNS on simulated microgravity environments. Our group used the TBI model to describe the pathophysiological pathways and potential therapeutic targets to help limiting secondary damage. If we find that microgravity decreases proinflammatory immune response, this could be a potential therapeutic option for patients that suffering from autoimmune activity against CNS.