Phytochemical Intervention for Neuroinflammation: Quercetin in Modulating Macrophage Dynamics at the Blood-Brain-Barrier

Pachiardi, Lorena (School: Cupeyville School)

Chronic neuroinflammation and macrophage migration to the blood-brain barrier BBB are key features of neurological diseases, with adhesion driving pro-inflammatory responses. However, prolonged anti-inflammatory treatments pose risks like osteoporosis and cardiovascular issues. This study explores quercetin from soursop as a potential phytochemical inhibitor of macrophage adhesion to brain endothelial cells. While quercetin's peripheral anti-inflammatory effects are well-known, its impact on macrophage adhesion to BBB endothelial cells remains unclear. To explore this, RAW 264.7 macrophages and bEnd.3 brain endothelial cells were used. Inflammation was induced in bEnd.3 cells with 100 ng/ml LPS, followed by 5 μM quercetin treatment for 48 hours. A fluorescence-based adhesion assay was employed to quantify the attachment of macrophages to bEnd.3 cells. Results indicated that 5 μM quercetin did not decrease macrophage adhesion to bEnd.3 cells under inflammatory conditions. In contrast, the anti-inflammatory drug dexamethasone (50 μM) significantly decreased macrophage adhesion to bEnd.3 cells. These findings imply that incubation of BBB cells with quercetin under inflammatory conditions does not affect their binding to macrophages. Future studies will focus on macrophage incubation with quercetin to further evaluate its impact on BBB cell adhesion. Results showed a significant increase in macrophage adhesion to BBB endothelial cells with LPS exposure, confirming our system as a reliable model for studying inflammation-induced adhesion. This research contributes to a deeper understanding of how phytochemicals can affect inflammation-related cellular functions.

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