Hyaluronic Acid Viscosupplement Modulates Inflammatory Mediators in Chondrocyte and Macrophage Coculture via MAPK and NF-κB Signaling Pathways

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Osteoarthritis (OA) is a chronic musculoskeletal disorder characterized by cartilage degeneration and synovial inflammation. Paracrine interactions between chondrocytes and macrophages play an essential role in the onset and progression of OA. In this study, in replicating the inflammatory response during OA pathogenesis, chondrocytes were treated with interleukin-1β (IL-1β), and macrophages were treated with lipopolysaccharide and interferon-γ. In addition, a coculture system was developed to simulate the biological situation in the joint. In this study, we examined the impact of hyaluronic acid (HA) viscosupplement, particularly Hyruan Plus, on chondrocytes and macrophages. Notably, this viscosupplement has demonstrated promising outcomes in reducing inflammation; however, the underlying mechanism of action remains elusive. The viscosupplement attenuated inflammation, showing an inhibitory effect on nitric oxide production, downregulating proinflammatory cytokines such as matrix metalloproteinases (MMP13 and MMP3), and upregulating the expression levels of type II collagen and aggrecan in chondrocytes. HA also reduced the expression level of inflammatory cytokines such as IL-1β, TNF-α, and IL-6 in macrophages, and HA exerted an overall protective effect by partially suppressing the MAPK pathway in chondrocytes and p65/NF-κB signaling in macrophages. Therefore, HA shows potential as a viscosupplement for treating arthritic joint.