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Bone and joint protection ability of ceramic material with biological effects.

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Abstract

Ceramic materials with biological effects (bioceramic) have been found to modulate various biological effects, especially those effects involved in antioxidant activity and hydrogen peroxide scavenging. As arthropathy and osteopathy are the major chronic diseases of geriatric medicine, we explored the possible activity of bioceramic on these conditions using animal and cell models. Rabbits received intra-articular injections of lipopolysaccharides (LPS) to induce inflammation that mimic rheumatic arthritis. FDG isotopes were then IV injected for PET scan examinations at 16 hours and 7 days after the LPS injection. We examined and compared the bioceramic and control groups to see if bioceramic was capable of relieving inflammation in the joints by subtracting the final and initial uptake amount of FDG (max SUV). We studied the effects in prostaglandin E2 (PGE2) inhibition on the human chondrosarcoma (SW1353) cell line, and the effects on the murine osteoblast (MC3T3-E1) cell line under oxidative stress. All the subtractions between final and initial uptakes of FDG in the left knee joints of the rabbits after LPS injection indicated larger decreases in the bioceramic group than in the control group. This anti-arthritic or inflammatory effect was also demonstrated by the PGE2 inhibition of the SW1353 cells. We further proved that bioceramic treatment of the MC3T3-E1 cells resulted in increased viability of osteoblast cells challenged with hydrogen peroxide toxicity, and increased alkaline phosphatase activity and the total protein production of MC3T3-E1 cells under oxidative stress. Since LPS-induced arthritis is an experimental model that mimics RA, the potential therapeutic effects of bioceramic on arthropathy merit discussion. Bioceramic may contribute to relieving inflammatory arthritis and maintaining bone health.

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