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A COMPUTATIONAL ANALYSIS OF EFFECTS OF MICROGRAVITY ON A BIO FABRICATED BONE

Abstract

Microgravity, the condition of near-weightlessness in space, poses unique challenges to the human body and offers potential for scientific breakthroughs alongside its physiological effects on astronauts. Among the areas of exploration is biofabrication, involving the 3D printing of living tissues. Despite its promise in regenerative medicine, bioprinting faces complexities influenced by gravity, such as hydrodynamic forces and limited cell distribution etc. Leveraging computational modeling, this study examines how microgravity impacts cell behavior and tissue formation within biofabricated bone scaffolds, potentially mitigating some challenges encountered on Earth. Enhanced cell quality and growth rate observed in microgravity suggest promising avenues for bone regeneration in space exploration, with implications for optimizing bioprinting strategies both in space and on Earth. This in silico analysis signifies a significant step towards advancing medical applications, offering insights that could revolutionize bioprinting techniques in microgravity environments.