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SPACE AND REGENERATIVE MEDICINE: NEW INSIGHTS

Abstract

Cell therapy has made spectacular progress in recent years. Human induced pluripotent stem cells and human embryonic stem cells are currently used in regenerative medicine to treat neurological, cardiac or liver diseases etc. As early as 1998, human embryonic cells were isolated and cultured in a pluripotent state. Oriented differentiation of stem cells provides cells of interest for specific tissue repair. While stem cell-based therapy requires great numbers of stem cells, the differentiation and proliferation of such cells remain very challenging. Here, we present the state of the art on recent studies into the enhancement of the cellular culture of totipotent cells, drawing on the recent field of space life sciences and space-specific factors such as microgravity, which would enable the enhancement of their potential therapeutic effects. Our review of the literature showed that the stem cell research approach under microgravity-like environments for the development of 3D tissue engineering is an evolving field. As under the earth gravity, cell cultures cultivate in a 2D manner due to their precipitation, many experimental approaches and sorts of microgravity simulators have been designed for 3D tissue engineering. Studies have shown that 3D cell cultures are efficient regarding the proliferative capacity, the viability and the gene expression homeostasis.Tissue engineering under microgravity attained great advancements in generating 3D organoids, spheroids, or tissues with and without scaffolds. These advancements has enhanced promising efforts toward advancing the field of regenerative medicine.