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Hydrogen supplementation of preservation solution improves viability of osteochondral grafts

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Abstract

Allogenic osteochondral tissue (OCT) is used for the treatment of large cartilage defects. Typically, OCTs collected during the disease-screening period are preserved at 4°C; however, the gradual reduction in cell viability during cold preservation adversely affects transplantation outcomes. Therefore, improved storage methods that maintain the cell viability of OCTs are needed to increase the availability of high-quality OCTs and improve treatment outcomes. Here, we evaluated whether long-term hydrogen delivery to preservation solution improved the viability of rat OCTs during cold preservation. Hydrogen-supplemented Dulbecco's Modified Eagles Medium (DMEM) and University of Wisconsin (UW) solution both significantly improved the cell viability of OCTs during preservation at 4°C for 21 days compared to nonsupplemented media. However, the long-term cold preservation of OCTs in DMEM containing hydrogen was associated with the most optimal maintenance of chondrocytes with respect to viability and morphology. Our findings demonstrate that OCTs preserved in DMEM supplemented with hydrogen are a promising material for the repair of large cartilage defects in the clinical setting.

Figures

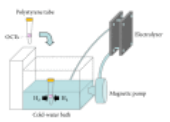

Figure 1 Hydrogen electrolyzer system used to...

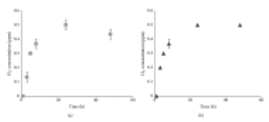

Figure 2 Measurement of hydrogen concentration in...

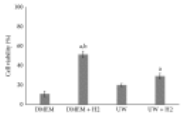

Figure 3 Effect of hydrogen on cell...

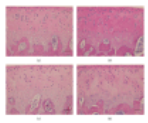

Figure 4 Representative hematoxylin and eosin-stained tissue...

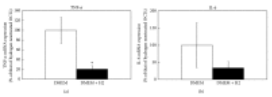

Figure 5 Real-time PCR analysis of OCTs...

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