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ORAL

Impacts of polymer-based and graphene-based biomaterials on the characteristics of Wharton jelly's-derived mesenchymal stem cells

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Abstract

The combination of mesenchymal stem cells (MSCs) and biomaterials scaffolds hold significant promise in tissue engineering and regenerative medicine field. In recent years, expansion and differentiation of MSCs culturing with polymer-based and graphene-based biomaterials have been intensely studied. However, the underlying molecular mechanisms are still largely unknown. This study was to examine the different characteristics of Wharton's jelly (WJ)-derived MSCs using two different types of biomaterials including polymer-based (PU157) and graphene oxide-based (GO). In term of proliferation, WJ-MSCs culturing with PU157 and GO showed no significant differences compared to the controls. PU157 and GO had no effects on morphological features of WJ-MSCs. RT-PCR results showed that all WJ-MSCs co-culturing with or without PU157 and GO expressed positive surface markers including CD29, CD44, CD73, CD90, CD105, CD106 and CD166 but the expression of negative markers (CD34, CD45 and CD133) was undetectable. The SOX2 and RUNX2 expression were both upregulated in WJ-MSCs combining with PU157 when compared to the controls at passage 6, where no obvious difference was observed in passage 3. Interestingly, COL2A expression became more noticeable in the presence of PU157 at passage 6 than passage 3. In contrast, GO did not alter the expression of stemness, osteogenic, adipogenic and chondrogenic genes. Both alizarin red and oil red staining showed calcium and lipid deposition in WJ-MSCs co-cultured with PU157 and GO respectively, suggesting the presence of osteoblast- and adipocyte-like cells. In conclusion, PU157 exerted certain effects on the expression gene profiles at later passage and able to enhance differentiation abilities in WJ-MSCs.

Keywords

Mesenchymal stem cell, biomaterials, polymer-based, graphene oxide, gene expressions

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References