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BIOMATERIALS MODULATE GENE EXPRESSION AND EPIGENETIC MARKERS OF AMNIOTIC MEMBRANE-DERIVED MESENCHYMAL STEM CELLS

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SUMMARY

Mesenchymal stem cells have a finite self-renewal capacity and are lineage-restricted. Biomaterials can function not only providing mechanical support for cell attachment but also modulating their surface properties and cellular responses via gene and epigenetic regulation. The study was to evaluate how graphene oxide (GO) and collagen (COL) influence the gene expression and epigenetic profile of amniotic membrane-derived mesenchymal stem cells (AM-MSCs). AM-MSCs were cultured in the presence of GO or COL. The expression of cell surface marker and MSCs markers was investigated by RT-PCR. To examine the effect of biomaterials on epigenetic markers, western blot was performed. Upregulation of surface markers such as *CD105*and *CD166* were observed in the presence of these two biomaterials. GO was found to upregulate the expression of stemness gene *OCT3/4*, *NANOG* in contrast to COL which downregulated these genes while increased the expression of adipogenic genes, *CEBPβ, CEBPα* and *PPARγ.* Besides that, these two biomaterials also increased the expression of DNA methyltransferases, *DNMT1* and *DNMT3a*. In term of histone modifications, only the expression of H3K9 acetylation was altered. COL was found to increase the expression of H3K9 acetylation, while GO showed an inversed expression. The expression of pERK1/2 was also upregulated by COL. These preliminary findings suggest that promotion of adipogenesis by COL is associated with histone acetylation and ERK pathway, while GO has more prominent roles in maintaining pluripotency of AM-MSCs.