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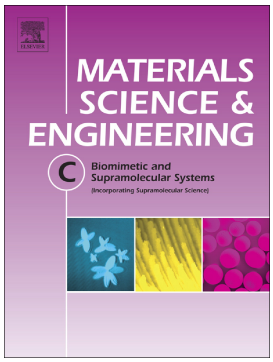

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ACCEPTED MANUSCRIPT

Neurogenic Differentiation of Adipose Derived Stem Cells on Graphene-based Mat

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Abstract: Adipose derived stem cells (ADSCs) have been proved as an abundant and accessible cell source with the ability to differentiate in to neuron-like cells. However, the low differentiation efficiency puts forward an important challenge to practical applications in clinic. Considering of the good biocompatibility of graphene-based materials and the potential interaction between graphene and cells mentioned in previous studies, herein, we investigated the effect of graphene oxide (GO) and reduced graphene oxide (rGO) mats on neurogenic differentiation of the ADSCs. We demonstrated the excellent capabilities of graphene-based mats, especially GO to support the neural differentiation of ADSCs. By comparing the observation under an optical microscope and fluorescence microscope, the conversion rate of neuron-like cells reached about 90%. We consider that GO mat is better for promoting the differentiation of ADSCs into neuron-like cells, which compared to rGO based platforms. Meanwhile, we made an analysis of the mechanism by which graphene induced the differentiation of ADSCs to neuron-like cells. The data obtained here highlight the effect of GO mat on neurogenic differentiation of ADSCs and implicate the potential of graphene-based materials in application of neural tissue engineering for the limited self-repair capability of nerve cells.

Keywords: Graphene; neurogenic differentiation; adipose derived stem cells; biocompatibility; neural tissue engineering

1. Introduction

Since the first description in 2002, adipose-derived stem cells (ADSCs) have been considered as potential alternatives to mesenchymal stem cells (MSCs) and other stem cells for cell research[1-5]. On the one hand, it avoids the problem of insufficient cell populations, poor histocompatibility and even ethical concerns caused by other stem cells, most importantly, it has

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