

## Enhanced photo-transfection efficiency of mammalian cells on graphene coated substrates

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### ABSTRACT

Literature reports graphene, an atomic-thick sheet of carbon atoms as one of the promising biocompatible scaffolds that promotes cellular proliferation in human mesenchymal stem cells. On the other hand, different mammalian cell lines including the induced pluripotent stem cells exhibited an accelerated proliferation rate when cultured on graphene or graphene oxide coated substrates. These findings provide strong motivation to explore the full capability of graphene in further pluripotent stem cell research activities as there exists an urgent requirement to preserve their therapeutic potential. This therefore calls for non-invasive procedures for handling stem cells *in-vitro*. For example, recent literature has shown successful laser light driven transfection in both multipotent and pluripotent stem cells. In order to explore the non-invasive nature of optical transfection alongside biocompatible qualities of graphene, in this work we investigated the impact of optically transfecting mouse embryonic stem (mES) cells plated on graphene coated sample chambers. Using Chinese Hamster Ovary cells (CHO-K1), we further studied the influence of graphene on cell viability as well as cell cytotoxicity through assessing changes in levels of mitochondrial adenosine triphosphate (ATP) activity and the release of cytosolic lactate dehydrogenase (LDH) respectively. Our results showed that compared to those treated on plain glass, CHO-K1 cells optically treated while plated on graphene coated substrates exhibited a higher production of ATP and a milder release of LDH. In addition there was enhanced photo-transfection efficiency in both CHO-K1 and mES cells irradiated on graphene sample chambers.

**Keywords:** Graphene, pluripotent stem cells, biocompatible scaffolds, photo-transfection, cell viability, cell cytotoxicity, mouse embryonic stem cells