Graphene oxide as a new material in lung cancer therapy

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In recent years, graphene enjoys an interest in many fields of science. Graphene is widely used in electronics and electrical engineering. But its unusual physical and chemical properties caused that started to study its biological properties. Interesting for scientists is the affinity of graphene to biological structures that related to its carbon structure [1]. In addition, graphene as a thin, tough, transparent and chemically resistant material appears to be a very good material for the production of implants, scaffolds for tissue engineering and biosensors [2]. Interest in graphene also resulted in the beginning of research about the possibility of its application in cancer therapy. One of the potential applications of graphene in anticancer therapy is to use it to block the supply of nutrients and oxygen to the tumor [3].

The aim of our work was to investigate a cytotoxic effect of graphene oxide (GO) on cancer A549 and normal MRC-5 cell line. We examined the influence of different concentration of GO on both cell line after 24h and 48h. The cytotoxicity of graphene oxide (GO) was assessed using metabolic activity alamarBlue® assay and differential staining (calcein AM and propidium idiode, Figure 1). Additionally, to investigate the mechanism of action of GO, the ROS (Reactive Oxygen Species) and LDH (Lactase Dehydrogenase Release) were examined. We were able to note that synthesized by us, GO had influenced only cancer A549 cell line. The cytotoxic effect was dose- and time-dependent. In addition, we showed the cytotoxic mechanism of GO based on high affinity of GO sheets to cancer cells and blocking the reach of nutrients to them. Moreover, we have proved that the GO can cause cell membrane damage and generation of reactive oxygen species. In the future, we will plan to carry out a research, which will help to explain the high affinity of graphene oxide to cancer cells.

References

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Figures

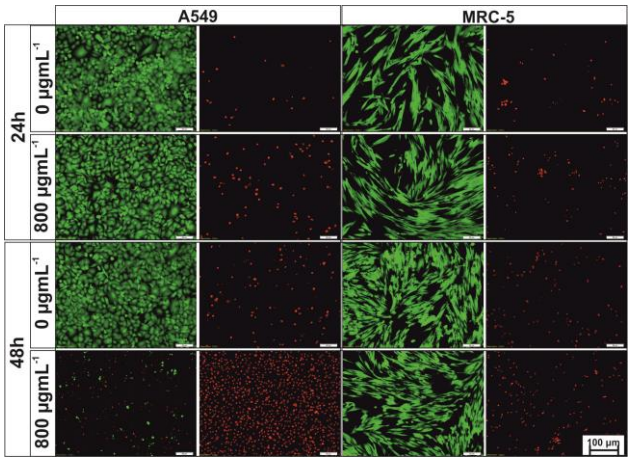

Figure 1: Microscopic analysis (differential staining) of viability of A549 and MRC-5 cells treated with 0 µgmL^{-1} and 800 µgmL^{-1} GO. Measurements were performed 24 h and 48 h after GO treatment.

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