IN VITRO BIOCOMPATIBILITY EVALUATION OF GRAPHENE OXIDE ON A549 CELL LINE AND ITS POSSIBLE USE AS A "IN SITU" DRUG DELIVERY SYSTEM

L. De Marzi[a*], **F. Perrozzi**[b], **L. Ottaviano**[b], **A. Monaco**[b]
V. Palermo[c], **E. Treossi**[c], **S. Santucci**[b] and **A. Poma**[a]

[a]Department of Basic and Applied Biology, University of LAquila, LAquila, Italy
[b]Department of Physics, University of LAquila, LAquila, Italy
[c]CNR-ISOF, Via Gobetti 101, 40129 Bologna, Italy

Graphene and its derivatives, of which one of the most important is Graphene Oxide (GO), have attracted great research interest for their potential applications in electronics, energy and material science. However, little information of their toxicity and biocompatibility is available despite the big impact that such devices can bring to the biomedical and drug delivery systems [1,2]. In a recent work Y.Chang et al. [1] suggest that GO does not enter the A549 cell line and has no obvious cytotoxicity but, on the other hand, GO can cause a dose-dependent oxidative stress in cells and induce a slight loss of cell viability at high concentration. Overall, GO is a pretty safe material at cellular level, which is confirmed by the favorable cell growth on GO film. It is even known (Zhuang Liu *et al.* [2]) that the PEGylazation of GO let this pure two dimensional material be more soluble in biological solution, included serum.
The rationale of the work presented in this abstract is to evaluate the biocompatibility of both GO "nude" and GO functionalized with PEG, on A549 cell line, a tumor cell line, and use the eventually biocompatibility to perform a cross-link interaction between the tumorigenic cells and a range of anti-tumoral drugs, specific for the pulmonary cancer treatment. In this way, it will be possible to evaluate and compare, *in vitro*, different anti-tumoral drugs and analyze which one is the most efficient and performing.
The work is organized in two different phases: a first step of physical-chemical characterization and a second step that devoted to the understanding of the biocompatibility of the selected materials on living systems. The physical-chemical characterization was performed by SEM and AFM microscopies, both on GO "nude" and on PEG-GO, and by XPS analysis. For the biological evaluation, we performed a comprehensive study on the biocompatibility of graphene oxide (GO) analyzing the influences of GO on the morphology and viability on A549 cell line, performing the Colony Forming Efficiency tests.

References

[1] Yanli Changa, Sheng-Tao Yanga, Jia-Hui Liua, Erya Dong, Yanwen Wang, Aoneng Cao, Yuanfang Liu, Haifang Wanga, Toxicology Letters 200 (2011) 201210.
[2] Zhuang Liu, Joshua T. Robinson, Xiaoming Sun, and Hongjie Dai, J. Am. Chem. Soc. 2008 August 20; 130(33): 1087610877.