

Carbon nanoparticles as nanoprobe for cancer therapy.

M. Rodio^a, R. Intartaglia^b, S. Lettieri^a, G. Manda^c, S. Giordani^{a*}

^a Nano Carbon Materials, Istituto Italiano di Tecnologia (IIT), Via Morego 30, 16163, Genoa, Italy

^b Nanophysics, Istituto Italiano di Tecnologia (IIT), Via Morego 30, 16163, Genoa, Italy

^c Victor Babes National Institute of Pathology, 99-101 Splaiul Independentei, 050096, Bucharest, Romania

* E-mail: *Silvia.Giordani@iit.it*

Multifunctional nanosystems able to carry out different tasks simultaneously would be of broad impact in the emerging field of nanomedicine. In this contest, composites based on carbon nanoparticles combined with functional molecules could be applied as agents in cancer therapy, imaging and drug delivery applications. [1] Nanosystems designed for these applications should satisfy some criteria in terms of *in-vitro/vivo* properties, such as biocompatibility, stability and non-immunogenic response. In this contest, carbon nano-horns (CNHs) have recently attracted much attention in the scientific community due to their excellent physical and chemical properties [2], i.e., large surface area for surface functionalization with fluorescent molecules for labelling and imaging.

In this study, the design and characterization of oxidized and fluorescent CNHs and the evaluation of their cytotoxic effects on normal and cancer cells are reported. Dynamic Light Scattering (DLS), Zeta Potential analysis and Spectroscopy techniques (Raman, XPS) are used to investigate the morphology and surface chemistry of CNHs. The cellular viability and proliferation along with the induced intracellular ROS production and the evaluation of various immune responses are discussed. Finally, CNHs localization into cellular substructures is investigated by means of microscopy techniques.

References

[1] Bartelmess J, Quinn SJ, Giordani S. Carbon nanomaterials: multi-functional agents for biomedical fluorescence and Raman imaging. *Chemical Society Reviews* 2015;44:4672-98.

[2] Jiang B-P, Hu L-F, Shen X-C, Ji S-C, Shi Z, Liu C-J, et al. One-Step Preparation of a Water-Soluble Carbon Nanohorn/Phthalocyanine Hybrid for Dual-Modality Photothermal and Photodynamic Therapy. *ACS Applied Materials & Interfaces* 2014;6:18008-17.