Study on cytotoxicity of carbon nanotubes

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Owing to the novel properties of carbon nanotubes (CBNs), a series of problems associated with in vitro toxicity assessments of carbon nanotubes (CNTs) have appeared in many literatures. In order to properly evaluate the potential risk to human health, the cell toxicity assay of CBNs can not be conducted by traditional methods employed in common toxicology.

Ying Zhu and Wenxin Li in Laboratory of Nano-biology and Medicine, Shanghai Institute of Applied Physics, Shanghai, P. R.China gave this point of view in their review articles. This paper, "Study on Cytotoxicity of Carbon Nanotubes" was published in Issue 51 (November, 2008) of the *Science in China Series B: Chemistry* .

With their production and application at large scale, CNTs may cause adverse response to the environment and human health. Thus, the study on bio-effects and safety of CNTs has attracted great attention from scientists and governments worldwide. Unfortunately experimental information obtained thus far on CNTs' cytotoxicity is often lack of comparability, or even in contradiction.

This paper systematically reviewed most of the experimental results reported in the literatures. The emphasis was placed on the examination of a variety of factors affecting CNTs cytotoxicity, including species of CNTs, impurities contained, lengths of CNTs, aspect ratios, chemical modification, and assaying methods of cytotoxicity. Based on analysis of the research status on cytotoxicity of CNTs, the authors suggested that care should be taken for several issues such as chemical modification

and realistic exposure, more complete and quantified characterization of CNTs, determination methods of cell viability. More importantly, the studies on physical and chemical mechanisms of CNTs' cytotoxicity should be strengthened.

In view of novel properties of CNTs, namely huge surface areas, high adsorption activity, and great ability of internalization into cells, CNTs are able to deliver various molecules in surroundings which usually can not enter cells due to poor cell permeability, into the cell interior and then effectively perform their biological activity. Accordingly "nanotoxicology should have its own characteristics differing from common toxicology in respect to research thinking, assay methods, technical routes, and evaluation criteria", as pointed out by the authors in this paper. Finally, the authors hoped that the scientists should deeply understand the uniqueness of nanomaterials, enhance the collaboration of physics, chemistry and toxicology, and push forward the study of nanotoxicology with the goal of making contribution to application of nanoscience and nanotechnology in various fields of national economy.

Reference: Zhu Y, Li WX. Cytotoxicity of carbon nanotubes. Science in China Series B: Chemistry, 2008; 51(11): 1021-1029
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