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Bio-degradable carbon nanotubes display intrinsic anti-tumoral effects

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The complex biosynthetic relationships of nanomaterials with the cellular components, resulting in their chemical nature, surface properties or morphology are often unpredictable. Our research group has demonstrated that Multi-Walled Carbon Nanotubes (MWCNTs) can penetrate inside cells and bind microtubules interfering with the cellular biomechanics. This biomimetic interaction leads to the formation of biosynthetic tubulin polymers displaying an enhanced stability that triggers anti-proliferative, anti-migratory and cytotoxic effects in different types of cancer cells. This antitumor activity is intrinsic to the nature of MWCNTs, complementary and synergetic to that of traditional microtubule-stabilizing anticancer drugs such as Taxol®. A key issue to take into account for the development of new alternatives to traditional drugs based on nanodevices or nanomedicines is the possible long-term effects of these nanomaterials, the tissue accumulation and the elimination rates, just as for traditional cytotoxic chemotherapies, CNTs can also interfere with the function of healthy cells and produce many unwanted side-effects. Consequently, unless most concerns about the toxicity of these materials disappear, the development of new treatments based on CNTs offer a poor risk-to-benefit ratio in oncology. Our group investigates different surface treatments on MWCNTs to make these nanomaterials more biocompatible and biodegradable. Improving *in vivo* biodegradability of MWCNTs - some of the most resistant materials discovered - is not trivial. Here we show how to preserve the anticancer properties of these nanomaterials, these treatments should maintain the general morphology of the tubes to retain the biomimetics of these filaments with the microtubules. Furthermore, we show how single dosages of o-MWCNTs produce significant anti-tumoral effects *in vivo*, in solid malignant melanomas produced by allograft transplantation in murine recipients. We believe these findings have critical implications for the development of new CNT-based nanotherapies to overcome drug resistance in cancer among other applications.

Biography

Monica L Fanarraga obtained Bachelor's in Vet. Med. from the University of Zaragoza (Spain), PhD by the University of Glasgow (UK) and Dr. Med. by the University of Cantabria (Spain). Currently, she directs the group of Nanomedicine at the IDIVAL Institute in Santander, Spain. The IDIVAL Nanomedicine group studies the biological response to different nanomaterials focusing in the study of nanomaterials as treatments for cancer, nanotoxicity and nanodelivery.

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