Investigation of Carboxylated Multi-Walled Carbon Nanotube Cytotoxicity In Vitro

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Abstract

Carbon nanotubes have been idealised as carrier vehicles for cell targeted drug and gene delivery. The physiochemical properties of the carbon nanotube also promote its function as a 'thermal antennae' for non-invasive cancer destruction. Covalent modification of carbon nanotubes is a result of acidic purification resulting in carboxylated carbon nanotubes. Additionally this covalent modification allows for the attachment of biological moieties for cell targeting. Conversely, carboxylated carbon nanotubes are suggested to be cytotoxic to mammalian cells. The current study investigates the potential cytotoxicity of short, carboxylated, multi-walled carbon nanotubes in vitro, in a primary fibroblast cell culture model. Cytotoxicity is assessed with vital staining using propidium iodide, and secondly with a lactate dehydrogenase colorimetric assay. Results indicate that there is a dose dependent cytotoxic relationship between the carboxylated multi-walled carbon nanotubes tested and the fibroblast cell culture model.

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Cheers

Aaron

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Abbreviations

CCF	Carboxylated Carbonaceous Fragment
CNT	Carbon Nanotube
Co	Cobalt
COOH-CNT	Carboxylated Carbon Nanotube
COOH-MWCNT	Carboxylated Multi-Walled Carbon Nanotube
CRaP	Carbonaceous Residues and Particles
Cu	Copper
CVD	Chemical Vapour Deposition
DAPI	4,6-Diamidino-2-phenylindole
ddH2O	Double Distilled Water
DMEM	Dulbecco's Modified Eagles Medium
ELISA	Enzyme Linked Immunosorbent Assay
FACS	Fluorescence Assisted Cell Sorting
FBS	Fetal Bovine Serum
Fe	Iron
FFM	Fibroblast Feeding Medium
H_2SO_4	Sulphuric Acid
HAEC	Human Aortic Endothelial Cells
HBSS	Hanks Balanced Salt Solution
HNO_3	Nitric Acid
LDH	Lactate Dehydrogenase
Mo	Molybdenum
MWCNT	Multi-Walled Carbon Nanotube
Ni	Nickel
PBS	Phosphate Buffered Saline
PI	Propidium Iodide
PLL	Poly-L-Lysine
ppMWCNT	Post-Processed Multi-Walled Carbon Nanotube
RCF	Relative Centrifugal Force
SWCNT	Single-Walled Carbon Nanotube
TEM	Transmission Electron Microscope