

Nanoparticles and Nanomaterials: Friend or Foe

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Nanotechnology involves the creation and manipulation of materials at the nano scale level to produce unique products with novel properties. Nanomaterials, which are by definition in the 1 - 100 nanometer range, have been used to create materials that have novel physicochemical properties and functions due to this advantageous, miniscule size. Limited studies assessing the toxicity of nanoparticles are available for risk assessment of nanomaterials. There are also an emerging field of nanotherapeutics, where these nanoparticles such as carbon nanotubes can be use to either in the area on high density conductors which transmit information in real time and enhance communication between patients and their physicians. At the same time, these nanoparticles are so small that human can be easily exposed to these nanomaterials, uptake by circulation and can reach some target organs in human body. Therefore there is a need to do extensive research in the potential hazardous and possible benefit of these nanomaterials. In our laboratory, we are exploring different ways to understand both neurotoxicity of nanoparticles and potential benefits of these nanomaterials using nanosensor to detect neurotransmitter in the brain or to stimulate sub-thalamic area to treat neurodegenerative diseases such as Parkinson's Diseases and in some case to treat spinal cord injury. Recently we have shown that these nanoparticles such as manganese, silver and copper can be neurotoxic by generating ROS and deplete dopamine (DA) concentration in PC-12 cells. We have also found significant changes in oxidative stress and apoptotic pathways related genes. On the other hand we are also investigating the potential neuroprotective novel compounds delivered to the CNS using nanowires techniques following brain or spinal cord injury. Implication to these effects are enormous, therefore, further studies are warrant to understand the nature of these nanomaterials and characteristic as friend or foe.