Combined Forces Of Physics And Medicine To Investigate Hidden Toxity

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A physicist and a medical researcher at the University of Leicester have received a grant of £100,000 from the Engineering and Physical Sciences Research Council to look at possible toxic damage from inhaled nanoparticles used for a range of everyday purposes.

The small size of nanoparticles in the size range 5-100 nm gives many novel and useful properties and they are used in applications as diverse as face creams, plastics, medical imaging, novel drug therapies and magnetic recording. Such particles are increasingly manufactured and released into the environment on industrial scales.

However, there is growing concern that the very same properties that make them so useful may also lead to enhanced toxicity if the particles are breathed in. The particles are so small - 100,000 particles laid end-to-end would only stretch a few millimetres - that it is not clear how the body's normal defence mechanisms will cope with them.

By harnessing their combined expertise in physics and medicine, Dr Paul Howes, Department of Physics & Astronomy, and Dr Jonathan Grigg, Department of Infection, Immunity and Inflammation, will research possible toxic damage from inhaled nanoparticles.

Dr Howes and Dr Grigg will produce macrophages from human blood monocytes and expose them, in vitro, to an aerosol of metal nanoparticles, measuring any toxic damage to their DNA. Precise control over the size, chemical composition and dose of particles with enable

them to determine whether there is a correlation between size and toxicity. The potential for genotoxicity (and therefore increased vulnerability to lung cancer) is an important factor when setting national air quality guidelines for particles. It is envisaged that this exposure technique, which more closely mimics "real life" exposure, will allow genotoxicity to be assessed for a wide range of manufactured nanoparticles.

Monocyte-derived macrophages were chosen since airway macrophages are a part of the body's immune system and normally reside deep in the lungs where they form the first line of defence against inhaled particles.

Dr Howes commented: "I am excited at the potential of this collaborative research that will enable us to study the crucially important question of nanoparticle toxicology. The new aerosol spectrometer purchase from the grant, combined with the University's existing microscopy facility, will give us unique ability to characterise and control the aerosol to answer fundamental questions about the interaction of nanoparticles with the human immune system."

Dr Grigg said: "This research may have profound implications for nanotechnology, if exposure of lung cells to low levels of highly reactive particles induces significant genotoxicity."

Source: University of Leicester