CHEMISTRY COLLOQUIUM

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Developing analytical methods for tracking nanoparticle internalization within cells and their uses in nanotoxicity studies

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As nanoparticles are adopted for biomedical and technological applications, it is important to determine whether their unique physical and chemical properties pose a risk to the environment. One of the challenges in understanding their potential toxicological properties is finding methods for tracking particle interactions in cells. The most common method used today is transmission electron microscopy. Though this method provides detailed structural information, the labor intensive process used in sample preparation often makes it challenging to quantify the number of particles taken into cells. On the contrary, quantitative methods such as inductively coupled plasma mass spectrometry provide very quantitative measurement of the number of particle taken up by cells, but require such large sample volumes that it normally requires a large quantity of cells for measurement and does not provide information regarding the localization of the particles within the cells. We have developed a new method for tracking nanoparticle internalization using smart poly(ethylene glycol) layers on the surface of the nanoparticle that provide both a semi-quantitative measure of the number of particles taken up by cells and information regarding the location of the particles within the cells (*Nano Lett.*, **2009**, *9* (8), pp 2914–2920). I will discuss the use of such analytical techniques for the tracking of cells and the development of bioassays for the detection of analytes.