**Fluorescent nanodiamonds for correlative nanoscale cellular imaging**

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Understanding the fate of nanomaterials inside cells is vital for many areas of science and technology. Many imaging techniques can provide information about the location and environment of nanoparticles in cells with nanoscale spatial resolution. However, every imaging technique on its own can only provide partial information about the interaction of nanoparticles with cells. Fluorescence microscopy is an excellent tool for live cell imaging, but its spatial resolution is often above 100 nm in the X-Y plane and significantly worse in Z. Electron microscopy on the other hand can provide excellent spatial resolution in at the nanoscale in 3D, but generally doesn’t allow the study of live cells in a natural environment. Hence, correlating the information provided by different imaging techniques is critical to advance our understanding of cell-nanomaterial interactions.



Here we investigate the uptake of fluorescent nanodiamonds by PC3 cancer cells by directly correlating airyscan fluorescence microscopy, atomic-force-microscopy (AFM) and scanning electron microscopy (SEM) images. Fluorescent nanodiamonds are uniquely suited for super-resolution and correlative imaging due to their exceptional photostability,1 chemical inertness and high biocompatibility.2 For the first time, fluorescent nanodiamonds are also imaged using soft X-ray tomography (Figure 1) as an emerging tool for the imaging of nanoparticles inside cells with nanoscale spatial resolution in all three dimensions. Findings from these imaging experiments are complemented by traditional cell viability, stress and nanoparticle uptake assays.

Figure 1. X-ray tomography image of fluorescent nanodiamonds in PC3 cancer cells.

**References**

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