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ID-5-P-6001 IMAGING OF CELLS LABELLED BY UPCONVERTING NANOPARTICLES ON A MODIFIED FLUORESCENCE MICROSCOPE

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Nanoparticles with upconversion luminescence (UCNP) are an emerging class of contrast agents suitable for bio-imaging. Their ability to convert infrared light to shorter wavelengths results in improved contrast and imaging depth compared to traditional fluorescent dyes and quantum dots. Unlike other multi-photon dyes, UCNP can be excited by relatively cheap continuous-wave laser diodes. However, using these light sources in common fluorescence microscopes is not straightforward and there is currently no commercially available illuminator for UCNP observation.

Here we present modification of Nikon Ti and E400 microscopes that allow wide-field epi-illumination with 980 nm fiber-coupled laser. Since the luminescence intensity of UCNP scales with powers of excitation intensity, homogenous illumination of the sample is important. We employed microlens arrays and moving diffuser to create flat-top illumination on the sample and to suppress interference artefacts caused by the coherent source.

Monodisperse upconverting nanoparticles were prepared by high-temperature decomposition of rare-earth oleates. Their luminescence efficiency was further increased by growing inert shell around the luminescent core. Hydrophilized UCNP were then used for cell labeling and samples were imaged on our modified microscopes. There was no detectable autofluorescence as the upconverting mechanism is not effective in biological samples. The UCNP displayed no significant toxicity at concentrations required for imaging.