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Covalent functionalisation of lanthanide nanoparticles

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Current biological imaging methods utilize organic dyes and quantum dots as contrast agents, however they suffer from problems such as autofluorescence of the biological tissues and toxicity, which limit their effectiveness in *vivo*. Upconverting nanophosphors have emerged as a new class of compounds for use in biological tissue imaging, as they do not suffer from the same limitations as current techniques due to their chemical stability and excitation using near infrared light, a region in which biological samples are silent and a wavelength capable of penetrating deeper into the tissue. Enzymes have a high selectivity/specificity and are capable of detecting their substrates at sub nanomolar concentrations. Examples exist in the literature of biosensing platforms for the detection of substrates using upconverting nanophsophors electrostatically interacting with enzymes, antibodies and other biomolecules. It is proposed that covalently attaching the enzyme to the surface of the nanoparticles could increase this interaction and improve the sensitivity of these systems. However to date there is little understanding of the surfaces of the nanoparticles and no bio-toolbox exists for the covalent attachment of enzymes to upconverting nanophosphor surfaces. This project aims to develop the understanding necessary and the methods needed for covalent attachment of enzymes to upconverting nanophosphor surfaces in order to create biosensing platforms for the detection of enzyme substrates at low concentrations.

Biography

Letitia Burgess is a second year PhD student funded by the Biotechnology and Biological Sciences Research Council Doctoral Training Partnership (BBSRC DTP) at the University of Manchester. She also completed her undergraduate and Master's degree at the University of Manchester. She also undertook a 3 month placement at C4X discovery, a drug discovery company that specialises in NMR conformational analysis to optimise the design and development of medicines.

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