

School of Pharmacy PhD Project 2017 / 2018

Maximising the radiation sensitising effect of gold nanoparticles through manipulation of particle shape and surface chemistry

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Key project aims will include:

Aim 1: Synthesis and characterisation a range of gold nanoparticles with varying geometries. The student will produce a range of stabilised nanospheres, nanostars, nanoboxes etc). Using surface enhanced Raman spectroscopy (SERS), we will monitor alteration in surface chemistry resulting from interactions with ionising radiation as a function of energy and dose. Changes in surface chemistry will be measured in progressively complex environments, from clean aqueous solutions, to biologically relevant media (i.e. mimicking blood serum levels). Ultimately these studies will help determine the impact of non-specific protein absorption on biological activity (internalisation and radiosensitising potential).

Aim 2: Manipulation of surface chemistry: Through ligand conjugation we will alter surface properties including charge and hydrophobicity, with the goal of minimising environmental induced changes (e.g. protein absorption), thereby retaining the predictable properties. In a manner similar to aim 1, we will assess the impact of ionising radiation on the modified surface, and the impact of modification on biological activity. Importantly, enabling technologies including our recently acquired hyperspectral microscope will permit real time analysis of nanoparticle transport in live cells.

Aim 3. Keeping it simple: We know that the most effective radiation dose-modifying gold particle is a simple citrate-reduced colloid. However, these particles lack sufficient stability. This aim will exploit the plasmonic properties our optimal particle (identified from aims 1&2) to generate a light triggered particle that sheds surface modifications, producing an in situ citrate-reduced particle. Full radiobiology characterisation will include in vitro radiosensitisation using 2D and 3D spheroid cultures and tumour growth delay experiments in vivo.

General Email Enquiries

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Project Email Enquiries

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How to Apply

Postgraduate applications should be made using Queen's University [Direct Applications Portal](#). Please note that there are two application processes: one for admission to the university and another for postgraduate awards.

Further Information

Additional information for prospective postgraduate students can be found on the [School of Pharmacy website](#) and the [Queen's Postgraduate website](#).