7.1 Spectroscopic Structure Property Relationships for Therapeutic Complexes.

Mentors: Luke O'Neill and Christine O'Connor (MSA)
Support Mentor: Laura Perdisatt

Background:

Cancer is treated by surgery, chemotherapy (the treatment of cancer with "anticancer drugs" that can destroy cancer cells) and radiotherapy (the use of ionizing radiation to kill cancer cells and shrink tumours). Newer treatments have come to the fore in the treatment of cancer such as targeted therapy (the use of agents specific for the deregulated proteins of cancer cells), photodynamic therapy (is a ternary treatment for cancer involving a photosensitizer, light, tissue oxygen and often use of lasers) and immunotherapy (a diverse set of therapeutic strategies designed to induce the patient's own immune system to fight the tumour). Cisplatin is a well known chemotherapeutic agent used in the treatment of ovarian cancers. The cisplatin binds onto the guanine in the DNA and distorts the strand causing cell apoptosis. Since this discovery there has been a rejuvenated interest in medicinal inorganic chemistry and two new platinum compounds are now used in the treatment of cancer. Carboplatin is similar to cisplatin although less toxic. Oxaliplatin is used in the treatment of metastatic colorectal cancer. However platinum complexes are not without their faults. They cause nephro and neurotoxicity during administration, have toxic side effects, cells can resist attack by the drug and drug administration can be difficult. The desire to create new metallopharmaceuticals with less toxic side effects, improved pharmacological profile and therapeutic efficiency is the aim of this project. Attention is placed on those metals situated around platinum in the periodic table, as they have similar properties.

Methodology:

i) Synthesis, purification and characterisation of organic ligand.
ii) Synthesis of Ruthenium complexes.
iii) Characterisation of mononuclear complexes using electronic, vibrational and NMR spectroscopies.
iv) Initial cytotoxicity testing of the metallopharmaceuticals.

Learning outcomes

Synthetic ability to prepare ruthenium complexes.

Understanding of the principles and application of spectroscopic analysis using I.R., NMR, UV-VIS, Fluorimetry spectroscopy and confocal microscopy.

Understanding of the applications of novel ruthenium therapeutic compounds.

Relevance to Research programme.

Researchers at MSA and the Inorganic Pharmaceutical and Biomimetic Research Group are currently investigating the development of novel therapeutic compounds for the application of chemotherapeutic/ antimicrobial agents. Initial research has commenced at a postgraduate level. This project will support the synthetic and characterisation of novel compounds and will allow progress in the synthetic development of this research.

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