Current Research Portfolio:
Molecular imaging allows monitoring of functional processes *in vivo* in a non-invasive manner, allowing longitudinal studies that are key for translational research and drug development. Preclinical *in vivo* imaging facilitates a wide variety of research areas, with some examples given below here.

Oncology – The most commonly used radiopharmaceutical, 18F-FDG (fluorodeoxyglucose), is an indicator of anaerobic glycolysis in cells which can enable early cancer detection/diagnosis, as well as provide information on response of tumours to therapy. Other developments have centred on use of radiotracers that provide in vivo readouts of altered cellular phenotypes linked to cancer/drug response, such as angiogenesis, proliferation, and apoptosis, as well as the use of radiolabelled antibodies to target tumour cells for imaging and, in certain contexts, therapeutic purposes.

Neurology – Radionuclide imaging is being increasingly used in neurological studies to monitor labelled biomarkers for evaluating disease progression in neurodegenerative disorders, such as Parkinson and Alzheimer's disease, with an aim to develop methods for early diagnosis and monitoring therapeutic efficiency.

Drug development – Preclinical evaluation, including biodistribution and pharmacokinetics of radiolabelled forms of a novel therapeutic agent, can be determined along with efficacy, toxicity and drug occupancy studies reducing time, cost and improving the drug development process. As well as labelling lead compounds, direct biomarkers of pharmacological activation can be targeted. Studying disease progression and monitoring response to therapy are crucial to the success of bringing any drug to clinical trials.

Optical imaging – While radionuclide imaging is quite pervasive within the clinical arena, optical imaging has emerged as a widely used and facile research tool for *in vivo* studies. Recently, we have used this system to monitor NF-kB activity *in vivo* using transgenic reporter models, as well as to examine the biodistribution of novel fluorescent imaging agents (see publications list). One can utilise a wide range of both chemical dyes and fluorescent proteins (GFP, RFP etc.) to image *in vivo* using this system, with novel applications in stem cell tracking emerging.

Key Publications Involving the Platform:
Byrne, A. T., O'Connor, A. E., Hall, M., Murtagh, J., O'Neill, K., Curran, K. M., Mongrain, K., Rousseau, J. A., Lecomte, R., McGee, S., Callanan, J. J., O'Shea, D. F., and Gallagher, W. M. (2009). Vascular targeted photodynamic therapy with BF_2-chelated tetraaryl-azadipyromethene agents: A multi-modality molecular imaging approach to therapeutic assessment. *British Journal of Cancer*, 101(9), 1565-1573.

A selection of other publications centred on the application of optical imaging within the oncology and inflammatory disease domain have been submitted and are in preparation.