

**Equipment Name: *In Vivo* Imaging**
**Category:**
**D. Particle exposure assessment**
**Institute:** University College Dublin

**Location:** Conway Institute, University College Dublin, Belfield, Dublin 4, Ireland

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**Short technology description/Overview:**

*In vivo* imaging of molecular events in animal models holds significant potential in areas like oncology, cardiovascular disease, neurology, diabetes, infectious disease and inflammation research. Molecular imaging is also an essential tool for translational research and new drug development, with the rapid emergence of imaging-based biomarkers. More recently these techniques have begun to be applied to the study of the biokinetics and biodistribution of appropriately labelled nanomaterials, to generate data for PBK models, and to begin to correlate observed impacts with nanoparticle localisation *in vivo*.

This dedicated optical imaging system in UCD has been widely used by a number of internal and external research groups to examine key pathophysiological events in cancer and inflammation, as well as for novel drug evaluation studies in these therapeutic domains.

The microPET/CT and microSPECT/CT facilities were installed in early 2011 and are now available for experimentation.

**Main Features (Equipment Capabilities):**

Instrumentation:

- Triumph PET/CT (LabPet 4, X-O CT)
- Explore SpecZT CT120
- IVIS Spectrum optical imaging system, a micro-ultrasound device and an intravital microscope.

**PET** (positron emission tomography) and **SPECT** (single photon emission tomography) are nuclear imaging techniques that involve the use of radioisotope tracers which can probe disease specific biochemical processes, thus providing functional and metabolic information.

Radioisotopes that emit two high-energy photons upon decay are detected by PET scanners, while those emitting gamma rays can be detected via SPECT.

Most PET tracers have short half-lives while SPECT tracers are available in kit form and can be prepared as needed

with longer half lives extending the imaging time window.

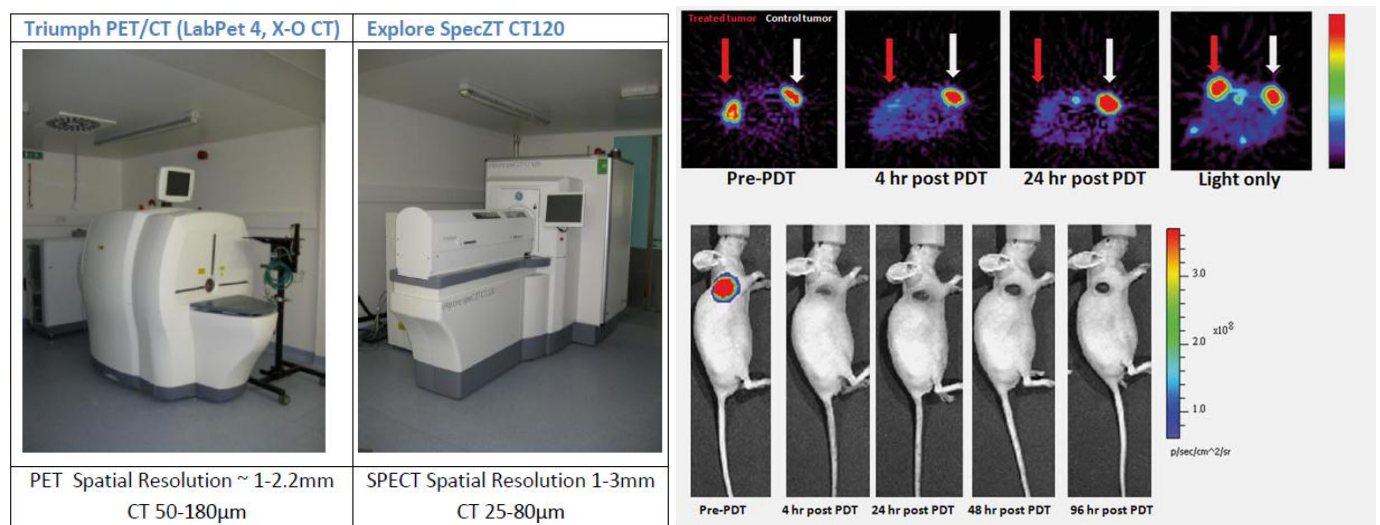
**Triumph PET/CT (LabPet 4, X-O CT)** and **Explore SpecZT CT120** systems were purchased as part of an overall strategy to develop a pre-clinical *in vivo* imaging centre of excellence at UCD, which also includes an IVIS optical imaging system, a micro-ultrasound device and an intravital microscope.

**IVIS Spectrum Optical Imaging System:** The **IVIS Spectrum optical imaging system** can image up to 5 mice simultaneously for bioluminescence/biofluorescence and can generate close to full tomographic reconstruction of the animal(s). As such, it provides an opportunity for large-scale *in vivo* studies.

*Issues to consider when planning TA visit:*

- Nanomaterials need to be suitably labelled for biokinetics / biodistribution studies,
- Near-IR labelling provides much better depth of penetration than fluorescent labelling.
- Ethical approvals must be in place for all animal studies.
- If animals are also required, that will need additional permission.

### Typical Samples & Images:



*Example publication:*

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. Vascular targeted photodynamic therapy with BF<sub>2</sub>-chelated tetraaryl-azadipyromethene agents: A multi-modality molecular imaging approach to therapeutic assessment. *British Journal of Cancer*, 2009, 101(9), 1565-1573.

*Any further Information:*

Ethical approval for all *in vivo* studies must be in place prior to commencing any experiments. Please check with the technology expert as to what are the ethical requirements for UCD.

The UCD Biomedical Facility primarily breeds and houses rats and mice but we also have facilities for housing rabbits and guinea pigs, and occasionally accommodate farm animals for short-term studies. However, most research work involving farm animals is carried out at Lyons Research Farm. Further information on the range of facilities and services available can be provided by contacting the UCD TAL.

All UCD staff and students considering carrying out live animal research at UCD or elsewhere should read the UCD Animal Research Policy and the UCD Animal Research Ethics Subcommittee Operating Procedures and ensure that they fully understand and comply with all legislative and policy requirements outlined in these documents.

<http://www.ucd.ie/vavctest/kierantest/biomedical/>