UBC · FACULTY OF PHARMACEUTICAL SCIENCES

Introduction to Preclinical Imaging

PHAR518 · Full-day intensive · Time schedule

Next session: yearly — contact UBC Pharmaceutical Sciences or Prof. Miffy Cheng for upcoming dates

A foundational, full-day intensive module covering the basics of small-animal molecular imaging - taught yearly as part of UBC PHAR518. The day combines lectures on the physical principles of PET, SPECT and CT with a hands-on tour in our imaging lab, an introduction to research applications across drug discovery, theranostics, nanomedicine and pharmacology, and closes with a two-hour SPECT/CT data analysis session.

COURSE	FORMAT	CADENCE
PHAR518	**Full-day intensive**	**Yearly**

MATERIAL

ITEM 01

Laptop

Bring your own

ITEM 02

AMIDE Software*

[download link]

SLICER3D Software*

[download link]

ITEM 03

Data Files

[download link]

** We are currently evaluating both platforms to ensure the smoothest user experience based on recent OS updates and our specific data file formats. We will finalize the choice and notify you exactly which software to download well before the course begins.*

NEW TOOLS COMING …

MIRA · **M**ultimodal **I**maging **R**ender & **A**nimation invivoimaging.ca/resources/software/mira/

MOSAIC · **M**ulti-panel **O**verlay & **S**napshot **A**rrangement of **I**maging **C**ompositions - for standardizing images into reproducible, presentation-ready figures invivoimaging.ca/resources/software/mosaic/

*We will also be introducing two new in-house tools currently in active development: **MIRA** (for preclinical PET/SPECT/CT image visualization) and **MOSAIC** (for reproducible figure preparation). You don't need to install these now - an overview and access instructions will be emailed to you ahead of the session.*

LOCATION

UBC Centre for Comparative Medicine

4145 Wesbrook Mall — Conference Room

⚠ **Policy for entering CCM facility**

Like most animal facilities, CCM is a SCENT-FREE facility. Please **do not wear perfume**, cologne, aftershave, deodorant or other fragrances on the day of the workshop.

TIME SCHEDULE

9:00 – 10:00 Overview of Preclinical Imaging Techniques

THE BIG PICTURE

- The drug discovery process
- Why preclinical imaging matters
- From bench to bedside — the translation question

THE IMAGING LANDSCAPE

- Imaging modalities overview (PET, SPECT, CT, MRI, US, optical)
- Modalities available on UBC campus
- Strengths and limitations compared

10:00 – 11:00 CCM & Imaging Lab Tour

THE TOUR

- Centre for Comparative Medicine (CCM) walkthrough
- MIRF imaging lab — scanner and workflow
- Radiochemistry bench overview
- Supporting instrumentation in the lab

OPTIONAL HANDS-ON PRACTICAL

Available if time permits and all participants hold a current radiosafety certificate.

- Live scanner walkthrough
- Tracer handling demonstration
- Brief positioning and imaging demo

⚠ **Required: UBC radiosafety certification for every participant.**

11:00 – 12:30 Principles of SPECT Imaging

INTRODUCTION

- The tracer principle
- Tracking drug distribution

PHYSICS AND INSTRUMENTATION

- The physics of SPECT
- SPECT vs PET
- Components of a SPECT system
- Collimators
- Phantoms

RESEARCH APPLICATIONS

- Overview
- Pulmonary drug delivery
- Circulation of drug formulations
- Optimizing LNP biodistribution
- Multi-isotope imaging
- Advanced imaging of rare radionuclides

SUPPORTING INSTRUMENTS IN PRECLINICAL IMAGING

- The dose calibrator
- The gamma counter

12:30 – 13:30	*Lunch Break*

13:30 – 14:30 Principles of CT Imaging

INTRODUCTION

- The birth of X-rays

PHYSICS AND INSTRUMENTATION

- The X-ray tube anatomy
- Cathode: electron source
- Anode: the target
- Essential parts
- X-ray production
- Characteristic radiation
- Bremsstrahlung radiation

INTERACTION WITH MATTER

- Overview
- Photoelectric effect
- Compton scatter

COMPUTED TOMOGRAPHY

- Overview
- Hounsfield units
- CT windowing: image display

14:30 – 16:30 SPECT/CT Data Analysis

VISUALIZATION FUNDAMENTALS

- Opening preclinical image data (DICOM, NIfTI)
- 2D and 3D viewing modes
- Color maps and intensity windowing
- Image fusion — PET/SPECT overlaid on CT
- Multi-modality overlay techniques

QUANTIFICATION

- Defining regions of interest (ROIs)
- Time activity curves (TACs)
- Standardized uptake values (SUVs)
- Percent injected dose per gram (%ID/g)
- Decay correction basics

HANDS-ON EXERCISES

Step-by-step guided exercises using a sample SPECT/CT dataset.

- Loading a sample SPECT/CT dataset in AMIDE
- Drawing ROIs in target organs
- Generating a TAC for a sample tracer
- Producing a quick 3D rotation movie

OUTPUTS & RECOMMENDED NEXT STEPS

- Saving publication-ready images
- Exporting figures for presentations
- Continuing to the full Imaging Data Analysis Workshop
- One-on-one analysis sessions for your own data

ABOUT MIRF

The Molecular Imaging Research Facility (MIRF) is UBC's preclinical PET, SPECT, and CT imaging facility, located at the UBC Centre for Comparative Medicine. The facility supports radiochemistry, theranostics, drug delivery, nanomedicine, and translational research through advanced in vivo molecular imaging.

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