



Northeastern University

Bouvé College of Health Sciences
School of Pharmacy

DRUG DISCOVERY, DEVELOPMENT, DELIVERY AND IMAGING Core Competencies and Resources in Pharmaceutical Sciences

Core Competencies

- Discovery Technologies
 - Drug Design and Synthesis
 - Molecular Recognition
 - Membrane Biophysics
 - Membrane Protein Purification and Characterization
 - Nuclear Magnetic Resonance Spectroscopy
 - Mass Spectrometry
 - High Throughput Screening Technologies
 - High Field EPR
 - Molecular Modeling

- Drug Formulations and Delivery
 - Polymeric biomaterials
 - Drug delivery systems
 - Nanomedical technologies
 - Physiologically active compounds
 - Experimental pharmacology
 - Animal models (cancer, inflammation, CNS diseases)
 - ADME/PK *in vitro* and *in vivo* studies

- Biological Screening
 - Biomarker Discovery
 - Proteomics of Cell Lines
 - Pathway Analysis
 - *in vivo* Analysis
 - Tissue Analysis
 - Antimicrobials
 - Immunologic pathways

- Protein Analysis
 - Mass Spectrometry
 - Chromatography / Electrophoresis
 - Ultratrace Analysis
 - Toxicological Analysis
 - Carbohydrate Analysis

- Imaging
 - Proprietary technology for identifying new atypical antipsychotics

- Proprietary technology for assessing toxicity and risk to chronic CNS drug exposure
 - Proprietary technology for imaging fully conscious animals for use in MR imaging
 - Custom chemical synthesis and radiolabeling for both the development of biomarkers for disease diagnosis and prospective studies on drug efficacy
 - Translational imaging using transgenic mice, inbred strains of rats and marmoset monkeys
 - Expertise in assessing pharmaco-kinetics and pharmaco-dynamics of novel therapies *in vivo* using nuclear imaging techniques
 - Established protocols in cardiac, oncology and CNS applications. Significant experience in performing large-scale imaging studies on xenograft models evaluating interaction of therapeutics across a variety of imaging agents. *In vivo* and *ex vivo* correlation of biomarkers such as cellular/molecular assays for proliferation, apoptosis, or histopathology.
 - Imaging animal models for drug discovery
 - Quick freeze deep etch electron microscopy w/immunogold labeling
 - Live cell imaging capacity with focal plane stabilized microscopes - NIKON TE2000E
 - Live toxicity screening
 - Custom bioreactors for live cell imaging
 - Phase imaging of transparent biological specimens such as embryos and stem cells
 - Multimodal imaging of preimplantation embryos to evaluate viability
 - Multimodal imaging to characterize non-melanoma skin cancers
- Cell Separation & Analysis
 - Microfluidic cell manipulation
 - BioMEMS device fabrication
- Physical Chemistry Capacity
 - Protein osmometry
 - Custom mechanochemical assay systems

Facilities and Resources

- AAALAC-Accredited Vivarium
 - Small animal facility (mice, rats, & rabbits)
 - IACUC approval
 - Availability of animal procedure suites and resources
 - Availability of a consulting veterinarian
 - Short course offerings
- Barnett Institute
 - LTQ-FT MS
 - LTQ-ETD MS
 - Synapt Ion Mobility MS

- MALDI TOF and TOF-TOF MS
- Q-TOF Atmospheric Pressure ESI MS
- ESI orthogonal extraction TOF-MS
- GC-MS
- Capillary Electrophoresis, and CE-MS
- 2D LC, UPLC, nanoLC
- HPLC, cap-HPLC, MDLC, FPLC
- 2D SDS-PAGE
- Automation Systems
- Computer Cluster
- 500MHz LC NMR with nanocoil

- Center for Drug Discovery
 - 700 MHz 4-channel NMR
 - 400MHz 4-channel wide-bore spectrometer
 - nano-LC- 4000 QTrap
 - TSQ quantum ultra triple quad MS
 - Electrothermal and autochem parallel synthesizers
 - 4800 MALDI TOF/TOF mass spectrometer.

- Center for High-rate Nano-Manufacturing
 - Microfluidics
 - Biosensor fabrication
 - Bio-electrical interface

- Center for Pharmaceutical Biotechnology and Nanomedicine
 - Beckman Optima TLX-100 bench top ultracentrifuge
 - Coulter Model N4+ submicron particle analyzer (Beckman Coulter)
 - Zeta potentiometer (Brookhaven Instruments)
 - 2 Hitachi HPLC systems with flow cell and auto sampler
 - Hitachi F-2000 fluorescence spectrophotometer
 - Beckman Gamma 5500B two-channel gamma-counter
 - Nikon Epifluorescence microscope
 - Flow cytometer calibur (Biosciences Inc.)

- Center for Translational Imaging
 - MollyQ SPECT camera
 - 7.0Tesla Bruker MRI
 - I-CIT DA transporter
 - HPLC
 - LC-MS
 - Accuscan Instruments Locomotor activity chambers and Versamax software (Columbus OH) - Febo lab NIH R01
 - Accuscan Instruments Active/Passive avoidance chamber with software (Columbus OH) - Febo lab Northeastern Startup
 - Plexon 16 channel Multiunit Acquisition Processor (MAP) for simultaneous single unit and field potential recordings in awake rats - Febo lab Northeastern startup
 - Sort client, Offline sorter, neuroexplorer software suite for neuronal recordings analysis - Febo lab startup

- Avisoft Bioacoustics Instrumentation and software suite for ultrasonic vocalization recordings, processing and analysis
- New England Inflammation and Tissue Protection Institute
 - Flow cytometry analyzer
 - ELISA luminoscan reader
 - Real time PCR machine
 - Mouse telemetry system
 - 18" x 24" hyperbaric chamber capable of administering oxygen and mixed gases under pressure
- Nanomaterials Instrumentation Facility
 - Hitachi S-4800 field emission scanning electron microscope with EDX
 - Amray AMR-100 scanning electron microscope
 - JEOL JEM-1000 transmission electron microscope
 - Agilent PicoPlus AFM/MFM/STM with liquid cell and electrochemical options
 - RHK Model UHV 350 AFM/STM
 - Nanonics NSOM/SPM-100 near-field, scanning optical microscope
 - Quantum Design MPMS XL-5 SQUID magnetometer
 - Olympus fluorescence microscopes
- Keck 3D Microscope Laboratory
 - Optical Quadrature Microscopy for full-field quantitative phase imaging
 - Two-Photon Fluorescence microscopy
 - Second-Harmonic Microscopy
 - Confocal Reflectance Microscopy
 - Confocal Fluorescence Microscopy
 - Differential Interference Contrast
 - Epi-Fluorescence Microscopy
 - Line Scanning FRAP
- 140 The Fenway Core Facilities
 - CompuCyte iCyte Laser Scanning Cytometer for Quantitative Analysis of cellular and tissue samples
 - Zeiss LSM700 confocal microscope
 - Roche LightCycler 480 for real time PCR
 - BioTek Synergy/HI microtiter plate reader for fluorescence/luminescence/polarization measurements
 - Thermo Nanodrop 2000C spectrophotometer
 - Expert knowledge in high content cellular analysis, molecular pathology based tissue analysis, Stereoscopic imaging and display