

## Center for Environmental Health Sciences

### Research Core Units

#### **Bioanalytical Chemistry Core**

Leader: Dr. Matthew K. Ross

Location: Wise Center

Description:

The *Bioanalytical Chemistry Core* resides in the Analytical Toxicology Laboratories within the Center for Environmental Health Sciences at the College of Veterinary Medicine (MSU). The *Bioanalytical Chemistry Core* is directed by Dr. Matt Ross. In addition to Dr. Ross, the Analytical Toxicology Laboratory presently includes one technician (Dr. Abdolsamad Borazjani), who conducts HPLC and LC-MS analyses, and Mr. Keith Davis who conducts GC analyses. Current and recent analytical projects conducted in the laboratory include the quantification of pesticide residues from flea treatments on dogs, the quantification of insecticide metabolites in human urine of people contacting these dogs, analyses of rodent tissues and blood to quantify atrazine and organophosphate residues (and their metabolites), enzymatic assays that require HPLC and LC-MS methods to measure product formation, and pesticide residue analyses of soil/water samples from the Mississippi Delta.

This Core is housed on the second and third floors of the research wing of the College of Veterinary Medicine (Wise Center, MSU). In terms of major instrumentation, the analytical laboratories possess an HPLC-single quadrupole MS (Thermo Electron Surveyor MSQ) equipped with autosampler, binary pump, solvent degasser, and diode-array detector. The Core has six Waters Alliance liquid chromatography units equipped with autosamplers and ultraviolet, fluorescence, or electrochemical detectors. The laboratory also possesses a Waters Acquity Ultra Performance Liquid Chromatography (UPLC) unit with UV detector interfaced to a Thermo Quantum triple-quadrupole mass spectrometer. Also available are three Hewlett-Packard 5890 GCs and one Agilent 6890 GC equipped with electron capture detectors (ECD), nitrogen phosphorus detectors (NPD), and flame ionization detectors (FID). The 6890 GC is equipped with a micro electron-capture detector for improved sensitivity and a recently purchased Agilent single-quadrupole mass spectrometer (5975C EI/CI MSD). All GCs are equipped with autosamplers (one with dual injection) and are controlled by an integrated data system (Dionex Chromeleon v.6.0 or Agilent ChemStation E.02.00.493). Also available to the core are equipment used for sample preparation and work-up for GC and LC analysis.

It is a specific goal of the Core to provide training to graduate students, staff, postdoctoral fellows, and faculty on the specific applications of each instrument used in the *Bioanalytical Chemistry Core*. Training opportunities and seminar presentations are also available to students, staff, fellows, and faculty. Furthermore, after appropriate training, the LC-MS (single quadrupole) instrument will be available to graduate students and fellows as a walk-up instrument. This provides hands-on experience and allows investigators to perform their own experiments with the guidance of Core personnel.

The ultimate goal of the Core is to provide analytical support for projects in the CEHS that utilizes chromatographic separation and ultraviolet, electrochemical, fluorescence, mass spectrometric, flame-ionization, nitrogen-phosphorus, and electron-capture detection methods.

## **Molecular Biology/Microscopy Core**

Leader: Dr. Jeffrey B. Eells

Location: Wise Center

Description:

The Molecular Biology/Microscopy Core provides investigators with equipment and expertise in tissue sectioning for light and fluorescent microscopy to utilize for stereology and laser capture microdissection applications. In addition, this core provides the methods and expertise in the isolation of small amounts of RNA and DNA, tracking the quality and amount of these nucleic acids, and using real-time PCR and multiplex capillary electrophoresis based PCR for quantifying expression levels. The combination of the introduction of LCM with recent advances in the technology of gene expression, both real-time quantitative PCR and multiplex PCR gene expression profiling using capillary electrophoresis, has integrated the skills and equipment needed for both sample preparation for microscopy and isolation of nucleic acids. As LCM provides the ability to isolate single cells within a heterogeneous tissue section, techniques in histochemistry and light and fluorescent microscopy allow for concurrent examination of cytological changes as determined with stereology and histological assessment with changes in gene expression. The combination of these techniques link the expertise for routine tissue processing, histological staining and light microscopy with nucleic acid isolation and gene expression measurements. Additionally, measurements of protein levels will likely become feasible as sensitivity for protein assays decrease.

This Core provides the expertise and equipment needed for microscopy with laser capture microdissection and effectively combines these efforts of cellular imaging with collection of RNA and DNA for analysis. Equipment available in the Core include a Microm HM 560 Cryostat for tissue sectioning, an Olympus BX51 microscope with a fluorescent lamp and fluorescent filters (fluorescein, Texas red, AMCA and a triple filter) with a CCD camera and a motorized Z-stage all connected to a computer with Stereo Investigator Stereology Software from MicroBrightField Inc. (Williston, VT) for stereology and imaging of tissue sections, a Veritas Microdissection System from Molecular Devices, a fully automated system containing both an infrared capture laser and ultraviolet cutting laser and full fluorescent capabilities, to isolate specific cell populations or specific tissue regions, a Nanodrop ND-3300 Fluorospectrometer and a SpectraMax M5 Fluorescence Microplate Reader (Molecular Devices) for measuring small amounts of RNA, DNA and/or protein (down to 10pg/□l for RNA using RiboGreen and the Nanodrop ND-3300), an Agilent Technologies 2100 Bioanalyzer for measuring the quality and quantity of isolated RNA, DNA or protein, a GenomeLab™ GeXP Genetic Analysis System with two CEQ™ 8000 Genetic Analysis System capillary electrophoresis systems for multiplex quantitative gene expression assays, and a MX3005P QPCR System from Stratagene with 5 filters and MxPro QPCR software for quantitative real-time PCR. Personnel in the core provide protocols and the expertise to setup experiments, to run the equipment and to help in data analysis. The Molecular Biology/Microscopy Core is located in the Research wing of the Wise Center of the College of Veterinary Medicine The Core is maintained and experiments supported on a daily basis by the director, Dr. Jeffrey Eells, along with the technicians Aimee Bell and Mary Beth Dail.