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- Xray Crystallography Shared Service

In addition to those listed, information on additional resource labs may be found at www.medschool.umaryland.edu/CIBR.
MISSION
Specialized expertise, cutting-edge technologies and sophisticated scientific resources supporting a robust basic, clinical and translational biomedical research environment.

ABOUT CIBR
In November, 2013, the University of Maryland School of Medicine (UMSOM) launched the Center for Innovative Biomedical Resources (CIBR), the organizational framework for the UMSOM biomedical core resources. CIBR serves as a center of excellence for state-of-the-art technologies, high-tech instrumentation, and expertise that supports biomedical research, clinical practice and health care. Physical consolidation of many core facilities in common space creates a dynamic environment that will enhance and stimulate high impact research through a trans-disciplinary approach.

CIBR's Vision
• Provide the broadest array of core services to support a successful biomedical research environment
• Facilitate access to state-of-the-art technologies necessary to catalyze high-impact science and support new research grants
• Provide a centralized management structure to optimize quality control, efficiencies and cost-effectiveness, marketing, customer support and financial management
• Operate core laboratories with directors and staff who are experts in these disciplines
• Foster a collaborative, interdisciplinary research environment

CORES

STRUCTURAL BIOLOGY FACILITIES
• Biosensor Facility
• NMR Facility
• X-Ray Crystallography

NUCLEIC ACID AND GENOMIC FACILITIES
• Genomics Core Facility
• Cytogenetics Facility
• Genomic Resource Center
• Translational Genomics Lab
• Pediatric Biochemical Genetics Lab

IMAGING TECHNOLOGIES
• Center for Fluorescence Spectroscopy
• Center for Translational Research in Imaging (CTRIM)
• Confocal Microscopy Facility
• Electron Microscopy Facility
• Magnetic Resonance Research Center

CYTOMETRIC AND BIOASSAY FACILITIES
• Cytokine Laboratory
• Flow Cytometry Facility
• Center for Vaccine Development Laboratory
• Greenebaum Comprehensive Cancer Center Shared Service
• µQUANT Facility

CLINICAL RESOURCE FACILITIES
• NICHD Brain and Tissue Bank for Developmental Disorders
• Pathology Biorepository Shared Service
• UMM Biorepository

ANIMAL MODEL RESOURCE FACILITIES
• Translational Core Laboratory
• Veterinary Services

BIOINFORMATICS AND STATISTICS RESOURCE FACILITIES
• Biostatistics
• Center for Health-Related Informatics and Bioimaging (CHIB)
• Clinical & Translational Research Informatics Centers
• Informatics Resource Center
BIOMEDICAL TECHNOLOGY SUPPORTING RESEARCH, HEALTHCARE AND EDUCATION

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LOCATION
The renovation of nearly 30,000 square feet of space was made possible through a $7.3 M NIH grant funded through the American Recovery and Reinvestment Act. Many of the CIBR resources have relocated to recently renovated space on the 7th floor of the Bressler Research Tower or on the 6th floor of Howard Hall and Health Sciences Facility I. Owing to their specific space and research requirements, some cores are located in other areas on campus.

Room 7-037, Bressler Research Building
655 West Baltimore Street
Baltimore, MD 21201
410-706-3339
MISSION
To conserve time, money, space and effort for the University of Maryland, Baltimore ("UMB") and UMB BioPark researchers, by maintaining a central supply core facility, e-commerce website and expediting service which thrives upon its ability to innovate and re-create itself in accordance with the requirements of the University and its research staff. BIORESCO enables scientists to “do science” instead of procurement and accounting. We endeavor to become a “one-stop shop” for researchers and their staff.

CORE SERVICES
All products purchased through BIORESCO are at the lowest possible prices and the researchers pay no Shipping or Handling charges. The BIORESCO website hosts catalogs from over 45 Vendors. Customers can search and order from over 1.5 million discounted products.
In addition to our Core purpose as stated above, we offer:
• Two large annual vendor shows that bring over 50 vendors and 1200 members from the research community together
• Collaboration with UMB Environmental Health and Safety to minimize the volume and variety of dangerous chemicals on campus by maintaining years of searchable campus purchasing data
• Calibration for pipettors and balances
• Peptide and Oligonucleotide Synthesis
• Emergency Freezer Storage (-20 degrees C, -80 degrees C)
• Free packing and shipping materials for all temperatures
• Dry ice for sale

Contact Information:
410-706-0322
freezerprogram.org
http://cf.umaryland.edu/freezer
For a complete listing of Participating Vendors, please visit our website at www.freezerprogram.org

Location and Hours of Operation:
Room 166, MSTF
Monday thru Friday 8:00 am - 5:00 pm
Closed on UMB Holidays
BIOMEDICAL RESEARCH SUPPLY CORE (BIORESCO)

CIBR: Center for Innovative Biomedical Resources

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HIGHLIGHTS
Based on a 10 year analysis:

• Average savings from List — 27%
• Savings in shipping and handling charges — $16.1 million
• Administrative Cost per purchase is around $4, which is much below the national average for a procurement purchase ($60) or P-card purchase ($20)
• We take the hassles out of replacements, backorder substitutions, cancellations and returns

Top Vendors:
• Life Technologies
• Sigma
• Fisher Scientific
• Qiagen
• Biorad
• VWR Scientific
• Roche
• BD Biosciences
• Pierce Biotechnology
• Cell Signaling
• Promega
• New England Biolabs
• Clontech
• Stratagene
• E Biosciences
• EMD Millipore
Mission
The Biosensor Core Facility's objective is to provide the faculty, staff and students on the University of Maryland, Baltimore, with the latest technology for the quantitative study of binding reactions in real time, specifically with an approach that is versatile, highly sensitive, and "user friendly," with molecules that are label-free. The instruments we use for this purpose are from Biacore® (GE Healthcare).

Core Instrumentation

Biacore® instruments utilize the optical method of "surface plasmon resonance" (SPR), small changes in the interaction of monochromatic light with a metallic surface that occur when a protein or other molecule binds to that surface. Using the T200 or 3000, the core and its staff can provide accurate determinations of "on" and "off" rates for binding reactions, as well as determine affinity constants for binding. Because our instruments use SPR, many different kinds of binding reactions can be studied, often robotically, and a wide range of biological molecules can be examined, including proteins, nucleic acids, carbohydrates and lipids, as well as small molecules. Typical studies can:

i. Determine if pairs of molecules bind to each other.
ii. Determine kinetic constants, binding constants, and specificity of binding.
iii. Determine if several molecules can bind simultaneously to the same ligand or if they compete for binding.

Biacore 3000
The Biacore 3000 is designed to study binding of macromolecules to each other, with the possibility of examining molecules as small as ~2 kDa. The instrument accepts a chip with 4 flow cells that can be used in pairs, to compare flow cell 2 with flow cell 1 and flow cell 4 with flow cell 3, or in a single set of 4, to compare flow cells 2, 3 and 4 each with flow cell 1. Software is designed to optimize curve fitting and calculation of kinetic and binding constants.

Biacore T200
The Biacore T200 operates very similarly to the 3000 but it has a very stable baseline signal which allows it to be used to study the binding of small molecules as well as macromolecules. The instrument accepts a chip with 4 flow cells that can be used in pairs, to compare flow cell 2 with flow cell 1, or flow cell 4 with flow cell 3. The software has been adapted to facilitate kinetics studies in a single cycle, by introducing low to high concentrations over the surface of the chip without intervening wash or regeneration steps.

Image courtesy of GE Healthcare
Biacore 3000: Binding of Bacterially Expressed Fusion Proteins


Biacore T200: Binding of Antibody and of Small Molecule

MISSION
Quantitative biomedical research is a team sport. The biostatistician brings a strong foundation in statistics, mathematics and computational methods, augmented by knowledge of the field of application and familiarity with biomedical concepts and terminology.

CORE SERVICES
We collaborate on all aspects of design, analysis, interpretation, and reporting of quantitative biomedical research, see left.

A FEW PRACTICAL NOTES
• The biostatistics service runs by appointment only.
• We will try to link you up with a biostatistician who has domain expertise and/or relevant methodology expertise AND available time.
• It takes time to set up an appointment, to provide advice and to act on the advice — last-minute consultations may not produce optimal service and are discouraged.
• We do not provide individual tutoring as a substitute for proper biostatistics education (e.g., as part of a degree program).
• For input to a grant proposal and for significant input to a research project or a data analysis, the biostatistician should be included as a co-investigator.


Example 3: Overview of Huntington disease-specific association network. In total, there are 3316 associations among 2499 biological entities (1253 diseases, 1131 chemical drugs, and 115 genes). Proceedings of IEEE International Conference on Bioinformatics and Biomedicine 2013, 72-75.
MISSION
The purpose is to accelerate the translation of scientific discoveries from the basic science bench to clinical studies, bedside practice, and community intervention, through use of information technologies (IT) and informatics. CTRIC enables and advances research through various services which support clinical and translational research. CTRIC offers a variety of services to assist University of Maryland Baltimore faculty with their research needs at any stage in the process.

ABOUT CTRIC
CTRIC is a service center within the Department of Epidemiology and Public Health (EPH) in the University of Maryland’s School of Medicine (UMSOM).
CTRIC supports clinical and translational researchers at all stages of project development. These services include: data capture; data management; custom database creation and data storage; enabling access to data in the University of Maryland Medical Center Clinical Data Repository; quality assurance/control; data analysis; and research design.

COMMON TOOLS USED BY CTRIC
• TeleForm®
• REDCap®
• Microsoft Access®
• MySQL®
• FreezerPro®
• Manual keying of data is also an option

CORE SERVICES
Research Design: CTRIC staff is trained to make recommendations on appropriate study design, selection of suitable measures and variables, and data analytic strategies. CTRIC can also give assistance with power and sample size calculations.

Data Management: CTRIC maintains each project’s relational database throughout the study including an IRB approved audit log of any data changes. Data can be prepared in tables in a readable format upon request, either at intervals during the study or at the end. Data reports, detailing enrollment, missing values, or other specifications can be created as needed.

Access to data in the University of Maryland Medical System (UMMS) Clinical Data Repository: Across various facilities, UMMS has more than 600,000 visits every year, with much of the resulting data stored in the data repository. Researchers who are interested in accessing this vast resource can be provided with guidance through the process of obtaining IRB approval, submitting a data request, and analytic strategies.

Quality Assurance/Control: CTRIC staff can design a quality assurance plan specific to a researcher’s study database and run regular reports to indicate improbable and impossible values in the database.

Data Analysis: CTRIC staff is available to provide a wide range of data analysis services, from t-tests and analysis of variance with repeated measures to complex regression analysis. CTRIC provides annotated documentation of the analysis results, ensuring clear understanding of both the statistical tests used and proper interpretation of the results; CTRIC can also prepare graphs and tables, as well as draft appropriate portions of the Results section for a manuscript or scientific poster.
Data Capture
CTRIC employs both web-based and scannable paper-based form technologies which minimize manual data entry in order to increase the speed and accuracy of collected data entered in the database.

Database Creation and Data Storage
CTRIC can organize study data from across various location and software packages into a cohesive, easy to use database, allowing the researcher to have ready access to any collected data. CTRIC can construct databases in a variety of different formats (PostgreSQL, MySQL, Microsoft Access, etc.) based on the needs of the researcher. Databases can be created to accept ongoing data entry or for extraction of datasets from pre-existing databases. CTRIC offers secure, HIPAA compliant data storage.

Recent Publications
CONFOCAL MICROSCOPY CORE FACILITY
DEPARTMENT OF PHYSIOLOGY
CIBR: Center for Innovative Biomedical Resources

CORE INSTRUMENTATION

Zeiss 710 NLO & Zeiss 7MP
• Upright confocal microscope with single photon and multiphoton excitation capabilities for imaging live cells, slices and whole animals
• Excitation wavelengths 730 to 1300 nm; 2 PMT and 2 sensitive GaAsP detectors
• Can be combined with electrophysiology or other measures

Zeiss 5Live & Zeiss 510
• Point-scanning and slit-scanning confocal microscope
• Fast acquisition frame rates for studying dynamic cellular processes at physiological temperatures
• Dual scan heads (5Live) allow simultaneous imaging and optical manipulation
• Excitation (488, 543, 560, 633, Ti:Sapphire laser)

Olympus LCV Incubated Microscope
• Widefield inverted microscope allowing continuous imaging of cells for hours or days
• Fluorescence and DIC imaging on multiple positions
• Cell migration, cell division, wounding and repair processes, phagocytosis

Olympus FV300/Atomic Force Microscope
• Inverted confocal microscope capable of multicolored imaging
• Equipped with an Atomic Force Microscope accessory (AFM, Bruker)

The new microscope combines the capabilities of confocal imaging with atomic force microscopy for your experiments.

MISSION
The Confocal Core’s mission is to provide researchers with a wide array of state-of-the-art confocal imaging equipment to enable acquisition of high resolution images (both in vivo and in vitro). The Confocal Core offers training and assistance in the use of multiple confocal microscopes housed in our facility. Optimization of data acquisition and image processing are both part of the training, thus enabling researchers to efficiently design studies, acquire image data and extract relevant data features. The confocal facility is available to all UMB researchers and extramural users on a fee-for-service basis.

CORE SERVICES
The facility provides individual instruction on an array of confocal microscopes. The needs of the researcher are considered in choosing which microscope will best suit the experimental design. Facility users can be trained to utilize the machine best matching their respective imaging requirements. In general, imaging of fixed samples, cultured cells, organ slices and small animals can be accommodated. Imaging techniques including FRET, FRAP, photoactivation and uncaging are readily implemented. The microscopes have excitation sources that cover most fluorophores with excitation ranging from 355-633 nm. Multiphoton excitation of fluorophores is also available on select instruments. An image analysis workstation equipped with software packages is available to users.

The Core also has a culture room with an incubator, culture hood and a widefield fluorescence microscope for use in preparation of cultured and live samples. Preparation of live animals for imaging experiments can also be done in this newly renovated space.
Imaging of vascular tone and Ca²⁺ signaling in murine cremaster muscle arterioles *in vivo*  
Mauban *et al.* (2013) *Microcirculation*

Cultured neuron expressing tdTomato (red) and the synaptic marker PSD-95-GFP (green)  
courtesy of Blanpied Lab

Microtentacles on a live, free-floating breast tumor cell labeled with membrane-localized GFP (green)  
encircle a neighboring tumor cell (red)  
courtesy of Martin Lab

CONTACT

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685 West Baltimore Street  
Baltimore, MD 21201  
410-706-3925

Web Address

http://medschool.umaryland.edu/confocal
MISSION
Our laboratory offers cytogenetic and molecular genomic diagnosis for both constitutional and acquired chromosome abnormalities. We focus on the detection and characterization of subtle chromosome abnormalities in hematological malignancies/stem cells, as well as roles of telomere biology in cancer and human aging.

CORE SERVICES
The Cytogenetics Laboratory is a CLIA-certified and CAP accredited facility that offers comprehensive cytogenetic diagnosis for both constitutional and acquired chromosome abnormalities. It provides conventional karyotype analysis and fluorescence in situ hybridization (FISH) studies for the detection and characterization of chromosome abnormalities in clinical specimens and in established cell lines. The Cytogenetics Laboratory includes an American Board of Medical Genetics-certified clinical cytogeneticist/clinical molecular geneticist, highly knowledgeable laboratory supervisors, and well-experienced staff.

SERVICES OFFERED
- Chromosome Studies on multiple sample types including peripheral blood, bone marrow, fibroblasts and solid tissues (Karyotype).
- FISH testing
- Microarray analyses (Data analyses)

Major equipment available:
- Metasystems Metafer Slide Scanner and Ikaros/Isis Analysis Software
- Nikon TMS microscope w/Fluorescence
- Olympus AX-70 microscope
- Olympus BHSM microscope
- Olympus BX-41 microscope
- Olympus BX-41 w/Fluorescence
- Zeiss Axiophot microscope
- Zeiss Axioskop microscope

Automatic Interphase and Metaphase Finder
Metasystems Metafer Slide Scanner and Ikaros/Isis Analysis Software are powerful tools.

- Automatic export of high resolution images for analysis
Chromosome Studies (Karyotype)

FISH Testing
- Whole chromosome painting
- Centromere probes
- Subtelomere probes
- Microdeletion probes
- Cancer probes
- Other locus-specific probes

Cytogenomic Microarray Analyses

Cytogenomic microarray analyses of a solid tumor revealed duplications (in blue lines), deletions (in red line) and CN-LOH regions (yellow in cytobands)
MISSION
The UM SOM Cytokine Core Laboratory (CCL) is an academic-based, fee-for-service laboratory dedicated to providing a high-quality, low-cost cytokine, chemokine and growth factor measurement service for both intramural and extramural investigators.

CORE SERVICES
The CCL offers an extensive list of human, mouse, and rat cytokine, chemokine and growth factor assays. We offer two assay platforms, ELISAs and Multiplex. Both platforms have their own unique advantages and disadvantages.

The lab offers in-house ELISA protocols utilizing validated commercial reagents and have the ability to order commercial kits for those less common biomarkers. Using in-house protocols allows us to greatly reduce costs while still upholding high standards in quality.

We utilize a Luminex™ 100 system for our multi analyte assays using high quality fully customizable commercial kits from the country’s leading vendors in multiplex technology.

The CCL is here for every investigator from beginning to end. We are happy to help with experimental design all the way through to data interpretation.

Our turnaround time is approximately 10 business days, and data are emailed to the investigator in a user-friendly Excel format.

Please contact us for sample volume requirements and pricing, or visit us at www.cytokines.com.

CORE INSTRUMENTATION

Luminex™ 100 Multi-analyte System
This system allows for the simultaneous measurement of up to 100 analytes in a single well. The machine utilizes two lasers, a reporter laser at 532 nm and a classification laser at 635 nm, to detect and measure fluorescently dyed microspheres. This allows for smaller sample requirements with a larger data output. Bio-Rad’s Bio-Plex Manager Software is used for data requisition and analysis.

Molecular Dynamics Precision Microplate Reader
The reader is used for all ELISA applications. It has 8 filters with the ability to change to others as required to read plates at multiple wavelengths. It reads 96-well plates in a matter of seconds and paired with the SoftMax Pro software it becomes a powerful machine to cover all ELISA needs.

BioTek ELx50 Plate Washer
BioTek’s ELx50 Microplate Washer is a fully programmable instrument that allows for full control of plate washing required for ELISA assays. Automated plate washers allows for higher throughput and for lower CV%’s over standard manual washing.
Results for both the ELISA and Multiplex can be customized to your needs. Results can include individual measurement results, means, standard deviations, and coefficient of variation.

If you are generating preliminary data, contact us to discuss our Pilot Development Program which allows for data for a smaller number of samples for one set price.

All of our assays are run with an internal control to ensure optimal assay function and every plate includes a 6- to 7- point standard curve.

Example of Multiplex Standard Curves
**MISSION**

The Electron Microscopy Core Imaging Facility provides electron microscopy related research, consultation and imaging services to all faculty and staff of the University of Maryland Baltimore campus and the academic and industrial community in the Washington, D.C. and Baltimore areas. The objective of this facility is to provide affordable electron microscopy research services using the modern EM techniques and state-of-the-art instrumentation from sample processing to image acquisition and analysis.

**CORE INSTRUMENTATION**

**Transmission Electron Microscope**
FEI tecnai T12 is a high performance, high resolution transmission electron microscope equipped with a tungsten filament. It is well suited to be a general purpose instrument in a multi-user facility. The tecnai T12 is also equipped with a Gatan 626 cryo transfer holder for observing frozen hydrated biological sample at liquid nitrogen temperature.

**Scanning Electron Microscope**
The FEI Quanta 200 is a versatile high performance, low-vacuum scanning electron microscope with a tungsten electron source. It can be operated in three different vacuum modes, High Vacuum (HV), Low Vacuum (LV) and Environmental Mode (ESEM), thus accommodate a wide range of sample of any SEM system. The Quanta 200 is also equipped with a Gatan Cryo transfer unit (ALTO2100) for cryo SEM imaging and freeze fracture.

**Cryo Sample Preparation Instruments**
- High Pressure Freezer
- Automated Freeze Substitution
- Plunge Freezer
- Cryoultramicrotome
- Gatan TEM Cryotransfer Holder
- Gatan SEM Alto Cryo Chamber

**CORE SERVICES**
- Conventional TEM sample preparation, including embedding in various types of resin and ultrathin sectioning
- Conventional SEM sample preparation, including chemical dehydration, critical point drying and sputter coating
- Cryo-sample preparation for both TEM and SEM, including high pressure freezing, freeze substitution, cryo-ultramicrotomy, plunge freezing and freeze fracture
- Immuno electron microscopy using pre-embedding, post embedding or Takuyasu methods
- Negative staining of purified macromolecular complexes, bacteria, viruses, liposomes, nanoparticles, or viral like particles (VLP)
- Advanced microscopy techniques, such as cryoEM, correlative LM/EM (CLEM) and 3D EM
- Electron microscopes imaging for trained or novice users
- Advanced consultation and training of electron microscopy related techniques and equipment usage
- Annual Current Electron Microscopy Techniques workshop
- Annual Ultramicrotomy Minicourse
- Instrument demonstration

MISSION
To ensure that University of Maryland investigators have access to flow cytometry and mass cytometry services for their research. A facility with dedicated operators ensures well-performing instruments and optimal results with a minimal outlay of expenses. Established in 1991, this facility has state-of-the-art equipment and a highly-trained and experienced staff.

CORE SERVICES
• Multichromatic flow cytometry
  Including markers for:
  • Lineage
  • Maturation
  • Activation
  • Homing
  • Intracellular cytokines

• Cell sorting (up to 6-way)
  based on GFP and/or multichromatic staining

• Mass Cytometry (>60 parameters)
  • Serum/supernatant cytokine levels using bead kits (e.g. BD Pharmingen CBA kit)
  • Cell cycle analysis (PI, DAPI)
  • Cell proliferation (CFSE, PCNA, BrdU and Ki67)
  • Apoptosis (Annexin V vs. PI; TUNEL; subG0/G1 peak analysis)
  • Green fluorescence protein (GFP) (eukaryotic and prokaryotic)
  • Advice with experimental design and data analysis
**Principles of Flow Cytometry**

**Fluidics**
- Cells in a single-cell suspension
- Flow in a single file through

**Optics**
- An illuminated volume where they
- Scatter light and emit fluorescence
- That is filtered, collected and

**Electronics**
- Converted to digital values
- That are stored on a computer
- And put through software for analysis

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**Principles of Mass Cytometry**


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**CONTACT**

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Regina Harley, MS  
Laboratory Supervisor

**LOCATION**

Room 456, Health Sciences Facility I  
685 West Baltimore Street  
Baltimore, MD 21201  
410-706-0095  
Fax: 410-706-6205

**Core Email**

cvdflowcore@medicine.umaryland.edu

**Web Address**

http://medschool.umaryland.edu/orags/flowlab.asp

**Laboratory Policies**

Experiments should preferably be scheduled one to two weeks in advance.

All sample analysis and cell sorting is done by Core Laboratory personnel.

The “Rules and Regulations” form (Revision March 10, 2015) is available at the CVD Flow Cytometry Core Laboratory.
FLOW CYTOMETRY SHARED SERVICES

CIBR: Center for Innovative Biomedical Resources

CORE INSTRUMENTATION

The facility has state-of-the-art analysis instruments used for quantitative analysis.

- BD LSRII Flow Cytometer with High Throughput Sampler Option
- BD FACS CANTO Cytometer
- BD FACScan Flow Cytometer

The facility is also equipped with two state-of-the-art high speed cell sorters.

- BD FACSAria I
- BD FACSAria II

MISSION

The University of Maryland Greenebaum Comprehensive Cancer Center Flow Cytometry Shared Service (FCSS) offers equipment and technical expertise to the entire campus, as well as outside clients in conducting research in all areas of basic and applied biomedical sciences. The FCSS provides full-scale, state-of-the-art flow cytometry services from sample acquisition through data analysis to cell sorting.

CORE SERVICES

The FCSS provides state-of-the-art instrumentation and technical support for sample acquisition and cell sorting, data analysis and interpretation, as well as training and experimental consultation and strategic planning.

- Operator-assisted sample acquisition
- Sample acquisition by user
- High throughput sample acquisition
- Operator-assisted data analysis with FlowJo or FACSDiva
- Data analysis by user on FCSS workstation
- Operator-assisted cell sorting
- Training for sample acquisition on analytical instruments
- Training on FACSDiva operating system
- Experimental planning and consultation

ORDERING

Online scheduling and ordering is available through iLabs.

https://cibr.umaryland.edu
FLOW CYTOMETRY SHARED SERVICES

CIBR: Center for Innovative Biomedical Resources

CONTACT

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410-706-2173
Fax: 410-328-6559

Web Address
www.umd.edu/research/flow_Cytometry.html

Email
flowcore@som.umaryland.edu

CORE INSTRUMENTATION

Fluorescence Lifetime Imaging Microscope
State-of-the-art imaging system, Alba V (FLIM and FCS) is designed for cellular imaging and bioassay readout and quantitative analysis. The system is equipped with multiple lasers, multiple channels, dual scanners and dual lifetime imaging capability (TD and FD).

Single Molecule Fluorescence Microscope
- Multiple lasers
- Lifetime capability
- FCS

Time-Resolved Fluorescence Spectrometer
- Super Continuum Laser
- Automated system

Atomic Force Microscope and NSOM WITec alpha300S
- Contact Mode
- AC Mode
- Confocal capability

MISSION
The Center for Fluorescence Spectroscopy (CFS) provides state-of-the-art fluorescence instrumentation for studies of structure, function, and dynamics of biological macromolecules. CFS also provides the expertise on applications of fluorescence for bioassays and cellular imaging.

CORE SERVICES
The CFS makes available state-of-the-art spectroscopic instrumentation and techniques for fluorometric bioassay development and cellular imaging.

Techniques include:
- Fluorescence energy transfer (FRET)
- Fluorescence polarization (FP)
- Fluorescence correlation spectroscopy (FCS)
- Single molecule detection (SMD)
- Time-resolved spectroscopy
- Fluorescence lifetime imaging microscopy (FLIM)

Facility also provides technical expertise on all aspects of fluorescence techniques used in basic science and biological/medical applications.

Cell imaging and studies of biomolecule interactions of assemble molecules and on single molecule basis are available with fluorescence microscopies.
CENTER FOR FLUORESCENCE SPECTROSCOPY

CIBR: Center for Innovative Biomedical Resources

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725 West Lombard Street
Baltimore, MD 21201
410-706-7500
Fax: 410-706-8408

Web Address
http://medschool.umaryland.edu/cfs
GCRC FACILITIES

The GCRC is located in the University of Maryland Medical Center, South Hospital, occupying the C&D wings on the tenth floor.

Our Outpatient facility on 10 South, D Wing includes:
• Three outpatient exam rooms
• Large outpatient treatment area
• A nursing station with computer workstation

Other outpatient area assets include:
• DEXA (Duel Energy X-Ray Absorptiometry) Facility
• Specimen Processing Lab
• Countertop Refrigerated Centrifuge
• Refrigerator, -20 and -70 freezer for temporary storage
• Reception and Waiting Areas
• Emergency equipment (UMMC crash carts)
• Biosafety cabinet
• Microscopes

Our flexible Inpatient/Outpatient facility on 10 South, C Wing includes:
• Five patient rooms- available for outpatient or inpatient visits up to double occupancy
• Specimen Processing Lab
• Procedure room
• 24 hour nursing care
• Kitchen/Activities Lounge
• Nursing station with computer workstation, EPIC access
• Countertop Refrigerated Centrifuge
• Omnicell

MISSION

The General Clinical Research Center (GCRC) is the cornerstone for clinical research within the University of Maryland. The GCRC supports the full spectrum of patient-oriented research. The GCRC is available to all University of Maryland investigators who have a need for Center resources and who will conduct clinical research of scientific merit. Studies funded by federal sources, foundations, industry and other sources are welcome. The GCRC welcomes pilot studies that may lead to future peer-reviewed clinical research.

The GCRC can provide investigators with the resources they need to conduct clinical research, including nursing support and the facilities for inpatient and outpatient data collection and patient care, as well as a state-of-the-art DEXA Facility.

GCRC Staff

The GCRC Nursing staff have the necessary education, certification and skills to provide quality research participant care. Staff training is an ongoing activity that assures all staff are competent to perform the skills required by GCRC Investigators. The Nursing staff is an integral part of the GCRC’s Quality Assurance program to assure the highest standards of research conduct and documentation. All nursing staff are BLS certified, some are ACLS certified.
CLINICAL SERVICES

Physical Examination and Monitoring
• Vital Signs, Weight, Height
• Serial BP Monitoring
• Intensive Physiologic Monitoring
• Pulse Oximetry
• Psychomotor/Cognitive Testing
• Activity Monitoring
• Intake/Output
• Anthropometry
• Doppler measurement

Subject Teaching
• Glucose Monitoring
• Medication Administration
• Protocol-specific Instructions

Specimen Collection/Processing
• Phlebotomy
• Serum Separation
• Multiple Specimen Aliquots
• Multiple Blood Samples from IV Access (e.g., PK sampling)
• Buffy Coat Extraction
• Urine Pregnancy Tests
• 24-hour Urine Collection
• Blood Glucose Monitoring
• Hemoglobin

Investigational Drug Administration
• Certified Chemotherapy Practitioners

Special Testing/Procedures
• IV and Oral Glucose Tolerance Test
• Spirometry
• O2 Administration
• GFR Testing
• Skin Testing
• DEXA Scan (on-site)
• Chemotherapy Infusion
• 12 Lead Electrocardiogram
• Assistance with Bone/Skin/Muscle/Fat Biopsy
• Anthropometric Measurements
• Bioelectrical Impedance Assessments (BIA)

Other Data Collection
• Questionnaire Administration
MISSION
The mission of the Genomics Laboratory is to provide the expertise, state-of-the-art resources and training necessary to promote cutting edge basic, translational and clinical genomic research, as well as clinical molecular testing under Clinical Laboratory Improvement Amendments (CLIA) and College of American Pathologists (CAP).

ABOUT
The Genomics Laboratory is committed to maintaining technologically advanced methodologies and instrumentation. We also provide an educational environment to instruct faculty, staff, fellows and students on the latest technologies and how they can positively impact on their research. Our staff are available to share their extensive knowledge and expertise in order to successfully support the research being conducted within the institution. Two separate laboratories make up the Genomics Shared Services: Genomics Core and TGL.

RESEARCH GENOMICS LABORATORY SERVICES (RGL)
- Cytogenomic Arrays
- Extraction of Nucleic Acid
  - DNA
  - RNA
- Gene Expression Arrays
  - Global Expression Profiling
  - miRNA Expression Profiling
  - Transcriptome Analysis
- Genotyping
  - Taqman Assays
  - SNP Arrays (targeted or GWAS studies)
- Next Generation Sequencing (NGS) Gene Panels
- Sanger DNA Sequencing
- MiSeqDX (Collaboration with Genomics Resource Center)

TRANSLATIONAL GENOMICS LABORATORY SERVICES (TGL)
- BTD Sequencing
- Confirmation of a Research Finding
- CYP2C19 Genotyping
- CYP2C19 Sequencing
- Cytogenomic Microarray
- Extract and Hold
- IDH1 R132_IDH2 R140 and R172
- Site-specific Familial variant analysis

Link to TGL Test Descriptions
http://medschool.umaryland.edu/TGL Test-Descriptions/

CORE INSTRUMENTATION
- Affymetrix GeneChip 3000 systems
- Agilent Bioanalyzer model 2100
- Applied Biosystems Model 3730XL DNA Sequencers
- Applied Biosystems Model 7900 rtPCR System
- Ion Torrent Personal Genome Machine (PGM) Sequencers
- MiSeqDX (Collaboration with Genomics Resource Center)
- Nanodrop single-channel and 8-channel spectrophotometers
MISSION
The Genomics Resource Center (GRC) is a high-throughput core laboratory and data analysis group supporting the scientific programs of the Institute for Genome Sciences, University of Maryland Baltimore and its collaborators utilizing state-of-the-art technology to generate high quality genomic data in a cost effective manner.

ABOUT GRC
Led by Dr. Lisa Sadzewicz, Administrative Director, and Mr. Luke Tallon, Scientific Director, who together have more than 40 years’ experience in managing high-throughput sequencing and analysis operations, the multi-disciplinary GRC group includes scientists, bioinformatics software engineers, bioinformatics analysts, project managers, and research specialists who have extensive experience in planning and managing projects, ranging in scope from small-scale amplicon and plasmid sequencing to large-scale comparative genomic and transcriptome sequencing.

The laboratory services offered by the GRC include sample quality assessment, library construction, sequencing and analysis of a broad range of sample types.

APPLICATIONS AND SERVICES

Sequencing Applications
• *de novo* Whole Genomes
• Comparative Genomes
• Human Genomes & Exomes
• Transcriptomes
• Custom Capture
• ChIP-Seq
• Methylation & Base Modification Detection
• Ecological and Organismal Metagenomes
• Amplicon Sequencing
• Custom Applications

Analysis Services
• Genomic and Metagenomic Sequence Assembly
• Comparative Genome Analysis
• Phylogenomic Analysis
• SNP, Indel, and Structural Variant Detection
• Epigenomic Analysis
• Pathway & Network Analysis
• Sequence Data Storage and Distribution
• Custom Data Analysis

Our Sequencing Platforms
• Illumina HiSeq 2500 & 4000
• Illumina MiSeq and MiSeqDx
• PacBio RS II & Sequel
• Oxford Nanopore MinION
• ABI 3730xl and 3130xl
Why the GRC?
Genomic technologies and applications now permeate both basic and clinical research. Personalized medicine is being driven by genomic data. However, transforming the data into medical knowledge is the primary challenge facing researchers today. Led by investigators with more than 40 years of experience at a major genome center, the GRC offers expertise in a compact, nimble, and responsive core. We cultivate long-standing relationships with genomic technology providers to gain early access to new platforms and to maintain our cutting-edge advantage. We offer services using any combination of our sequencing platforms and bioinformatics analysis pipelines.

Who can work with the GRC?
Everyone! We strive to bring the increasing power and decreasing cost of genomic analysis to a continually expanding research community. We provide services to a wide range of researchers – from experienced genomic scientists, to clinicians, to computer scientists. Prior experience with genome sequencing is not required. No matter your experience or expertise, we can guide you through every phase of the process and ensure that your project completes on time and on budget.

What types of projects does the GRC take on?
We routinely work with projects that range from a single sample, to multi-year projects with thousands of samples. On average, we have more than 30 active projects ongoing, and our capacity grows each year. While we have particular expertise in microbial genomics, human microbiome studies, and human genome analysis, if it can be sequenced and analyzed, we can do it! From viral genomes to human genomes, from metagenomes to metatranscriptomes, and everything in between, we have experience sequencing and analyzing a wide variety of samples. Whether you are interested in only sequencing, or a combination of sequencing and analysis, we can customize the project to meet your needs.

How does it work?
We tailor each project to the needs of the researcher. We conduct an initial consultation to develop a project plan that utilizes the most efficient and effective combination of available platforms and analysis pipelines to accomplish the goals of the project. This customized project plan serves to ensure the services provided by GRC address the underlying scientific question(s) driving the project. As the project commences, we initiate regular project updates, deliver data and quality metrics as they are generated, and conduct a post-project consultation to guide each researcher through the results.

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LOCATION
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Genomics Resource Center
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Baltimore, MD 21201

Email Questions
grc-info@som.umaryland.edu

Web Address
http://www.igs.umaryland.edu/grc

Blog
http://grcblog.igs.umaryland.edu
**MISSION**
To enable basic and translational research by leveraging expertise in genome-scale analysis tools and high-performance computing.

**CORE SERVICES**
The Institute for Genome Sciences Informatics Resource Center engages in fee-for-service (FFS) and collaborative research projects and proposals. For this purpose two cores were created: the Genome Informatics Core (GIC) and the High-Performance Computing Core (HPC). The following are some of the major services available through these IRC cores.

**ANALYSIS SERVICES**
The IRC has developed and maintains several analysis tools and pipelines that facilitate research at the UMSOM. These include:

- Genome assembly and annotation. Pipelines for both prokaryotic and eukaryotic organisms are available. These include both reference-based and reference-independent protocols
- Differential expression analysis. The IRC has pipelines to conduct gene and isoform level differential expression analysis using microarrays or RNA-Seq
- Genome variation analysis. Pipelines for single nucleotide polymorphism (SNP) and copy number variant (CNV) detection and visualization
- Metagenome/Metatranscriptome Analysis. Pipelines are available for analysis of microbiome community composition and functional dynamics from 16S, Whole Metagenome Shotgun sequence, and metatranscriptome sequencing
- Custom Programming and Analysis. IRC staff have expertise to develop custom pipelines, analysis tools, websites, databases, and custom applications

**SOFTWARE AND TOOL DEVELOPMENT**
GIC software engineers are available to develop custom software solutions that include:

- Web site Development
- Custom Programming/Scripting
- Research Data Capture Systems
- Database Design

**OUTREACH AND EDUCATIONAL PROGRAMS**
The Institute for Genome Sciences offers regular professional development workshops. Workshop topics include:

- Genomics
- Metagenomics
- Transcriptomics
- Programming

More information can be found at [http://www.igs.umaryland.edu/education/workshops.php](http://www.igs.umaryland.edu/education/workshops.php)
INFORMATICS RESOURCE CENTER (IRC)

CIBR: Center for Innovative Biomedical Resources

VISUALIZATION TOOLS
The IRC has developed a number of genome visualization and curation tools that are available to the research community. In addition we have also deployed third-party open source tools. Some of these include:

• SYBIL – A browser for comparative genomics results that provides views for ortholog groups, synteny gradients, genomic regions, and more.
• Circelator – A circular genome visualization tool providing compact figures showing diverse types of information that can be used to compare features of multiple genomes.
• Manatee – A genome annotation query and curation tool that allows users to browse annotations by gene location, function, and biological role. Annotations can be revised by users as well as downloaded in a variety of standard formats.
• Integrative Genome Browser (IGV) – A tool that provides simultaneous visualization of multiple types of genome-associated information including gene models, ortholog data, RNA-Seq alignments, and more.
• JBrowse – A Web-based genome visualization tool.

COMPUTATIONAL INFRASTRUCTURE
Supporting informatics at IGS/IRC is a state-of-the-art computational infrastructure that includes a computational grid, an internal 10-gigabit network, database servers, and a hierarchical storage management system.

The infrastructure includes:
• Twenty-five high-performance high-memory multi-processor machines (128-1024 GB RAM, 4-8 CPU multi-core processors)
• Over eighty high throughput computational nodes (24-128 GB RAM, 2 CPU multi-core Intel Xeon processor machines)
• A 4-tier enterprise-class high-performance storage system with 1.5 petabytes
• A tape library with a capacity to store 1 petabyte of data

The IRC has recently deployed one of the largest public academic clouds, the Data Intensive Academic Grid (DIAG), to enable bioinformatics analysis to be conducted remotely by researchers in the community. The scientific community can access this resource as a traditional grid, as a computational cloud like Amazon EC2, or through Ergatis, a pipeline management system.

The DIAG includes:
• Eight high-performance high-memory multi-processor machines (128-1024 GB RAM, 4-8 CPU multi-core processors)
• Over one hundred twenty five high throughput machines (48 GB RAM 2 CPU multi-core Intel Xeon processor machines)
• 500 TB of shared high-performance storage

WEB SITE
http://www.igs.umaryland.edu/resources/irc/

LOCATION
Biopark II, Institute for Genome Sciences
801 West Baltimore Street
Baltimore, MD 21201

CONTACT
irc-info@som.umaryland.edu
410-706-5682
CORE FOR TRANSLATIONAL RESEARCH IN IMAGING @MARYLAND (C-TRIM)
MAGNETIC RESONANCE RESEARCH CENTER

MISSION
To provide full-fledged access to research using Magnetic Resonance Imaging for humans and large animals to discover new imaging markers, understand brain function, and to translate basic science to the clinic.

Objective: To provide a collaborative environment to imaging researchers, that leads to innovation that can be rapidly translated to the clinic.

CORE SERVICES
The staff of C-TRIM provides consultation on all imaging related research. Assistance is available for the design of experiments and to optimize imaging techniques. The staff also provides assistance in image processing and image analysis. Training is provided to users upon request. The core conducts an annual retreat where specific areas of imaging research are highlighted.

One aspect of the core is to develop new technologies with the goal of making available state-of-the-art techniques to investigators. Through this core, investigators have access to facilities at the Center for Metabolic Imaging & Therapeutics (CMIT).

CORE EQUIPMENT
Siemens Tim Trio 3 Tesla whole body MRI System
- Siemens whole body Tim-Trio 3.0 Tesla system with high-speed gradients
- 32 receiver channels with head and body array coils
- High-resolution anatomic imaging (~70-µm resolution) for CNS and body applications
- Tumor kinetics
- Metabolomic studies
- High-resolution Diffusion Tensor and Diffusion Kurtosis Imaging for detecting microstructural and cellular changes
- Cardiac Functional Analysis and Vascular studies
- Cerebral blood flow studies using endogenous contrast
- Functional MRI and Resting state brain networks
- Interventional Imaging

GE SpinLab Dynamic Nuclear Polarizer
- Hyperpolarization of C-13 substrates (pyruvate, fumarate, glutamine etc) for detection in vivo
- Four sterile sample sizes up to 100 mL of 250 mM C-13 substrates for human applications
- Detection of downstream metabolic products in vivo in real-time
- Ability to determine metabolic fluxes, for example to determine aggressiveness of tumor
- Metabolic response to therapeutic drugs

MR guided Focused Ultrasound (MRgFUS)
- Insightec Neuro ExAblate system for neuro-interventions
- 1024 element high-intensity focused ultrasound (HIFU) system
- Ability to focus ultrasound beam within 2 mm radius
- MR temperature mapping to facilitate brain interventions
- Neuromodulation Studies
- Blood brain barrier opening for delivery of nanoparticles
- Translational studies
Significant disruption of anterior-posterior white matter tracts due to extensive micro-hemorrhage along the tracts.

Minimally invasive neurosurgical intervention robot performing neurosurgery under image guidance.

Anatomic, Biophysical, Biochemical & Functional Changes following TBI.
CORE INSTRUMENTATION

- 600 MHz Bruker Avance III NMR Spectrometer with TCI cryoprobe
- 800 MHz Bruker Avance Spectrometer with TXI cryoprobe and BACS 60 automatic sample changer
- 950 MHz Bruker Avance III Spectrometer with TCI cryoprobe

MISSION

The objective of the UMB NMR Center is to promote the use of nuclear magnetic resonance spectroscopy for use in ongoing and new research projects at the University of Maryland School of Medicine.

CORE SERVICES

We offer assistance and training for:

- Collecting NMR data
- Processing NMR data
- Analysis of NMR data

ADDITIONAL CORE SERVICES

- Linux and Apple workstation access for data processing and analysis
- Lab space for sample handling
- Assistance with NMR-related computer software including Bruker Topspin, NMRView, nmrPipe, nmrDraw, xplor-NIH, and several others
Ribbon diagram of RIIβ<sup>112-416</sup> (A) and NMR feasibility data for RIIβ<sup>112-416</sup> (B) and CaS100A1-RIIβ<sup>112-416</sup> (C) at 950 MHz. (A) Ribbon diagram of RIIβ<sup>112-416</sup> (2); (B) 15N-TROSY-HSQC of [2H,13C,15N]-RIIβ<sup>112-416</sup> at 950 MHz after refolding/back-exchange to give H<sup>2</sup> protons. (C) 3D-TROSY-HNCA of [2H,13C,15N]-RIIβ<sup>112-416</sup>-CaS100A1unlabeled with RIIβ<sup>112-416</sup> back-exchanged. (D) 13C-TROSY-HSQC with selection of A,I,L,V-methyls in uniform [2H,13C,15N]-labeled PKA-RIIβ<sup>112-416</sup> in the absence (black) and presence of CaS100A1 bound (red). The inset in the top left corner illustrates several chemical shift perturbations from S100A1 binding (>19 ΔΔ<sup>13</sup>C perturbations labeled with a number or **). In the lower left-hand corner (inset) is the negative contour region in the absence (blue) and presence of CaS100A1 bound (green). In the top right (inset) is a native gel illustrating the high quality of the NMR sample (lane 3).
PATHOLOGY BIOREPOSITORY SHARED SERVICE

CIBR: Center for Innovative Biomedical Resources

CORE SERVICES

TISSUE PROCUREMENT AND PROCESSING SERVICES
- Fresh or Frozen tissue
- Plasma and serum collection
- Bone marrow and peripheral blood mononuclear cell isolation
- Biospecimen storage and retrieval
- Rapid collection and storage methods
- Project/protocol-specific procurement

TRANSLATIONAL RESEARCH SUPPORT

Histology Services
- Tissue processing and embedding
- Sectioning and staining
- Immunohistochemistry (IHC), including antibody work-up and control tissues
- Special Stains
- Tissue Microarray (TMA) Construction

Digital Image Analysis Services
- Aperio digital IHC and TMA software
- Quantitative IHC

Data Services
- Association of archived and prospectively collected tissue with clinical data
- Prospectively maintained and queryable database for all collections

Consultation Services
- Pathology consultations
- Interpretation support
- IRB application assistance
- Material Transfer Agreement (MTA) submission support

MISSION
Pathology Biorepository Shared Service (PBSS) provides access to a collection of high quality banked patient samples while maintaining patient confidentiality. PBSS provides pathology, histology, and histotechnology services to assist with procurement, analyses, and clinicopathologic correlations of human tissue specimens. Access to a high-quality bank of patient samples permits UMGCCC investigators to perform studies aimed at understanding the biology of normal and diseased tissues with an ultimate goal of translating this knowledge into diagnostic and clinical applications.

ABOUT PBSS
Pathology and Biorepository Shared Service was established by UMGCCC in 2006 as a developing core. PBSS has both the unique advantage of the long-standing expertise gained under the well-established relationship with the NCI as well as the advantage of existing expertise and archives of the Pathology Department.

PBSS is the only tissue bank shared service for specimens removed at surgery on the campus.

We have an integrated relationship with the Anatomic Pathology Department, which is essential for obtaining well-characterized tissue samples as well as for pathology and histology expertise.

Frozen tissue archives of PBSS consist of more than 7,000 frozen tumor samples, 5,900 of which are paired with normal tissue from the same patient, and more than 22,000 frozen mononuclear cell isolates, plasma, and serum samples.
PATHOLOGY BIOREPOSITORY SHARED SERVICE

CIBR: Center for Innovative Biomedical Resources

CONTACT

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655 West Baltimore Street
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410-706-2174
PHYSIOLOGICAL PHENOTYPING CORE

CIBR: Center for Innovative Biomedical Resources

CORE INSTRUMENTATION

- Vevo 2100 High-frequency Ultrasound System (VisualSonics), the most updated system that allows high-resolution imaging under B-, M-, color and pulse-wave Doppler mode, 3-D construct, and Vevo strain. (Figures: Mouse Echo; Tumor Imaging)

- Telemetry System (DSI) allows long-term recordings of blood pressure, biopotential (ECG, EEG, EMG), sympathetic nerve activity, and blood glucose concentration. It can be interfaced with flowmeters (Transonic), e.g., for simultaneously long-term recordings of blood pressure and cardiac output (Figure: Long-term BP and CO)

- MP150 Acquisition System (BioPac): 16-channel modular system interfaced with various transducers or amplifiers of pressure, volume, flow, biopotential, and temperature, as well as Mikro-tip catheters (Millar), flowmeters (Transonic), and cardiac output computer (Columbus Instruments)

- Environment System (Kent Scientific) allows customized exposure of hypoxia or hyperoxia (Figure: CIH setup)

- Pressure-volume loop system (Transonic) for comprehensive analysis of cardiac function in vivo or in isolated heart preparation

- Tailcuff Blood Pressure System (SC1000, Hatteras)

MISSION

The Physiological Phenotyping Core (PPC) provides cutting-edge phenotyping services with a focus on cardiovascular and respiratory systems. The core has a 10-year track record of services, including microsurgery, telemetry recordings, high-frequency ultrasound, and pressure-volume loop analysis.

CORE SERVICES

- Microsurgery and animal models: catheter and device implanting; coronary artery ligation; aortic banding; artery wire denudation or ligation; chronic hypoxia

- Biomicroscopy (high-frequency ultrasound) of the hearts, large or small vessels, tumors, or abdominal organs

- Acute in vivo measurements: hemodynamics, pressure-volume loop analysis, respiratory mechanics, sympathetic nerve activity

- Long-term recordings: blood pressure, aortic or organ blood flow, sympathetic nerve activity, ECG, EEG, EMG, temperature

- Equipment Rent
PHYSIOLOGICAL PHENOTYPING CORE

CIBR: Center for Innovative Biomedical Resources

**CONTACT**

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**LOCATION**

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**Web Address**

http://medschool.umaryland.edu/ppc/

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**TARGETED HIGH-FREQUENCY ULTRASOUND IMAGING IN TUMOR**

(Vevo 2100, Visualsonics System)

<table>
<thead>
<tr>
<th>Image Courtesy of VisualSonics</th>
<th>Whole Tumor (Green)</th>
<th>Left Area (Yellow)</th>
<th>Right Area (Pink)</th>
</tr>
</thead>
<tbody>
<tr>
<td>VEGFR2</td>
<td>7.56</td>
<td>10.00</td>
<td>5.79</td>
</tr>
<tr>
<td>Isotype Control</td>
<td>1.47</td>
<td>2.08</td>
<td>1.08</td>
</tr>
</tbody>
</table>

**Echocardiography of Mouse Left and Right Ventricle**

(Vevo 2100, Visualsonics)

**Image Characteristics**

- **LV**: Left Ventricle
- **LA**: Left Atrium
- **RV**: Right Ventricle
- **RA**: Right Atrium
- **RVOT**: Right Ventricular Outflow Tract
- **LV cavity**: Left Ventricle Cavity
- **LV Post. Wall**: Left Ventricle Posterior Wall
- **RV cavity**: Right Ventricle Cavity
- **RV Post. Wall**: Right Ventricle Posterior Wall

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**CENTER FOR INNOVATIVE BIOMEDICAL RESOURCES (CIBR)**

medschool.umaryland.edu/CIBR
MISSION
The University of Maryland Greenebaum Comprehensive Cancer Center Translational Shared Service (TLSS) offers pre-clinical and clinical experimental support to basic researchers and physicians in the UMGCCC community. We work in areas across the entire spectrum: cell biology, in vitro, in vivo and human trials.

CORE RESOURCES
• Access to 50+ human cell lines
• Luciferase-expressing breast, leukemia, ovarian and prostate cancer cell lines
• IACUC approved umbrella protocol
• Access/Knowledge in Using Xenogen/IVIS Imaging Mice
• Primary Xenograft Models
  • Breast
  • Leukemia (under development)
  • Ovarian (under development)
Access to IRB approved protocol for tissue acquisition

Clinical Trial Support
We isolate:
• Plasma
• Serum
• Tumor Biopsy
• Whole Blood (isolation of PBMC, DNA, RNA, protein)
• Bone Marrow (isolation of marrow cells)
• Buccal Mucosa

CORE SERVICES

In Vitro Assays
• IC50 generation
• Cell cycle (propidium iodide)
• Viability (trypan blue exclusion)
• Apoptosis
• Potentiation/Synergy
• ROS
• Western Analysis
• Angiogenesis
• Mycoplasma testing

Xcelligence
• Real time proliferation/invasion/migration

In Vivo Assays
• IACUC approved umbrella protocol
• Tolerability
• Tumor Growth
• Pharmacokinetics: generation of plasma
• Efficacy (flank models)
• Efficacy (orthotopic models)
• Pharmacodynamic Endpoints
• Imaging of cells with Xenogen System

Pharmacodynamic (PD) Endpoints
• in-patient samples, tumor or surrogate tissues, preclinical samples
• Endpoint dependent on target (e.g., ELISA, flow cytometry, Western, unique assay)
Combination BMN673 and 5-Azacytidine inhibit leukemia growth in NSG mice. Female NSG mice were injected intravenously with 1x10^6 cells human MV4-11-luc acute myelogenous leukemia cells. After engraftment, mice were sorted into 4 groups of 5 mice and treatment started. Mice received either vehicle, BMN 673 (oral daily x5), 5-azacytidine (SC daily x5) or the combination. The mice were imaged weekly on the Xenogen IVIS imaging system in the Imaging Core. Leukemia burden is depicted by quantity by color in order from high to low (red, orange, green, blue).

Dichloroacetate (DCA) augments Reactive Oxygen Species (ROS) production in the presence of arsenic trioxide (ATO) in human MOLM-14 acute myelogenous leukemia cells. Cells were stained with 5 μM CM-H2DCFDA dye, plated in a 96 well format and then exposed to either Vehicle, DCA, ATO or their combination for 24 and 48 hours. ROS generation is monitored over time on the Biotek Synergy HT reader at 480/528 nm.
CENTER FOR TRANSLATIONAL RESEARCH IN IMAGING @ MARYLAND (C-TRIM)

CIBR: Center for Innovative Biomedical Resources

**MISSION**

To foster a collaborative environment that facilitates novel innovations in imaging and image guided therapeutics that can be translated to the clinic.

**CORE SERVICES**

The staff of C-TRIM provides consultation on all imaging related research. Assistance is available for the design of experiments and to optimize imaging techniques. Image processing and analysis expertise is available within the core and training is provided upon request. The core also conducts an annual retreat where specific areas of research are highlighted. One aspect of the core is to develop new diagnostic imaging technologies and to develop image guided therapeutic interventions to remain at the state-of-the-art.

**CORE INSTRUMENTATION**

**Bruker BiospecAvance III 7 Tesla Small Animal MRI Scanner**

- High-resolution qualitative and quantitative assessment of structure and function for CNS and various body applications
- Multi-nuclear spectroscopy (H-1, C-13, Na-23, P-31, F-19 etc)
- High-resolution Diffusion Tensor Imaging for detecting microstructural and cellular changes
- Vascular studies, cerebral blood flow, cardiac function analysis

**Siemens Inveon Small Animal PET-CT Imaging System**

- Dockable PET-CT for combined anatomic and functional imaging
- High specificity radionuclide uptake
- Metabolic imaging
- High resolution system, (50 μm for CT and 1.2 mm for PET) with extended FOV

**Xenogen IVIS-200 Optical in vivo imaging System**

- Rapid whole-body optical images of mice, rats or rabbits
- Wide range of fluorescence excitation and emission filters
- Wide array of molecular biology assays including GFP and luciferase
- Measures proteasome activity, monitor tumor growth, drug efficacy
MRI-guided Focused Ultrasound (MRgFUS) System

- Integrated with MR for image guidance
- Tumor ablation studies, blood brain barrier disruption and neuromodulation

CORE APPLICATIONS INCLUDE

- High-resolution anatomic imaging for CNS and body applications (MR/CT)
- Tumor kinetics using receptor specific exogenous agents (MR/PET)
- Multi-nuclear MR spectroscopy (H-1, C-13, Na-23, P-31, F-19 etc.)
- Metabolomic studies (MR/PET)
- High-resolution Diffusion Tensor Imaging for detecting microstructural and cellular changes (MR)
- Vascular studies (CT/MRI)
- Cerebral blood flow studies using endogenous contrast (MR)
- Cardiac functional analysis (MR/PET/CT)
- Investigation of Blood-Brain Barrier disruption for various particle delivery (MR/MRgFUS)
- Neuromodulation using low energy ultrasound (MRgFUS)
- Ablative image guided surgery
- Focal image guided body and neuro thermal therapy applications. (MRgFUS)
- Bone density measurements (CT)
- Cardiac metabolism (MR/PET)
- Musculoskeletal studies (MR/CT)
- Detection of novel fluorophores (Xenogen)
- GFP and Luciferase imaging (Xenogen)
- Monitoring tumor growth (CT/MR/PET/Xenogen)
MAJOR EQUIPMENT
Hamilton Biorepository (BiOS) Freezer System

- state-of-the-art automated, ultra-low temperature (-80°C) freezer system
- equipped to accommodate over 900,000 biospecimens

MISSION
The objective of the UMM Biorepository is to provide the resources and support for large-scale studies to empower basic and clinical researchers to make discoveries in genomics and ‘omics’ science and to translate these discoveries to more effective diagnostics and therapeutics.

ABOUT
The UMM Biorepository is a resource building effort that includes banking of blood samples from UMMS patients as well as collections of various biospecimens from collaborating UM researchers. State-of-the-art robotic freezer and liquid-handling equipment offers a secure and managed environment for biospecimen processing, storage and distribution. Data connected to the samples is obtained through the electronic health record and/or study-specific data collection, allowing for multi-disciplinary research that can impact a range of health issues.

CORE SERVICES
Laboratory
- Sample processing & banking
- DNA/RNA extraction & banking
- Sample storage
- Sample retrieval

Clinical Research Support
- IRB protocol preparation assistance
- Consenting
- Phlebotomy/sample collection
- Survey administration
MAJOR EQUIPMENT (CONT.)

Microlab chemagic STAR liquid handling system (Hamilton)
- DNA/RNA extraction

Microlab STAR liquid handling system (Hamilton)
- Sample aliquoting and set up specific assays using retrieved samples

CONTACT

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Kathleen Palmer, BSN, RN
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LOCATION

Bressler Research Building, Room 7-010
655 West Baltimore Street
Baltimore, MD 21201
410-706-0453
**CORE INSTRUMENTATION**

**SPECTRAMAX M2 6-96 WELL PLATE READER**
- 6-well to 96-well plate reading capability
- Built-in absorbance and fluorescence
- Absorbance wavelength between 200 nm and 1000 nm, excitation wavelength between 250 nm and 850 nm, and emission wavelength between 360 nm and 850 nm

**WALLAC VICTOR 2 MULTI-ANALYTE PLATE READER**
- Complete platform for quantitative detection of light-emitting or light absorbing markers
- Luminescence, fluorescence, time-resolved fluorescence (DELFIA), and photometer

**VERITAS MICROPLATE LUMINOMETER**
- Read glow and flash luminescent reactions in 96-well plates

**BIO-PLEX 200 SYSTEM**
- Simultaneously quantitate up to 100 analytes per sample from culture media and serum
- Automatically analyze up to 96 samples in 30 min
- Instantly customize your assay by mixing Bio-Plex assay, or create your own assays
- Dramatically increase the amount of useful data obtained from a single sample

**StepOnePlus REAL-TIME PCR SYSTEM**
- 96-well Real-Time PCR instrument with sensitive 4-color optical LED recording system

**SimpliAmp PCR THERMAL CYCLER**

**MISSION**

The μQUANT Core Facility housed within the Institute of Human Virology provides quality immunological analyses of biological analytes to researchers at the UM SOM, as well as other collaborators locally and nationally. Our aim is to provide consistent service that allows researchers to compare results generated this week with those gathered last month or a year ago.

**CORE SERVICES**

Services offered include, but are not limited to:

- ELISAs
- PBMCs
- Immunoassay setup & protocol establishment
- Luminex assays
- Mycoplasma & endotoxin testing
- Monoclonal antibody and recombinant protein screening, production, purification, & labeling
- HIV, SIV, & SHIV culture
- TCID50 and neutralization assays
- Quantitative PCR
The University School of Medicine Program in Comparative Medicine was established in 1989. All Program faculty members hold joint appointments in other departments; conduct independent and collaborative research; and have expertise in the fields of clinical laboratory animal medicine, surgery, comparative pathology, microbiology, immunology, genetics and infectious diseases.

Comparative Medicine faculty members are available for consultation on animal research protocols, laboratory animal management and development of grant applications proposing the use of animals. Members participate in the teaching of medical students, graduate students, and postdoctoral fellows and provide postdoctoral residency and graduate training programs for veterinarians in the fields of Laboratory Animal Medicine and Veterinary Pathology.

As members of the University of Maryland School of Medicine’s Veterinary Resources, we also provide veterinary supervision for husbandry and health care related to facilities management, diagnosis, treatment and prevention of intercurrent disease in research animals.

**MISSION**

Our mission is to study the characterization of animal models of human disease; provide accredited services for laboratory animal care through collaborative research, professional development of veterinarians through specialty training with American College of Laboratory Animal Medicine (ACLAM); achieve continuous certification through compliance with The Association for Assessment and Accreditation of Laboratory Animal Care International (AAALAC), the United States Department of Agriculture (USDA); and the Office of Laboratory Animal Welfare (Public Health Service, NIH) and to act as a resource for information and instruction on the use of laboratory animals.

**CORE SERVICES**

- Wide range of animal models from mice to non-human primates for biomedical research
- GLP support for FDA/EPA-regulated studies
- Generation of polyclonal/monoclonal antibodies and induced pluripotent stem cells
- Maintain mouse colonies (SCID-NOD/NSG/NRG, nude, C57BL/6)
- Pre-research consultations with researchers on development of animal models
- Technical services provided for rodent procedures such as: blood withdrawal, anesthetic support, and weaning
- Hands on training course to investigators and staff on humane handling of laboratory animals
TRANSGENIC RESOURCES

The new, as of 2015, Transgenic Resources and the University of Maryland School of Medicine exists to facilitate all aspects of customized production of genetically engineered rodent models. Transgenic Resources has developed a partnership with Jackson Laboratories (JAX) (you may contact George Scheer, UMB, Senior Buyer, 410-706-8305, for Terms & Conditions, Pricing) which is a proven leader in conducting transgenic knockout rodent services. The services offered are extensive and include standard transgenics, nuclease-mediated (CRISPR) knockout and knock-in mouse services, as well as ES cell injections. The mission of Transgenic Resources is to ensure that these established partnerships provide the best pricing, customization and the highest product quality to support our world class research. Lou DeTolla, VMD, PhD, will serve as Director, Transgenic Resources. Lou’s Ph.D. is in immunogenetics and he has directed transgenic core facilities previously, both at UMB and Merck Sharp and Dohme Laboratories.

Researchers may directly contact the following vendors (listed below) for information and quotes for generation of their transgenic model(s).

TRANSGENIC VENDORS

Jackson Laboratory
Susan Kolocotronis
Opportunity Development Manager
410-926-2620
susan.kolocotronis@jax.org

The Harvard Clinical and Translational Science Center
Arlene H. Sharpe, MD, PhD
Director, BWH Transgenic Mouse Facility
617-432-6569
asharpe@rics.bwh.harvard.edu

University of Michigan
Thom Saunders, PhD
734-647-2910
tsaunder@umich.edu

Ingenious Targeting Laboratory
Michael Castelli
Scientific Strategy Consultant
631-468-8530 ext. 103

Cyagen Biosciences Inc.
Marvin Y. Ouyang, PhD
Vice President, Technologies
800-921-8930
marvinouyang@cyagen.com

CONTACT

Louis DeTolla, VMD, PhD, DACLAM
Professor and Director
Comparative Medicine
Chief, Veterinary Resources
Professor of Pathology, Medicine (Infectious Diseases) and Epidemiology and Public Health
detolla@vetmed.umaryland.edu

E. Douglas Allen, BS, LATg
Deputy Director
edallen@vetmed.umaryland.edu

LOCATION

Room G-100, MSTF
10 South Pine Street
Baltimore, MD 21201
410-706-8536 or 410-706-8537
Fax: 410-706-8538

Web Address
medschool.umaryland.edu/
vetmedicine/vetresources.asp
MISSION
The X-ray Crystallography Shared Service provides the expertise, training and equipment to help determine important proteins structures as part of the UMGCCC mission to understand the molecular basis of cancer-causing cellular defects. The X-ray Crystallography Shared Service will be most valuable in helping the UMB research community understand underlying causes of diseases and develop novel therapeutic interventions.

CORE SERVICES
The facility makes state-of-the-art robotic crystallization and automated documentation of crystallization experiments available to UMGCCC researchers.

Members of the X-ray Crystallography Shared Service are available to consult with investigators regarding sample preparation, yields, and quality. Data collection and structure solution can also be carried out by the core for a fee.

We are also willing to consult with investigators who want to perform the structure determination themselves.
X-RAY CRYSTALLOGRAPHY SHARED SERVICE

CIBR: Center for Innovative Biomedical Resources

Recent Data – S100B Inhibitors

Biochemistry. 2014; 53(42): 6628

CONTACT

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