The Handbook of Core Facilities and Resources Supporting Basic, Clinical, and Translational Research

UNIVERSITY of MARYLAND
SCHOOL OF MEDICINE

Winter - 2013

Imaging Core Facilities and Resources

Page 11 **Center for Fluorescence Spectroscopy (SOM)**
Joseph Lakowicz, Ph.D., Director (410) 706-8409
Mary Rosenfeld, (410) 706-8409
mrosenfeld@umaryland.edu
http://cfs.umbi.umd.edu/cfs/

Page 13 **Confocal Microscopy Core Facility (SOM)**
Joseph Mauban, Ph.D. (410)-706-3925 HSF1 Room 608-612
jmauban@umaryland.edu
http://medschool.umaryland.edu/confocal/

Page 16 **Core for Translational Research Imaging at Maryland**
Rao Gullapalli, PhD, MBA, Director (410) 328-2099 Howard Hall 644
rgullapalli@umm.edu
Mark Smith, PhD. (410) 328-1320
Msmith7@umm.edu

Page 17 **Imaging Core (SON)**
Chris W. Ward, Ph.D. (410) 706-3618
ward@son.umaryland.edu

Page 18 **Electron Microscope Core Facility (SOD)**
Dr. Ru-ching Hsia (410)706-7992 Howard Hall 696
rhsia@umaryland.edu
http://www.dental.umaryland.edu/Core-imaging

Page 19 **Magnetic Resonance Research Center**
Rao Gullapalli, PhD, MBA, Director (410) 328-2099
Paca-Pratt Suite 104
rgullapalli@umm.edu
Jiachen Zhuo, PhD (410) 328-5974
jzhuo@umm.edu

Structural Biology Core Facilities and Resources

Page 21 **BIACore Core Facility (SOM)**
Robert Bloch, Ph.D. (410) 706-2036 HSF 2, Room 611
biacore@umaryland.edu
http://medschool.umaryland.edu/physiology/biacore.asp

Page 22 **Center for Mass Spectometry Resources (SOP)**
Maureen Kane, Ph.D., Director (410) 706-5097 Pharmacy Hall 723N
mkane@rx.umaryland.edu
Jace Jones, Ph.D., Manager (410) 706-7598
jjones@rx.umaryland.edu
http://www.pharmacy.umaryland.edu/facilities/massspec/instruments/

Page 23 **Edman Sequencing / Protein Analysis Core Facility (SOM/CVID)**
Brian Hampton (410) 706-8207 Biopark I, Room 307
bhampton@som.umaryland.edu Fax: (410) 706-8234

Page 24 **NMR Center (SOM/SOP)**
Kristin Varney (410) 706-2110 HSF-II Basement
kvarney@umaryland.edu
David Weber, Ph.D. (410) 706-4354
dweber@umaryland.edu
http://www.umaryland.edu/nmr

Page 26 **X-ray Crystallography Core Facility (SOP/SOM)**
Vesna de Serrano, Ph.D. (410)706-1124 HSF-II, Room 514
xtal@rx.umaryland.edu
http://www.pharmacy.umaryland.edu/PSC/xray/

Genomic Technologies Core Facilities and Resources

Page 28 **Biopolymer/Genomics Core Facility (SOM)**
Nicholas Ambulos, Ph.D. (410) 706-8553 Howard Hall, Room 560
nambulos@umaryland.edu
Phone - (410) 706-3339 Fax: (410) 706-0287
biopolym@umaryland.edu
http://medschool.umaryland.edu/biopolymer

Page 30 **Cytogenetics Facility**
Yi Ning, Ph.D. (410) 706-2809 Bressler 8-051
yning@som.umaryland.edu
JoAnn Meekins jmeekins@som.umaryland.edu

Page 31 **Genomic Resource Center (SOM)**
Lisa Deshong Sadzewicz Ph.D. (410) 706-6734
lsadzewicz@som.umaryland.edu
Luke Tallon (410) 706-5668
ljtallon@som.umaryland.edu
grc-info@som.umaryland.edu
http://www.igs.umaryland.edu/grc

Page 32 **Molecular Biology/Functional Genomics Core Facility (SON)**
Susan Dorsey, Ph.D., Director (410) 706-7250 SON 727
sdorsey@son.umaryland.edu

Page 33 **Pediatric Biochemical Genetics Laboratory**
Erin T. Strovel, PhD, Director (410) 706-8016 Bressler 11-037
estrovel@peds.umaryland.edu
Miriam Blitzer, PhD, Co-Director
mblitzer@peds.umaryland.edu

Page 35 **Transgenic and Knockout Core Facility (SOM)**
Valerie Stewart (410) 706-0454 Howard Hall, Room 582
vstewart@som.umaryland.edu
http://medschool.umaryland.edu/orags/transgenic/

Page 36 **Translational Genomics Lab (SOM)**
Nicholas Ambulos, Ph.D. (410) 706-8553 Howard Hall, Room 560
Danielle Sewell (410) 706-3339
dsewell@som.umaryland.edu
Phone - (410) 706-3339 Fax: (410) 706-0287

Preclinical Assay Development Core Facilities and Resources

Page 37 **Cytokine Laboratory (SOM)**
Lisa Hester, Lab Supervisor (410) 706-1508 MSTF, Room 8-64-A
Lhest001@umaryland.edu
http://www.cytokines.com

Page 38 **Flow Cytometry Core Facility (SOM/CVD)**
Marcelo Sztein, MD (410) 706-5328 HSF-I, Room 456
msztein@medicine.umaryland.edu
http://medschool.umaryland.edu/orags/flowlab.asp

Page 40 **Flow Cytometry Core Facility (SOM/UMGCC)**
Ferenc Livak, MD (410) 328-3915 BRB 8-042
flowcore@som.umaryland.edu
http://cf.umaryland.edu/freezer/promo_fcs.cfm

Page 41 **Cellular Physiology Core Facility (SON)**
Chris W. Ward, Ph.D., Director (410) 706-3618
ward@son.umaryland.edu
Susan G. Dorsey, Ph.D., Co-Director (410) 706-7250
sdorsey@son.umaryland.edu
http://www.umgcc.org/research/flow_cytometry.htm

Page 42 **Veterinary Services (UMB)**
Louis Detolla, V.M.D., Ph.D. (410) 706-8537 MSTF, Room G100
detolla@vetmed.umaryland.edu
http://vetmedicine.umaryland.edu

Page 43 **Mouse Functional and Behavioral Core Facility (SON)**
Susan Dorsey, Ph.D., Co-Director (410) 706-7250 SON 727
sdorsey@son.umaryland.edu

Page 44 **Physiology Phenotyping Core (PPC) (SOM)**
Ling Chen, MD, Ph.D. (410) 706-4920 MSTF, Room 8-16
lchen@medicine.umaryland.edu
http://medschool.umaryland.edu/smallanimal/default.asp

Page 47 **µQUANT Core Facility (IHV)**
Brian M. Taylor, PhD. 410-706-4648
725 West Lombard Street, Lab S-632, Office N-562
brtaylor@ihv.umaryland.edu
http://www.ihv.org/research/facility.html

Page 48 **Translational Core Facility (SOM/UMGCC)**
Rena Lapidus Ph.D. (410) 706-8092 Bressler 9-020
rlapidus@som.umaryland.edu
Mariola Sadowska, Ph.D. (410) 706-8091
msadowska2@ihv.umaryland.edu
http://www.umgcc.org/research/translational_core_lab.htm

Drug Development Core Facilities and Resources

Page 50 **Clinical Pharmacology Unit (SOP)**
Kenneth Bauer, PharmD., Ph.D., Director (410) 706-3274
Allied Health Building, Room 540
kbauer@rx.umaryland.edu
Joga Goburro, Ph.D., Director (410) 706-4907
jgobburu@rx.umaryland.edu

Page 52 **Computer Aided Drug Design Center (SOP)**
Alex MacKerell, Ph.D., Director (410) 706-7442
amackere@rx.umaryland.edu
http://www.pharmacy.umaryland.edu/CADD/

Page 53 **High Throughput Screening Core Facility (SOM)**
Paul T. Wilder Ph.D. (410) 706-4353
108 N Green Street, Room 439
pwild001@umaryland.edu

Page 55 **Industrial Pharmaceutics Laboratory & GMP Manufacturing Facility (SOP)**
Stephen Hoag, Ph.D., Director (410) 706-6865
Pharmacy Hall, Room 603S
shoag@rx.umaryland.edu
http://www.pharmacy.umaryland.edu/facilities/gmp/fees.html

Page 56 **Pharmacokinetics Biopharmaceutics Laboratory (SOP)**
Natalie Eddington, Ph.D., Director (410) 706-6710
Pharmacy Hall, Room 730
neddingt@rx.umaryland.edu

Page 56 **Center for Nanomedicine and Cellular Delivery (SOP)**
Peter Swaan, Ph.D. Director (410) 706-0103 HSF II, Room 543
pswaan@rx.umaryland.edu
http://www.pharmacy.umaryland.edu/nanomedicine

Basic and Clinical Science Resources

Page 57 **Clinical Research Shared Service**
Edward Sausville, MD, PhD, Director
Galina Tucker, Program Director (410) 328-8607 Hospital N9E32
gtucker@umm.edu
http://www.umgcc.org/research/clinical_research.htm

Page 58 **Dermatopathology/Histology Laboratory (SOM)**
Grace F. Kao, MD (410) 328-6098 405 W. Redwood St, Ste 240
gkao@som.umaryland.edu

Page 60 **General Clinical Research Center**
Robert Mitchell, Administrative Director (410) 328-7365
gcrc@medicine.umaryland.edu Hospital S10D13
http://medschool.umaryland.edu/GCRC/

Page 61 **Histology Core Facility (SOM/CVID)**
Elizabeth Smith, HT, QIHC (410) 706-8185 Biopark I, Room 330
esmith@som.umaryland.edu

Page 62 **Molecular Diagnostics Laboratory / Division of Molecular Pathology (SOM)**
Richard Y. Zhao, Ph.D. (410) 328-0054
rzhao@som.umaryland.edu

Page 63 **NICHD Brain and Tissue Bank for Developmental Disorders (SOM)**
H. Ronald Zielke, Ph.D. (410) 706-1755 BRB, 13th floor
btbumab@umaryland.edu
http://btbank.org

Page 64 **Pathology Biorepository Shared Service**
Olga Ioffe, MD, Director; Paul Staats MD, Co-Director
Room NBW58, Anatomic Pathology, 22 S. Greene St.
Olga Ioffe, MD (410) 328-5525
Carol Robles, MS, (410) 328-5558
carca@umm.edu
http://www.umgcc.org/research/tissue_bank.htm

Page 66 **Translational Phenotyping Core (SON)**
Susan Dorsey, Ph.D., Co-Director (410) 706-7250 SON 727
sdorsey@son.umaryland.edu

Information Technology, Informatics & Statistics,

Page 68 **Biostatistics Core Facility (SOM/UMGCC)**
Olga Goloubeva, Interim Director (410) 706-8502 Howard Hall 109
ogoloubeva@som.umaryland.edu
Susan Holt (410) 328-8505
sholt@som.umaryland.edu
http://medschool.umaryland.edu/epidemiology/div_bio_bqrc.asp

Page 69 **Center for Information Technology Services (CITS)**
Peter Murray, Ph.D., Vice President and Chief Information Officer
620 West Lexington Street (410) 706-2461 Suite 3149
pmurray@umaryland.edu

Page 72 **Clinical & Translational Research Informatics Center (CTRIC)**
Kathleen Tracy, Ph.D. (410) 706-3461 MSTF, Room 334F
ktracy@epi.umaryland.edu
Teresa Yates, Program Manager (410) 706-3461
tyates@epi.umaryland.edu

Page 74 **Infomatics Resource Center (IRC)**
Anup Marhurkar, Director (410) 706-5682
Irc-info@som.umaryland.edu
http://www.igs.umaryland.edu/research/bioinf/intro.php

Page 76 **Pharmaceutical Research Computing (SOP)**
Ilene Zuckerman, PharmD, Ph.D. (410) 706-3266
Health Services Research, Saratoga Street Garage
izuckerm@rx.umaryland.edu
http://www.pharmacy.umaryland.edu/prc

Page 78 **UM School of Medicine Information Services**
Sharon Bowser, MBA, Interim Associate Dean and CIO
sbowser@som.umaryland.edu
Help Desk (410) 706-3998
help@som.umaryland.edu

Resources for Research and Compliance

Page 79 **BIORESCO**
Carol McKissick, MBA (410) 706-0322 Howard Hall, Room 664
freezerprogram.org
http://cf.umaryland.edu/freezer

Page 80 **Environmental Health and Safety Office (UMB)**
James J. Jaeger, Ph.D., Director
714 West Lombard St.
(410) 706-7182 Fax: (410) 706-8212
After Hours Emergency, Contact University Police at 711
http://www.ehs.umaryland.edu

Page 81 **Human Research Protections Program (HRPP) (UMB)**
Susan Buskirk (410) 706-5037 Biopark I, Suite 100
hrpo@som.umaryland.edu
http://medschool.umaryland.edu/orags/hrpo

Page 83 **Office for Research**
Susan Hobbs (410) 706-5485 BRB 14-016
shobbs@som.umaryland.edu Fax (410) 706-4958
http://medschool.umaryland.edu/orags

Page 84 **Office of Animal Welfare Assurance (OAWA) (SOM)**
Angela Peiser (410) 706-4365 BRB M023
IACUC@som.umaryland.edu
http://medschool.umaryland.edu/IACUC/

Page 85 **Office of Research and Development (UMB)**
James L Hughes, Vice President and Chief
620 W Lexington ST. 4th floor
(410) 706-6723 [Fax: (410) 706-1066]
http://www.ord.umaryland.edu
www.umbiopark.com

Page 86 **PromptPrint Copy Center**
Carmen W. White MPA Howard Hall Basement
560 W. Redwood Street
(410) 706-7182
PromptPrint@umaryland.edu

Page 87 **Research Career Development Program**
Stacie Mendoza (410) 706-5434 MSTF 319
ssmall@som.umaryland.edu Fax (410) 706-3103
Wendy Sanders, MA (410) 706-5434
wsanders@som.umaryland.edu

Page 88 **Veterinary Resources**
Louis Detolla, V.M.D., Ph.D. (410) 706-8537 MSTF, Room G100
detolla@vetmed.umaryland.edu
http://vetmedicine.umaryland.edu

Resources for Faculty Development and Education

Page 89 **Building Interdisciplinary Research Careers in Women's Health Program (BIRCWH K12) (SOM)**
Patricia Langenberg, PhD, PI
plangenb@umaryland.edu
Istvan Merchenthaler, MD, Ph.D., D.Sc. Program Director
imerchen@epi.umaryland.edu (410) 706-1350
http://www.umaryland.edu/womenshealth/BIRCWH/index.html

Page 89 **Paul Calabresi Clinical Oncology Training Program**
Shannon Decker, J.D., M.P.H., Program Director, N9E34
sdecker@umm.edu 410-328-9161
http://www.umgcc.org/research/scholars_program/index.htm

Page 90 **Faculty Affairs and Professional Development (SOM)**
Nancy Ryan Lowitt, MD, EdM, Associate Dean for Professional Development nlowitt@som.umaryland.edu (410) 706-3861
Robertha Simpson, Director
rsimpson@som.umaryland.edu (410) 706-8633
http://medschool.umaryland.edu/opd/

Page 91 **Graduate Program in Life Sciences (UMB)**
Dudley Strickland, Ph.D., Assistant Dean for Graduate Studies
dstrickland@som.umaryland.edu (410) 706-8010
Tom McHugh, Program Director
tmchugh@som.umaryland.edu (410) 706-6041 Bressler 1-005
http://lifesciences.umaryland.edu

Page 93 **Medical Scientist Training Program (SOM)**
Michael Donnenberg, MD (410) 706-3990 HSF-2, Room S-012
mdonnenb@umaryland.edu
Achsah Keegan, PhD
akeegan@som.umaryland.edu
http://mdphd.umaryland.edu

Post Printing Submissions

Page 94 **N-Storm Facility – Super Resolution Microscope**
Olga Latinovic Ph.D., (410) 706-2769 IHV, Room S614
olatinovic@ihv.umaryland.edu
Antholy DeVico, Ph.D.,

Imaging Core Facilities and Resources:

Center for Fluorescence Spectroscopy (SOM)

The Center for Fluorescence Spectroscopy (CFS) provides state-of-the-art time-domain and frequency-domain fluorescence instrumentation in studies of the structure, function, and dynamics of biological macromolecules. The CFS is supported by the National Center for Research Resources in the National Institutes of Health, with additional support from the University of Maryland School of Medicine, Medical Biotechnology Center, and the University of Maryland Baltimore Graduate School. The staff of the CFS offers an annual week-long course on the "Principles and Applications of Time-Resolved Fluorescence". This course is taught at the CFS in the beginning of each year. The CFS announces free time-domain and frequency-domain fluorescence lifetime analysis software for IBM PCs.

Research Emphases include:

1. Basic Fluorescence Spectroscopy
   - -Probe Chemistry
   - -Light Quenching
   - -Multi-Photon Excitation
2. Biochemical and Biomedical Applications
   - -Fluorescence Sensing
   - -Fluorescence Lifetime
   - -Imaging Microscopy
3. Related Projects
   - -Multi-Pulse Fluorescence
   - -Microsecond Dynamics of Macromolecules
   - -Radiative Decay Engineering

Instrumentation:
The CFS provides access to state-of-the-art time-domain (TD) and frequency-domain (FD) fluorescence instrumentation for time-resolved studies of biological macromolecules. The excitation sources are cavity-dumped and frequency-doubled ps dye lasers, or a Ti:Sapphire laser. Time-correlated single photon counting (TCSPC) is accomplished with a microchannel plate (MCP)-PMT, to provide an instrument response function near 60 ps. Frequency-domain measurements are possible up to 10 GHz using the Center's FD instrument, and a high speed MCP-PMT. Available excitation wavelengths range from UV to NIR. For less demanding applications modulated cw lasers (for FD) are available. A unique capability of the CFS will be the ability to collect and analyze both TD and FD data for the same samples, and in the future, simultaneous dual-domain (DD) analysis of the data. A Ti:Sapphire laser is now available for two- and three-photon excitation.

Novel instruments are under development for fluorescence lifetime imaging microscopy (FLIM) and for cell-by-cell lifetime measurements in flow cytometry. A FLIM instrument

with a red sensitive image intensifier will soon be available for photon migration imaging of tissues and turbid objects.

Access:
Access to the CFS can be obtained by submission of a brief proposal which describes the project, its objectives, and the types of measurements required. Potential users are encouraged to consult with CFS prior to preparation of their proposals and for assistance with experimental design. The proposals will be reviewed and the individual contacted by CFS personnel within two weeks. Scheduling of experiments will be based on need, special requirements for the experiment, and other relevant factors. For efficient use of instrument time, CFS staff will request to see the steady-state emission and absorption spectra of all samples, with appropriate blank controls, prior to scheduling and initiation of the time-resolved measurements.

Contact:
Michael Johnson, Ph.D. University of Virginia (804) 924-8607, email for software (mlj8e@virginia.edu)
Kazimierz Nowaczyk, Ph.D. Network Administrator (410) 706-7500 (kazik@cfs.umbi.umd.edu)
Mary Rosenfeld (410) 706-8409
(mary@cfs.umbi.umd.edu
Joseph R. Lakowicz, Ph.D., Director (410) 706-8409

Confocal Microscopy Core Facility

Scientific Objectives & Overview:

Fluorescence imaging is a central technology in much of life sciences and medical research. The aim of the Confocal Microscopy Core is to make available state-of-the-art optical microscopy and imaging capabilities to campus researchers. The facility houses multiple confocal microscopes and an incubated widefield fluorescence microscope that together enable researchers to perform a wide variety of experimentation with live cells, fixed tissues, *ex vivo* samples, and whole animals.

The current user group includes researchers from the Schools of Medicine, Dentistry, Nursing and Pharmacy, as well as other units on campus (MBI, IHV, VA). The facility is open to users from off-campus. Research data from the Confocal Microscopy Core Facility has resulted in the publication of more than 90 peer-reviewed publications, and contributed to more than 50 Ph.D. theses. Furthermore, the facility has provided data essential for the award of at least $45 million in grant funds to campus researchers. Investigators in the areas of neuroscience, cardiology and muscle biophysics, cancer biology, Ca^{2+} signaling and immunology continue to be users of the Confocal Core facilities.

Instrumentation:

The Microscopy Facility houses two confocal microscopes on inverted microscope platforms, one upright multiphoton microscope, and an incubated fluorescence microscope. Altogether, the instrumentation available permits users to perform a wide array of investigations that require high efficiency and high resolution of fluorophores in fixed tissues, living cells and whole animals.

Zeiss 710 NLO OPO multiphoton microscope:
- New, world-class instrument designed for *in vivo* imaging of brain, vessel, muscle, skin, and other tissues in live mouse, rat, and other organisms
- Fluorescence imaging deep into intact tissue, scattering samples, or *ex vivo* preparations
- Uncaging, photoactivation, and multicolor live-cell imaging
- Two Ti:Sapphire lasers provide a wavelength range of 690 to 1600 nm for imaging a wide array of fluorophores and unique modalities such as second harmonic generation imaging
- SHG, RICS, FCS, and other software-based acquisition and analysis strategies

Zeiss Duo microscope:
- Inverted microscope with stage-top incubation for extended experiments on live samples such as cultured cells
- Two independent scanning systems permit simultaneous imaging and optical manipulation
- Extremely high-speed confocal imaging (1 kHz in 2D, over 10 Hz in 3D)
- Optimized for Ca^{2+} imaging, photoactivation, photobleaching, FRET
- Motorized stage for high-resolution tiling of large areas

Zeiss LSM 510 Meta NLO:

- Inverted confocal microscope equipped with a Ti:Sapphire laser for multiphoton excitation; multiple laser lines 400-633nm, two PMTs, "meta detector" for measurement of emission spectra, plus DIC imaging.
- Emission filters allow separation and simultaneous acquisition of fluorescence from multiple fluorophores (~400-700nm)
- Workhorse confocal for multicolor imaging of fixed, labeled tissue/cells
- Photobleaching, photoactivation, uncaging

Olympus LCV incubated microscope:

- Live-cell, widefield imaging microscope built within a true 37ºC 5% CO_2 incubator
- Image cells growing over many hours and days.
- Fluorescence and DIC imaging for cell growth, migration, and division assays, tagged fluorescent protein expression time course, cell motility and wound-healing assays
- A multi-position motorized stage enables investigators to track multiple cells and culture plates for extended periods of time.

Other facilities:

The core facility in room 608 HSF-1 includes tissue culture facilities and an *in vivo* preparation space for use by trained core facility users. An image analysis workstation equipped with several software packages is available for all campus members.

Personnel:

The Confocal Microscopy Core Facility is managed by Joseph Mauban, PhD, who is responsible for maintaining the instruments, training new users, consulting with researchers regarding the technical aspects of sample preparation, advanced confocal techniques. The Faculty Director is Thomas Blanpied, PhD, Department of Physiology.

Training:

All users of the facility must undergo individual training with the Manager or core facility staff before independent use of the microscopes. The training is an intensive, 4-hour, one-on-one session that covers 1) the fundamentals of fluorescence and confocal microscopy; 2) start-up/shutdown procedures and microscope care; 3) configuration of the microscope: fluorophore excitation/emission spectra, optical path, function of components, concepts of numerical aperture and spatial sampling, signal optimization and spectral overlap problems; 4) data acquisition, including image optimization, noise reduction, factors affecting resolution and image analysis. Users bring samples to the session if possible, so that training is tailored as much as possible to the particular needs of the user.

Following successful training, users are approved to reserve time for independent use of the microscope. According to the requirements of the investigator, additional training is available for specialized applications; photobleaching, photoactivation, microscopy of living cells, FRET, 3D reconstructions, high speed and xt scanning, and other techniques and analyses. Staff is available for further consultation and advice on designing and executing specialized experimental designs. Approval to use additional microscopes can be obtained following success with a 1-hour supplemental training session per microscope.

Location:

As of January 2013, the Confocal Microscopy Facility will be located in a newly renovated space on the 6th floor of HSF-1, rooms 608, 610, and 612.

Zeiss 510 Meta	Bressler 5-040
Zeiss Duo	Bressler 5-042
Zeiss 710 NLO OPO	HSF1-610 (January, 2013)

Olympus LCV incubated microscope: contact the Manager for availability

Fees and Scheduling:
Training: 4-hour introductory training sessions: $200. 1-hour training updates: $40

Fees: Use of the 710, Duo and 510 microscopes is $40/hour during normal business hours and $20/hour after 5 pm and during weekends. Rates for the Olympus ICV are dependent on the type of experiment, because some protocols extend over days. Extended blocks of time necessary for *in vivo* imaging or electrophysiology will be negotiable on the 710 NLO for reduced price per hour or day.

Training costs and all fees are paid via a Project ID number, which must be supplied before for each usage session.

Scheduling is available online, with links available at:
http://medschool.umaryland.edu/confocal/

Off-campus users are welcome to use the facility. Fees are generally 50% above on-campus user rates.

Contact:
Joseph Mauban, Ph.D., Manager: (410) 706-3925
jmauban@umaryland.edu

Core for Translational Research in Imaging @ Maryland (C-TRIM)

Description of Services

The Core for Translational Research in Imaging @ Maryland (C-TRIM) was established with the goal to advance state of the art technology for animal imaging at the molecular, cellular and system level, to serve as resource for medical research, biotechnology advances and pharmaceutical development, and for probing in vivo gene function, disease processes and therapeutic applications including drug delivery and trials. The goal of this core is to facilitate inter-institutional collaboration between Academic Institutions in Maryland and technology transfer to Industry.

A major objective of C-TRIM is to provide services for in-vivo and ex-vivo cross-sectional and functional imaging using MRI, PET, and CT. The center will provide consultation on advanced imaging techniques and will also provide all necessary image-processing support to investigators. Capabilities also exist within the center to build custom made coils for specific applications.

Brief Description of Equipment

MRI The small animal MRI is a 7.0 Tesla 31 cm bore magnet from Bruker Biospec and is located in HH 645. This intermediate bore spectrometer/imaging system is suitable for localized spectroscopic investigations of rodents and small animals (such as rabbits and cats) and perfused organs (e.g. dog heart, dog pancreas and pig lung).

PET-CT The Siemens Inveon small animal PET-CT imaging system is located in a 578 square foot imaging suite in Howard Hall Room 644..

The Inveon imager consists of PET and CT subsystems that can be docked together for combined functional and anatomic imaging with implicit registration between the modalities or the systems can be separated for independent operation. Post-acquisition image analysis can be performed with the Inveon Research Workplace (IRW) software for viewing, image fusion and quantitative analysis.

The small animal CT system has a variable focus x-ray source with an adjustable voltage potential of 20-130 kVp and a maximum anode current of 0.5 mA. The focal spot size is dependent on system power and is between 6 microns (μm) at 8 W and 60 microns (μm) at 65 W. The CCD detector has 4064x4064 pixels with detector element size 32 microns (μm). System magnification is 1.2-3.3 with a maximum field of view of 10.8x10.8 cm2. Image reconstruction is performed with a modified Feldkamp algorithm. Typical reconstructed image resolution is 50 microns (μm), with best achievable resolution of 15 microns (μm).

Daily Operations

The C-TRIM is directed by Dr. Rao Gullapalli who chairs the steering committee that sets policy and provides scientific and financial oversight for the core. Dr. Su Xu manages the day-to-day operations and provides guidance and assistance with core activities. She provides consultancy to investigators wishing to embark on MR imaging projects. Dr. Mark Smith provides consultancy and assistance on PET/CT related imaging projects. The C-TRIM provides a full array of cross-sectional structural and functional imaging services.

List of Selected Services

a. Anatomical Imaging, brain and whole body
b. Cardiac imaging, cardiac flow analysis
c. Musculoskeletal imaging
d. Muscle Spectroscopy
e. Brain Neurochemistry
f. Tumor Kinetics
g. Tumor Metabolism
h. Vascular studies
i. Cancer Imaging
j. Microscopy
k. Diffusion Tensor Imaging
l. Arterial Spin Labeling
m. Magnetization Transfer Imaging
n. Multi-nuclear Spectroscopy including C-13, Na-23, P-31, and F-19
o. Bone Imaging

At the C-TRIM, there is a 4-core Dell Precision T7500 PET/CT reconstruction server running WinXP-64 bit with 24GB memory and a 2TB disk, and a 2-core Xeon workstation running 64-bit Ubuntu with 4GB memory and a 2TB raid 5 disk array. In addition, there are multiple Linux and Windows workstations, as well as the Bruker MRI console computer and remote workstation, and PET/CT control computers and reconstruction workstations. For C-TRIM data storage, a second rack-mount Iomega NAS with 8TB of storage (also expandable to 24TB) is available. There is also a 1TB FTP server on a DMZ configured for "world" FTP access. C-TRIM servers are also networked to the research PACS system. Computing resources are updated/expanded on a regular basis depending on the demand.

Contact:

Dr. Rao Gullapalli	Dr. Su Xu	Dr. Mark Smith
Phone: 410-328-2099	Phone: 410-706-6384	Phone: 410-328-1320
Email: rgullapalli@umm.edu	Email: sxu@umm.edu	Email: mailto:msmith7@umm.edu

Imaging Core (SON)

Instrumentation:

1) BioRad Radiance 2100 confocal microscope on an Olympus IX-70 inverted microscope.
2) CCD-based epifluorescent imaging system on an Olympus IX-50 microscope.
3) Olympus IX-51 upright microscope with fluorescence capacity and Olympus DP70 12.5 megapixel color digital camera for image acquisition.

Contact:

Chris W. Ward, Ph.D., Director (410) 706-3618
ward@son.umaryland.edu

Electron Microscopy Core Facility (SOD)

Objectives:
To provide faculty and students with low cost access to high performance transmission electron microscopy (TEM) and scanning electron microscopy (SEM).

Applications:
- Negative Staining to visualize viruses, assembly of filaments, characterize membrane preps.
- Immunolocalization using colloidal gold or nanogold to localize antibodies to specific components.
- Thin section structural analysis
- High Vacuum, Low vacuum and Environmental SEM analysis
- Cryo-SEM and Cryo –TEM to examine frozen hydrated biological specimen
- Cryo EM specimen preparation using high pressure freezer or plunge freezer
- Cryo ultrathin section and Tokuyasu immunolabeling method

Instrumentation:
- FEI Tecnai T12 transmission electron microscope with sample tilt and rotation capability
- FEI Quanta 200 scanning electron microscopy with HV,LV, ESEM and Cryo capability
- Gatan Cryo-transfer unit ALTO 2100
- Gatan cryo transfer holder and pumping station
- Leica room temp Ultramicrotome UC6
- Sputter coater
- Vacuum evaporator
- Critical Point Dryer
- Glow discharge system
- Leica high pressure freezer EMPACTII & RTS
- Leica cryo ultramicrotome UC7
- Leica automated freeze substitution system AFS
- Leica Grid Plunger GP

Personnel:
Dr. Ru-ching Hsia is PI and director of the facility.
Mr. John Strong and Ms. Johanna Sotiris are the research assistants

Contact Information and to schedule training:
Dr. Ru-ching Hsia (410)706-7992, Dental School, Howard Hall Room 696
rhsia@umaryland.edu

Pricing:
Training sessions for scope operation and EM techniques, $400/2 hr one-on-one session, and 2 hr supervised practice
Electron microscope usage, $50 /hr (all digital images, no additional negative and developing charges)
Technical assistance, $50/hr

Please visit our web site for more information:
http://www.dental.umaryland.edu/Core-imaging

Magnetic Resonance Research Center

The Magnetic Resonance Research Center (MRRC) is a 3000 sq ft research space in the Paca-Pratt Building (100 S. Paca St, Suite 104) and houses the research 3.0 Tesla Siemens Tim-Trio scanner which is also equipped with the state of the art gradient and computer system with eighteen channels for parallel imaging. The 3.0 Tesla is also equipped with **multi-nuclear capability** and is used for phosphorus and sodium detection. The facility also houses a GE Lunar Dexa scanner for bone densitometry studies. The goals of MRRC is to translate basic science to the clinic and to advance the state of the art in the neurosciences, develop novel image guided interventions, and to develop multi-parametric methods for early detection of neurodegeneration, cancer staging and to develop novel imaging markers. Although primarily used for human imaging, the scanner is also available for large animal imaging. The MRRC supports over 20 users on the campus and from neighboring institutes working on federal and non-federal projects including the Allen Institute for Brain Sciences.

A strong research relationship exists between the MRRC and the scientists from Siemens Medical Solutions which facilitates the progress on many ongoing research projects. The MRI group is well-trained on the use of the IDEA pulse sequence environment and the ICE environment for reconstruction on the Siemens scanner, and has created several in-house novel pulse sequences to probe in vivo physiology, biochemistry and function. Stimulus presentation software and hardware for fMRI is available. Training is available for all users to design and test novel fMRI paradigms. Some of the imaging services include (but are not limited to) studying

- cardiac function
- brain function
- image guided interventional procedures
- contrast agent development
- multi-parametric imaging
- cerebral blood perfusion (non contrast based)
- stroke imaging
- proton spectroscopy
- multi-nuclear spectroscopy including phosphorus and sodium
- high angular diffusion tensor imaging
- fiber tracking
- brain volumetrics

Because a significant portion of the research conducted at both the MR facilities pertains to fMRI, the scanning rooms have been designed with optimum radio-frequency (RF) shielding. All electronic equipment that is brought into the scan room pass through a penetration panel which is conveniently located at the scanner console. The center also features power conditioning to enhance MRI temporal stability. Preventive maintenance that involves measurement of temporal stability and noise characteristics are done on a monthly basis over and beyond what is performed by the vendors of the respective machines. A 100 Kilowatt uninterruptible power supply (UPS) provides continuous conditioning of the electrical power for the scanners, shielding the gradient and radio-frequency amplifiers from any fluctuations in building power.

In addition to the above facilities, the MRRC also has access to the three clinical scanners in the Gudelsky building of the University of Maryland Medical Center. Although primarily used for clinical purposes, significant time has been allocated for research on these scanners. Further, it

is an ideal place for clinician scientist to test new hypothesis on clinical population and is also ideal for clinical research and clinical trials research. Several fMRI clinical procedures are performed at this center on an annual basis. It is an interdisciplinary facility dedicated to providing state-of-the-art technology in imaging, and has extensive MRI expertise to facilitate biomedical research in the neurosciences, cancer research and new imaging technology development. The center's primary resources are two 1.5T MR state-of-the-art Siemens Avanto systems and a 3.0 Tesla Siemens Tim-Trio system with eighteen channels each for parallel imaging. These scanners are available for research after 4pm every day and all of the weekend. In addition, the outpatient center is equipped with a 1.5 Tesla Siemens Espree magnet, which is also available for research after 5pm every day including the weekends

RF Laboratory
State-of-the-art equipment is available for design and construction of RF coils including an Agilent Network Analyzer, spectrum analyzer, and several oscilloscopes. Equipment for fabrication of coil forms is also available.

Computational Resources at MRRC
At the MRRC, there are two main processing and storage servers: a 4-core Intel server running 64-bit Ubuntu with 8GB memory and a 3TB raid 5 disk array, and a 6-core AMD server running 64-bit Ubuntu with 16GB memory and a 12TB raid 5 disk array. There are also multiple (8+) Ubuntu workstations, and numerous Windows 7 and XP workstations. For MRRC data storage, in addition to the server disk drives, a rack-mount Iomega NAS with 8TB of storage (expandable to 24TB) is also available. All systems are networked and all server and NAS disks are accessible from any workstation or server.

For DICOM image storage and retrieval, a home-built research PACS server that uses DCM4CHE PACS s/w, and a MySQL database interface is available. All equipment at the MRRC are configured to send DICOM images to the research PACS server.

Miscellaneous:
Assistance is available for researchers from personnel at MRRC to help in the study design and quantitative image analysis. Capabilities also exist within the center to build custom made coils for specific MRI applications. Dedicated image processing workstations are available at the MRRC to facilitate various projects. Investigators are provided training on the use of the equipment and image processing techniques. All servers also have the capability to read and write CD, DVD, and Blu-Ray media.

In addition to the servers, a number of linux and windows workstations are also available. For fMRI stimulus presentation and subject response collection, E-prime is available on the windows systems, and we also have the capability of collecting both cardiac and respiratory information digitally during MRI scans. In-house developed software is also available that controls the triggers from or to the scanners. Matlab and IDL with multiple network nodes is available for the development of novel image processing algorithms, and other programming languages and packages are available for image processing and analysis (C++, Java, Perl, AFNI, FSL, MIPAV, TrackVis).

Contact Information:

Dr. Rao P Gullapalli, Ph.D., MBA	Dr. Jiachen Zhuo, Ph.D.	Xin Lu, MS
Phone: 410-328-2099	Phone : 410-328-5974	Phone : 410-706-4498
E-mail: rgullapalli@umm.edu	E-mail : jzhuo@umm.edu	E-mail : xlu@umm.edu

Structural Biology Core Facilities and Resources:

Biacore Core Facility (SOM and SOP)

Scientific Objectives:
Our main scientific objective is to provide the faculty, staff and students on our campus with the latest technology for the quantitative study of real-time binding interactions, 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) -- the T200 and 3000. Both instruments utilize the optical method of surface plasmon resonance (SPR) to measure binding interactions. Using them, the core and its staff can now provide accurate determinations of "on" and "off" rates for binding reactions, and, of course, the determination of affinity (association and dissociation) constants for binding. As it uses SPR, the instruments can effectively study interactions between a wide variety of molecules, including proteins, antibody-antigen, nucleic acids, lipids, peptides, as well as drugs as small as a few hundred daltons in mass as they bind to their receptors. Speed, reproducibility and small sample consumption are hallmarks of experiments that utilize Biacore technology, making the core cost effective for all users.

Policies:
The policies for the use of the facility, and relevant charges, are currently as follows:

1. For first time users, a journal entry transfer of the estimated cost is required before any experiments are performed. This charge includes an initial set-up fee and will cover consumables, machine time, and, if the Core Operator is performing the studies, the operator's time. The actual charge will be based on the services provided.
2. Users are only allowed to make "hands-on" use of the Biacore instruments if they have been properly trained by Biacore through the Biacore Basics class and have had enough experience that the core personnel is convinced that they will use instrument safely, without causing damage. (The microhydraulics of the units are easily damaged and expensive to repair). Scheduling of the use of the instrument on an hourly basis must be done 1 week in advance.
3. If users are properly trained by Biacore but have insufficient experience, then Dr. Yinghua Zhang, the Core Operator, will supervise their experiments until she feels that they can safely run the Biacore on their own. Costs will be adjusted accordingly. Access to the core will be denied to individuals whose experiments repeatedly cause damage to the instruments.
4. These policies will be updated periodically. For recent changes or more information, please consult the Core's website (www.biacorelab.com), Dr. Zhang (yzhan004@umaryland.edu), or the Core Director, Dr. R. Bloch (rbloch@umaryland.edu).

Center for Mass Spectrometry Resources (SOP)

The School of Pharmacy has a centralized Mass Spectrometry facility housed on the 7th floor of the new Pharmacy Hall North. The Department of Pharmaceutical Sciences Mass Spectrometry Facility provides state-of-the-art expertise, methodology, and instrumentation to the School of Pharmacy and the surrounding research community. The Mass Spectrometry Facility maintains 10 state-of-the-art mass spectrometers with several other instruments planned for arrival in 2013. Experimental capabilities include, but are not limited to, proteomics/metabolomics/lipidomics, targeted quantification of small molecules/metabolites, quantification of peptides/proteins, PK/PD studies, small molecule/metabolite/protein/lipid identification and structural characterization, imaging mass spectrometry of tissue/cell culture/TLC plate, metals analysis, and H/D exchange experiments. To learn more about the instruments available in the Mass Spectrometry Facility, including the features each mass spectrometer is equipped with and the tasks that each is able to perform: http://www.pharmacy.umaryland.edu/facilities/massspec/instruments/

The Facility provides researchers the opportunity to access very sophisticated experiments by working closely in a true collaborative effort between faculty, students, and staff. Some instrumentation offers the opportunity for researcher access (with training). The Facility is an interdisciplinary unit aimed at serving faculty from the schools of Pharmacy, Dentistry, and Medicine. It also serves researchers from other universities and industries within and outside of Maryland. Key areas of focus include: (1) Chemical Biology, (2) Quantitative Biosciences, and (3) Translational and Regulatory Sciences.

Contact Information:
http://www.pharmacy.umaryland.edu/facilities/massspec/

Maureen A. Kane, Ph.D., Director (410) 706-5097 Pharmacy Hall 723N
mkane@rx.umaryland.edu
or
Jace W. Jones, Ph.D., Manager (410) 706-7598 Pharmacy Hall 721N
jjones@rx.umaryland.edu

Protein Analysis Core Facility (SOM)

Objective: The Protein Analysis Core provides mass spectrometry based protein identification and **global protein expression analysis** services for investigators in the Center for Vascular and Inflammatory Diseases and for investigators in the greater University's scientific community. The Core uses liquid chromatography tandem mass spectrometry (**LC-MS/MS**) to determine the identity of proteins following proteolytic digestion in-gel or in-solution. **MuDPIT** (multi-dimensional protein identification technique) is used to identify hundreds to thousands of proteins in complex samples. The result is a list of proteins (and their statistical probabilities) present in the sample. For the MuDPIT technique, our facility uses two dimensions of chromatographic separation of peptides with ERLIC (electrophilic repulsion hydrophilic interaction chromatography) in the first dimension and reversed phase chromatography in the second dimension prior to MS analysis. MudPIT + quantitation provides **relative quantification** between two samples. This is accomplished by chemical labeling to introduce stable isotopes into the peptides prior to MuDPIT analysis. The result is a list of proteins and a corresponding relative quantitative value determined by integrating the chromatographic peak areas of the light and heavy isotope labeled peptides. All data analysis is performed using the Trans-Proteomic Pipeline, developed at the Institute for Systems Biology. Access to the results is available using a web browser on the campus network and can be exported into spreadsheet format for additional manipulation.

Quantitative real-time PCR is also offered. The core facility has an Applied Biosystems 7900HT with a 96-well standard block only. Priority access to the instrument is given to investigators at the CVID. Investigators outside the center please contact Brian Hampton at 6-8207 or bhampton@som.umaryland.edu for access.
Note: Automated Edman degradation is no longer offered, but I will consult and provide contact information for a lab that still does N-terminal sequencing.

Instrumentation:
Thermo Finnigan LCQ Deca XP ion trap mass spectrometer
Waters Quattro Micro triple quadrupole mass spectrometer
Waters Alliance 2695 HPLC
Waters 2996 Photodiode array detector
Applied Biosystems 140B microbore HPLC
BioRad Protean IEF Cell
Applied Biosystems 7900HT QPCR

Contact Information:
Brian Hampton – Program Director
Location: BioPark One Room 307 (Lab) Room 314 (office)
V: 410-706-8207
F: 410-706-8234
Email: bhampton@som.umaryland.edu

Pricing:

LC/MS protein identification	$125
MuDPIT (ERLIC fractionation + 2hr LC/MS runs)	$850
MuDPIT + Relative Quantitation (stable isotopic chemical peptide labeling)	$1500
SDS-PAGE	$50
HPLC purification (per run + column if not in stock)	$75
QPCR /run	$20

NMR Center (SOM/SOP)

Brief History:
The NMR center opened in October of 1996 with a 600 MHz NMR spectrometer in HSF I. In August of 2003, specially designed space to receive this spectrometer and an additional 800 MHz spectrometer was made available. Currently, the UMB NMR facility houses a 950 MHz Bruker Avance III series NMR spectrometer, an 800 MHz Bruker Avance series NMR spectrometer, a 600 MHz Bruker Avance III series NMR spectrometer, and a 400 MHz Bruker Avance III series NMR spectrometer (located at the CBT in Rockville). The 600, 800 and 950 MHz instruments have 4 channels, pulsed-field gradient hardware and are equipped with cryoprobes (TCI on the 600 and 950, TXI on the 800). The 800 MHz instrument also includes a BACS 60 sample automatic sample changer. The 400 MHz instrument is equipped with a multinuclear broadband fluorine observe probe (BBFO^{PLUS}) and a SampleXPRESS Lite sample changer. NMR data visualization, analysis, and structure calculation will be carried out on either a linux or a Mac OS X workstation loaded with the required NMR-related computer programs, including NMRPipe, NMRView, and Pymol (among others).

Objectives:
The UMB NMR center will promote the use of Nuclear Magnetic Resonance Spectroscopy for use in research projects at the University of Maryland School of Medicine. The major objective of this center is to make sophisticated methods in NMR spectroscopy available to Principal Investigators at the University of Maryland, Baltimore in order to enhance their research efforts.

Personnel:
Dr. David J. Weber is the director of the Center for Biomedical Therapeutics and Dr. Kristen Varney is the director of the NMR facility and she runs the day-to-day operation of the facility that includes the 600, 800 and 950 MHz spectrometers equipped with cryogenic probes.

Users Policies:
The facility director, Dr. Kristen Varney, oversees all of the users' policies for data collection and scheduling NMR time. All investigators who wish to use the NMR facility are required to give information pertinent to their NMR usage to Dr. Varney. Authorization is required for all users who wish to operate the 600, 800, or 950 MHz NMR spectrometers. Authorization will be given for use of higher field strengths only when it is demonstrated that data collection at the lower fields are insufficient. The facility director will recommend this authorization to the committee chairman (Dr. Weber) prior to data collection. Dr. Varney keeps all NMR spectrometers in good working condition, trains users, manages the NMR facility billing and ordering, and performs NMR related research.

Pricing:

950 MHz	$18/hr
800 MHz	$15/hr
600 MHz	$13/hr
400 MHZ	to be determined

Set-up fee	$200 for 3hrs or less, $50/each additional hour
New Users	50 hr grant available for new users to set-up/optimize conditions of promising new proteins

NMR time is scheduled in 24 hour (minimum) increments
Updated pricing is always listed on the NMR facility website
(http://medschool.umaryland.edu/nmr).

What we suggest to start an NMR project:

1. Expression System/Cell types (need to grow on defined/minimal media):
   BL21(DE3)
   HMS174(DE3)
   We typically use pET expression vectors, but others are available
2. Appropriate Buffers:
   Tris (needs to be d11-deuterated for homonuclear proton only data; i.e. 2D NOESY etc) Hepes (only good for heteronuclear data; keep at 10-20 mM) Phosphate (good for proton only data and heteronuclear data)
   Deuterated buffers are also available for proton only data (i.e. 2D NOESY etc)
   If you have questions about a buffer, just call us.
3. Sample Conditions:
   Protein Concentration:
   We recommend a protein concentration of between 0.2mM - 2mM (less than 0.2mM is possible for some experiments, if necessary). Proteins larger than 10 kDa need to be ^{15}N and/or ^{13}C-labeled.
   Sample Volume: Samples need to be 600ul if using a standard NMR tube, or no less than 300ul if using a Shigemi tube D_2O:
   The final NMR sample must contain between 5% and 10% D_2O
   Salt Concentrations: Try to keep this LOW, if possible (<100mM total ionic strength)
4. Things to buy:
   Sample Tubes:
   Shigemi
   Wilmad

   Labeled Isotopes (^{13}C and/or ^{15}N):
   CIL for ^{13}C-glucose
   CIL for 15N-ammomium sulfate
   CIL for D20

   For questions contact Drs. Weber or Varney and/or see the NMR website:

Contact:

Kristen Varney (410) 706-2110 HSFII Basement
kvarney@umaryland.edu
David Weber, Ph.D. (410) 706-4354
dweber@som.umaryland.edu

X-ray Crystallography Shared Service Facility (SOP/SOM)

Scientific Objectives:
The unique information derived from protein structure determination acts as an accelerant for subsequent biochemical studies. Thus, collaborating scientists create a cycle of structure determination and biochemistry that pushes their research forward. There exists a similar relationship with the field of computer-aided drug design (CADD), because the structural techniques are the most direct way to assess potential new drugs at the molecular level and subsequently improve there efficacy. The X-ray crystallography shared service will be most valuable in helping the UMB research community bring into focus the molecular bases of defects in the machines that govern our cellular well-being and the development of drugs that combat a variety of diseases.

Personnel:

Vesna de Serrano, Ph.D. Dr. de Serrano currently coordinates the activities of the X-ray Crystallography Shared Resource. Dr. de Serrano has extensive experience as an x-ray crystallographer and is familiar with maintenance of X-ray equipment. She is also an expert in protein crystallization and has great skills in protein crystal manipulation and various aspects of cryocrystallography. As the manager of the X-ray shared service facility, Dr. de Serrano is responsible for both the administrative and technical operation of the resources provided by the facility. More specifically, she determines the schedule for use of the X-ray equipment, bills users for services rendered, and ensures that the equipment, including computers and their associated software packages, is properly maintained. She is also responsible for training new users on the X-ray equipment and assisting them in the structure solution process from the beginning (i.e. obtaining crystals) to the end (i.e. a final model worthy of publication). Dr. de Serrano has valuable expertise in data collection procedures at synchrotron facilities, both on-site and remote. Finally, she will ensure that radiation safety guidelines are strictly enforced at all times. Dr. de Serrano will thus serve as the primary interface between the X-ray facility and the scientific community at UMB, helping to guide users through the often daunting steps that turn crystals into a finished structure that helps to answer pressing scientific questions.

The decisions regarding the day-to-day operations of the X-ray crystallography shared resource are made by an internal oversight committee comprised of Drs. Eric Toth and Edwin Pozharski. This committee meets monthly with the facility manager Dr. de Serrano present to discuss pressing issues pertaining to the shared resource. Their qualifications and distinct roles (in addition to their collaborative efforts on devising an operational strategy for the shared resource) are detailed below:

Services:
The X-ray Crystallography Shared Service provides the following services to investigators:

* protein crystallization
* High throughput crystallization screening (~400 conditions)
* X-ray characterization of crystals
* data collection
* processing and quality analysis of data
* structure determination

Instrumentation:

* Rigaku-MSC Micromax 7 generator equipped with a Raxis-4++ image plate detector
* Oxford Cryosystems Cryocooler
* Crystal manipulation accessories, such as microscope with attached camera for crystal viewing/documentation
* Computer suite for data analysis and structure determination
* Popular x-ray diffraction data processing software suites, such as HKL2000, CCP4, CNS, and O.

Contact:

Vesna de Serrano, Ph.D. (410) 706-1124 HSF-II, Room 514
xtal@rx.umaryland.edu
http://www.pharmacy.umaryland.edu/PSC/xray

Pricing:

University of Maryland usage fees are presented below. Outside users should contact the X-ray shared service manager for pricing. Users can also work in collaboration with an X-ray shared service member by contacting the member or the shared service manager directly.

Use of the Facility for authorized personnel	$50/hour; $100 maximum per day
Annual "unlimited"* diffraction use	$1,500 per year
Training by our staff	$50/hour, $25 subsequent fee (one hour minimum)
Crystal growth screening (low throughput)	$25/hour + materials
Crystal growth screening (high throughput)	$28 per plate
Optimization of Crystal Growth	$32/hour + materials
Crystal Diffraction Screening	$25/hour
X-ray Data Collection	Same as use of the facility
Data analysis	$25/hour
Protein Purification	Contact us
Other Services	Contact us

*Unlimited use is defined by the terms of the annual usage agreement.

Genomic Technologies Core Facilities and Resources

Biopolymer/Genomics Core Facility (SOM)

Mission:
The mission of the Biopolymer/Genomics Core Facility is to enable and foster institutional science by providing the expertise, state-of-the-art resources and the training necessary to promote cutting edge genomic research.
The facility and the personnel that staff it, are committed to maintaining technologically advanced instrumentation and providing 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 is available to share their extensive knowledge and expertise in order to successfully support the research being conducted within the institution.

Scientific Objectives:
Established in 1986, the Biopolymer/Genomics Core Facility occupies 3,600 square feet of laboratory and office space on the fifth floor of the John Eager Howard Hall. The facility operates state-of-the-art genomics instrumentation to support DNA sequencing, gene expression studies, and genotyping. Major instrumentation includes an Applied Biosystems model 3730XL automated DNA sequencer, and Affymetrix GeneChip system 3000 7G with three fluidics stations, a hybridization oven, and a scanner equipped with an autoloader, an Illumina iScan system, an Applied Biosystems model 7900 HT Fast real time PCR system, and an Illumina BeadXpress. Most recently, the facility incorporated two Ion Torrent Personal Genomic Machines.

The Biopolymer/Genomics Core Facility is an integral resource for the University of Maryland Baltimore community. Specifically within the School of Medicine it provides services as the genomics core to the Marlene and Stewart Greenebaum Cancer Center, the Mid-Atlantic Nutrition Obesity Research Center, the JHU-UMD Diabetes Research Center, the UMB Center for Pain Studies and the UMB Center for the Genomics of Pain. The facility operates with state-of-the-art instrumentation and an extremely knowledgeable, well-experienced staff.

Hours:	Monday through Friday 7:30am – 5:30pm
Main Entrance:	Howard Hall, room 564 (by the northwest stairwell of Howard Hall)
Phone:	(410) 706-8553 or (410) 706-3339
Fax:	(410) 706-0287
Email:	biopolymer@som.umaryland.edu
Web:	http://medschool.umaryland.edu/biopolymer

Staff (areas of expertise):

Nick Ambulos, Ph.D. (All Services)	nambulos@umaryland.edu
Jing Yin, DDS (Gene Expression and Genotyping)	jyin@umaryland.edu
Kevin Rossomando (DNA Sequencing)	kross001@umaryland.edu
Li Tang (Gene Expression and Genotyping)	ltang@som.umaryland.edu

SERVICES **INSTRUMENTATION:**

DNA Sequencing ABI model 3730XL Sequencer

- General DNA sequencing
- Identification of methylation sites
- Sequencing to identify SNP variants

Genotyping/SNP analysis ABI 3730

- Low-plex — Affymetrix GeneChip 3000 7G
  - ABI Taqman (single-plex) — ABI 7900 Fast Real-Time PCR
- Mid-plex — Illumina iScan
  - Illumina (48-1536-plex) — Illumina BeadXpress
    - Veracode technology
    - Goldengate technology
- High-plex
  - Affymetrix
    - SNP 6.0 array (1M SNPs)
  - Illumina
    - HumanOmni2.5 (2.5M SNPs)
    - HumanOmni5 (5M SNPs)

Gene Expression Profiling

Supported by three platforms:

- Affymetrix — Affymetrix GeneChip System 3000
- Illumina — Ilumina iScan
- Custom glass slide arrays — Axon 4000B scanner and software

Array products include solutions for:

- Global Gene Expression Profiling
- Methylation analysis
- miRNA profiling
- Profiling of drug metabolism genes
- Transcriptome arrays
- Exome arrays
- Custom panels

Pricing (As of 1/1/13):

DNA Sequencing

Full Reaction samples performed by Core:	$8.00/sample
Full Reaction (full 96 well trays) performed by core:	$600.00/tray
Ready-to-Run samples:	$3.00/sample
Ready-to-Run full 96 well trays:	$75/tray
Primers (for primer-walking projects)	$8.00/primer

Inquire for pricing for genotyping or gene expression services

Cytogenetics Facility

The Cytogenetics Laboratory is a CLIA-certified 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, highly knowledgeable laboratory supervisors, and well-experienced staff.

Chromosome Analysis	**Turn-around Time**
Peripheral Blood	7-10 days (STAT cases 24-72 hours)
Bone Marrow	10-14 days (STAT cases 24-48 hours)
Amniotic fluid	8-10 days
Products of Conception	14-21 days
Skin Fibroblasts	14-21 days
Solid Tumors	10-21 days
Lymph Nodes	10-21 days
Pleural Effusions	10-14 days
CSF	10-14 days

Karyotyping of cell lines for research studies
Culturing of specimens for offsite testing

FISH (Fluorescence In-Situ Hybridization)

Microdeletions (e.g., DiGeorge syndrome, Prader Willi syndrome)
Hematological disorders (targeted regions with available probes)
Touch Preps of tissue specimens (targeted regions with available probes)
UroVysion for early detection of bladder cancer

Transportation of samples from campus locations can be arranged by contacting the lab.

Contact Information
Laboratory Hours: Monday through Friday, 7:00am - 5:00pm
Laboratory Phone: 410-706-2809 and 410-706-4063; Fax: 410-706-6068
Laboratory Director: Yi Ning, PhD; Email: yning@som.umaryland.edu
Laboratory Supervisor: JoAnn Meekins; Email: jmeekins@som.umaryland.edu

Genomics Resource Center (SOM)

The Genomics Resource Center (GRC) is a high-throughput core laboratory and data analysis group supporting the scientific programs of IGS and its collaborators utilizing state-of-the-art technology to generate high quality genomic data in a cost effective manner. Led by Dr. Lisa Sadzewicz, Administrative Director, and Mr. Luke Tallon, Scientific Director, who together have more than 30 years experience in managing high-throughput sequencing 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 GRC occupies 7000 sq. ft. of space within the BioPark II facility on the UMSOM campus. The combined annual sequencing capacity is more than **400 billion reads** and **40 trillion bases** of high-quality, passed-filter data. The GRC consults with each prospective researcher 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. The GRC strives to bring the increasing power and decreasing cost of genomic analysis to a continually expanding research community.

The GRC sequencing platforms include:

- ABI 3730xl & 3130xl sequencers
- 454 GS FLX+ Titanium pyrosequencers
- Illumina MiSeq and HiSeq2000 sequencers
- Pacific Biosciences RS sequencers

Sequencing Applications:

- *de novo* Whole Genome Sequencing
- Comparative Genome Resequencing
- Human Genome Sequencing
- Exome and Custom Targeted Capture Sequencing
- Ecological and Organismal Metagenomic Sequencing
- Transcriptome, mRNA, miRNA, and cDNA Sequencing
- ChIP-Sequencing & Methylation Sequencing
- Amplicon Sequencing
- Custom Sequencing Applications

Sequence Assembly & Analysis Services:

- Genomic and Metagenomic Sequence Assembly
- Comparative Genome Analysis
- Expression Analysis
- SNP, Indel, and Structural Variant Detection
- Phylogenomic Analysis
- Epigenomic Analysis
- Pathway & Network Analysis
- Sequence Data storage and distribution
- Custom Sequence Data Analysis

Contact Information:
Email: grc-info@som.umaryland.edu
Web: http://www.igs.umaryland.edu/grc
Luke Tallon, Scientific Director, ljtallon@som.umaryland.edu, x6-5668
Lisa DeShong Sadzewicz, PhD, Administrative Director,
lsadzewicz@som.umaryland.edu, x6-6734
Naomi Sengamalay, Lab Manager, nsengamalay@som.umaryland.edu, x6-6761

Molecular Biology/Functional Genomics Core (SON)

Instrumentation:

1) Stratagene Robocycler
2) Two MJ Research Thermal Cyclers
3) Two GeneSpring GX7.3 individual licenses for analyzing microarray data
4) Southern Blot/PCR genotyping services
5) Gene targeting vector design and construction services

Contact:
Susan G. Dorsey PhD RN FAAN, Director (410) 706-7250 SON 727
sdorsey@son.umaryland.edu

Pediatric Biochemical Genetics Laboratory

The Pediatric Biochemical Genetics Laboratory at the University of Maryland, Baltimore, is overseen by Dr. Erin Strovel, a board-certified Clinical Biochemical Geneticist with over 10 years of clinical diagnostic experience. This CLIA accredited (Clinical Laboratory Improvement Amendments) laboratory is a high quality, full service clinical lab that provides diagnostic testing for a wide variety of inborn errors of metabolism including aminoacidemias, organic acidurias, lysosomal storage disorders, disorders of galactose metabolism, biotinidase deficiency, and cystic fibrosis. Currently, the laboratory houses an Agilent 6890/5973 Gas Chromatograph/Mass Spectrometer (GC/MS), an Agilent 6460 triple quadripole LC/MS system, two Biochrom amino acid analyzers, a Beckman DU 800 Spectrophotometer, and a Sequoia Turner Model 450 Fluorometer. Our facility is instrumental in the training of Clinical Biochemical Genetics Fellows, and also provides support for researchers with respect to the development of assays aimed to detect specific analytes and metabolites characteristic of certain human disorders.

Hours: Monday through Friday 8:00am – 5:00pm

Services:

Test Name	Bill Code	Turnaround Time*
Quantitative amino acids (plasma, urine, CSF)	82139	5
Organic acid screen, qualitative	83919, 82541	5
Mucopolysaccharides, spot test	83866	2
Mucopolysaccharides, thin layer chromatography	83866, 82489	7
Oligosaccharide screen, qualitative	84377, 82489	7
Carnitine, free and total	82379, 82658	7
Galactose-1-Phosphate, quantitative	84378, 84311	5
Galactose-1-phosphate uridyltransferase	82775, 82658	5
UDP-Galactose-4' Epimerase	82657	5
Arylsulfatase A	82657	5
Arylsulfatse B	82657	5
Biotinidase	82261	4
Cerebroside □-galactosidase	82657	5
□-Galctosidase	82657	5
□-Galactosidase	82657	5
□-Glucosidase	82963	5
Hexosaminidase A and Total	83080	5

Test Name	Bill Code	Turnaround Time*
Hexosaminidase (leukocytes)		
Hexosaminidase A and Total Hexosaminidase (Serum, Plasma))	83080	5
Reducing sugars (Clinitest)	81000	1
Disaccharidase panel	82963	7
Sweat Chloride	82438	1

- Working days

Please contact the laboratory director for pricing on individuals tests.

Staff:

Erin T. Strovel, Ph.D. (Director) estrovel@peds.umaryland.edu
Miriam G. Blitzer, Ph.D. (Co-Director) mblitzer@peds.umaryland.edu
Dorothy Demers (technician) ddemers@umm.edu
Ruth Payne (technician) rpayne@peds.umaryland.edu

Transgenic Core (SOM)

Scientific Objectives: The main objective of the Transgenic Core Facility at UM-SOM is to provide the expertise, equipment, and technology to produce and preserve genetically modified mouse models for researchers. A second objective is to provide advice and consultation to investigators in the design of transgenic experiments, analysis of transgenic models, and maintaining transgenic colonies. A third objective is to constantly examine and test new techniques and expand the range of services available to the community.

Personnel:

Director: Valerie J. Stewart, M.S.

Ms. Stewart trained in micro-injection techniques in the laboratory of Dr. Fred Alt at Columbia University in New York, beginning in 1990. She later moved with Dr. Alt to Children's Hospital, Boston, and worked concurrently as lab manager and transgenic supervisor, with two assistants. In 1995, she moved to the Lerner Research Institute, Cleveland Clinic Foundation, Cleveland, Ohio, to establish a Transgenic/Knockout Mouse Facility there. In April 2003, she was recruited to establish the Transgenic Core Facility at the University of Maryland School of Medicine. She has *22* years experience in micro-injection techniques, and *17* years as a core facility director.

Research Assistant: Dennis J. Wilson, M.S.

Dennis Wilson has *over 20* years experience working in a laboratory environment. He spent 6 years working peripherally on transgenic swine and mouse projects at the American Red Cross. He spent 5 years at Johns Hopkins managing a hybridoma facility. He *is fully trained in micro-injection techniques and* has produced several transgenic founders and knockouts on his own. His expertise in PCR has led to his developing a DNA purification/PCR genotyping service for the Transgenic Core Facility, *as well as construct design service.*

Instrumentation:

Micro-Injection

Two Xenoworks micro-injection systems with Olympus IX-71 inverted microscopes equipped with DIC and phase contrast optics
Two Nikon SMZ-1000 dissecting scopes
Nikon SMZ-645 microscope for animal surgery
Nuaire 425 biological safety cabinet for animal surgery
Sutter P-97 pipet puller
GlassWoRx F-1200 DeFonbrune type microfuge

Electroporation

Bio-Rad Gene Pulser XCell system with Shockpod chamber

Cryopreservation

FTS Bio-Cool III controlled rate freezer
Taylor-Wharton HC34 liquid nitrogen cryogenic refrigerator

Tissue Culture

Two Sanyo incubators
Nuaire 425 biological safety cabinet

Olympus CKX41 inverted microscope

Pricing:

Pronuclear injection	$1980 B6C3 hybrid strain
	$2400 FVB strain
	$2640 C57Bl6NCr strain
Lentiviral injection	$1100
ES cell injections	$1980 B6 strain
	$2200 albino B6 strain
ES cell targeting	$2000-$3000, depending on # clones picked

No guarantee with any injections, but repeats done as warranted.

Contact:

Valerie Stewart (410) 706-0454 Howard Hall, Room 582
vstewart@som.umaryland.edu

The Translational Genomics Laboratory

The Translational Genomics Laboratory (TGL) was launched in May, 2011. The TGL is a CLIA (Clinical Laboratory Improvement Amendments)-compliant laboratory, capable of providing support to clinical and translational genomic studies (CLIA #21D2027356). The services offered by the TGL are similar to those offered in traditional academic genomic core labs, except that these assays are validated such that the resulting data can be used in the clinical decision-making process, supporting both clinical research/trials and for routine patient care.
Instrumentation housed in the TGL includes an Applied Biosystems 3730XL automated sequencer for Sanger-based sequencing assays; an Affymetrix GeneChip system 3000 7G on which the TGL can run chip-based arrays for expression profiling, whole-genome genotyping, miRNA profiling, CytoScan arrays and drug metabolism (DMET) arrays; Illumina iScan system for genotyping products including whole-genome genotyping and exome arrays; Nanosphere's FDA cleared Verigene pharmacogenomics test for specific genotyping of cyp2C19 variants; an Applied Biosystems 7900 RT-PCR system for genotyping by Taqman©-based methods; and two Ion Torrent Personal Genome Machines that supports analysis using Ion Torrent's Hot Spot Cancer Panel, Comprehensive Cancer Panel and Inherited Disease Panel, all of which are based on multiplex PCR amplification of target genes and variants. Custom AmpliSeq panels can also be designed to target specific gene variants of interest.

Please contact the TGL to discuss specific needs, as each assay is custom developed to meet the desired needs of the investigator.

Hours:	Monday through Friday 7:30am – 5:30pm
Main Entrance:	Howard Hall, room 564 (by the northwest stairwell of Howard Hall)
Phone:	(410) 706-8553 or (410) 706-3339
Fax:	(410) 706-0287

Director:	Richard Zhao, PhD	rzhao@som.umaryland.edu
Technical Supervisor:	Nicholas Ambulos, PhD	nambulos@som.umaryland.edu
Compliance Manager:	Danielle Sewell	dsewell@som.umaryland.edu

Preclinical Assay Development Core Facilities and Resources

Cytokine Lab (SOM)

Introduction:
The University of Maryland Cytokine Core Laboratory (CCL) was established March 31, 1995. The CCL is an academic-based fee-for-service laboratory dedicated to providing a high quality, low cost cytokine and growth factor measurement service. The CCL has performed cytokine assay services for many University of Maryland intramural investigators and many extramural investigators from across the United States, including NIH intramural investigators, and from several other countries. The CCL's operating model utilizes ELISA and multianalyte assays (Luminex technology) that are constructed and optimized in-house using individual high-quality commercial reagents, rather than pre-packaged kits. Every effort is made to continue using the same reagents for each assay to provide high inter-assay reproducibility over time. Cross-lot (and if necessary cross-supplier) validation/calibration of reagents is routinely performed. The pricing structure of the CCL is based on high volume and low profit margin. The high volume also allows the CCL to negotiate for lower reagent costs, providing further reductions in the final price of our assays. The CCL has experience in handling orders from multiple investigators with sizes of orders that vary up to 2000 samples per order and up to 6000 samples per year from individual investigators.

Instrumentation:
The CCL utilizes the following major equipment located in its MSTF laboratory: BioTek automatic plate washers (2), Molecular Devices Thermo Max microplate reader (2), Luminex 100 Multianalyte System (1), walk-in coldroom, Forma –80°C freezers with generator and liquid nitrogen back-up and audible and automated telephone temperature alarms (2 units with additional back-up unit available), plate shakers (3 units), and incubators (1 units).

Personnel:
The laboratory is directed by Dr. Jeffrey D. Hasday, with 20 years experience in cytokine research. The laboratory is supervised by Ms. Lisa Hester, B.S./M.B.A. who has 14 years experience as the CCL supervisor.

Assays Available:
The lab offer both ELISA and multiplex assays for human, mouse, and rat. Please contact the lab directly to discuss if a particular marker you are looking for is available.

Pricing:
Please call the lab directly to discuss pricing or see our website at www.cytokines.com. Pricing is based on the number of samples and the number of markers to be tested for. All University of Maryland staff will receive a 10% discount off of the pricing.

Contact Information:
Lisa Hester, Lab supervisor (6-1508) MSTF 8-64A
Lhest001@umaryland.edu
http://www.cytokines.com

Flow Cytometry Core (SOM/CVD)

Scientific objectives:
The primary goal of the CVD flow cytometry/cell sorting Core Laboratory is to ensure that University of Maryland investigators whose research projects require the use of a flow cytometer have access to such instrumentation. As this equipment is very expensive and very time-consuming to become trained on, it is much more efficient to have a facility with a dedicated operator(s) to run the equipment. Established in 1991, this facility has state-of-the-art equipment and a highly-trained and experienced staff.

Measurements/Services:
1. Characterization of cell subpopulations by multichromatic conventional flow cytometry (up to 14 simultaneous fluorochromes plus forward and side light scatter parameters) or mass cytometry (once installed in early 2013 we expect to be able to measure 30 or more simultaneous parameters). These are cutting-edge technologies.
2. Measurement of intracellular cytokine levels and other molecules and determination of the expression of cytokine and chemokine receptors in defined cell populations by multichromatic flow cytometry or mass cytometry.
3. Measurement of serum/supernatant cytokine levels using commercially available bead kits, such as the BD Pharmingen cytometry bead array (CBA) assay kit.
4. Cell cycle analysis as determined by propidium iodide or 7-AAD staining and measurement of cell proliferation by CFSE, PCNA, BrdU and Ki67 staining.
5. Determination of apoptosis in individual cells as measured by TUNEL staining, simultaneous staining with Annexin V and propidium iodide, and subG0/G1 peak analysis using DNA dyes such as propidium iodide or 7-AAD.
6. Measurement of expression of green fluorescence protein (GFP) in transiently or stably transfected eukaryotic and prokaryotic cells.
7. Physical isolation of cell subpopulations by flow cytometric cell sorting (2- and 4-way) based on expression of GFP and/or other markers defined by multichromatic monoclonal antibody staining.

Experiments should be scheduled as far in advance as possible. Generally it takes about two weeks to be fit into the schedule.

Instrumentation:
DakoCytomation MoFlo flow cytometer and cell sorter with 4-way sorting and up to 12 parameters (capable of 10 colors plus forward and side scatter; this is state-of-the-art).

BD Biosciences LSR II flow cytometer with 16 parameters (capable of 14 colors plus forward and side scatter; this is state-of-the-art).

CyTOF Mass Cytometer (expected in early 2013) with the capability of measuring over 30 parameters simultaneously in a single tube. This cutting-edge technology is based on the detection of cells labeled with stable isotope-bound monoclonal antibodies by mass spec.

Personnel:
Marcelo Sztein, M.D.
Associate Director for Immunologic Studies, Leader, Immunology Group and Chief of the Cellular Immunology Section and Flow Cytometry Core Laboratory of the Center for Vaccine Development (CVD). Holds an appointment as tenured Professor, Division of

Infectious Diseases and Tropical Pediatrics, Department of Pediatrics and secondary appointments in the Departments of Medicine and Microbiology and Immunology
Has 26 years of experience in flow cytometry and has been director of the CVD's Flow Cytometry Core Laboratory since its inception in 1991.
Has over 35 years of experience in the study of molecules involved in the regulation of cellular, humoral, innate and mucosal immunity, with particular emphasis on the understanding of the mechanisms underlying the generation of immune responses to infectious agents in humans and animal models.

Regina Harley, M.S.
Has been Lab Supervisor of the CVD Flow Cytometry Core Laboratory since November 1999
Lab Supervisor of the University of Rochester Cancer Center Flow Cytometry Facility for 10 years prior.
Has had professional training on all of the flow cytometers in the CVD Core Laboratory as well as others.
Has extensive experience in all of the services listed above, including multichromatic flow cytometry, cell sorting (2- and 4-way), CBA assays, cell cycle analysis, measurement of cell proliferation, determination of apoptosis, measurement of expression of green fluorescence protein (GFP), etc.

Cathy Storer, B.S.
Has over 20 years of experience in analytical flow cytometry, including complex multicolor analysis, cytometry bead arrays (CBA), proliferation, etc.

Pricing:
All flow cytometric sample analysis and cell sorting is done by Core Laboratory personnel and is charged at a rate of $100.00/hour, rounded up to the nearest half hour. Sorting has an additional flat 2-hour set-up charge ($200.00).

A final decision on the CyTOF Mass Cytometer charge rate has not been made; however it is likely to be ~$150.00/hour.

Laboratory Policies:
The "Rules and Regulations" form (Revision May 10, 2005) is available at the CVD Flow Cytometry Core Laboratory.

Contact:
Marcelo Sztein, MD. (410) 706-5328 HSF I, Room 456
msztein@medicine.umaryland.edu
http://medschool.umaryland.edu/orags/flowlab.asp

Flow Cytometry Shared Service (SOM/UMGCC)

Scientific Objectives:
To provide state-of-the-art flow cytometry services for investigators at the Marlene and Stewart Greenebaum Cancer Center and campus wide at the University of Maryland Baltimore.

Instrumentation:
Bench top Analyzers: The Flow Cytometry Shared Services Facility has three analytical cytometers, a BD FACScan, a BD-LSR II and a BD FACSCanto II for use by both operator-assisted and user independent data acquisition/analysis. The FACScan has a fixed blue 488nm laser and three-color capabilities. The BD LSR II has three lasers (Blue 488nm, Red 633nm, and Violet 350nm) and nine fluorescence detectors (11 parameters), multiple pulse processing and fully digital data processing. The BD FACSCanto II has two lasers (Blue 488nm and Red 633nm) and seven fluorescence detectors (9 parameters), multiple pulse processing and fully digital data processing.
Cell Sorter: The Facility has one cell sorter, BD FACSAria I with a 96-well plate attachment for single cell sorting. This sorter is equipped with two lasers (Blue 488nm and Red 633nm excitations) and seven fluorescent detectors (9 parameters) available for use in complex analysis and cell sorting. This is a high-speed, fully digital cell sorter and is available solely for operator-assisted cell sorting for both sterile and non-sterile applications.

Personnel:
Ferenc Livak, M.D. Director
Dr. Livak became director of the Shared Service in 2009 and oversaw the reorganization of the facility that included the acquisition of the state-of-the-art LSRII and Canto II analytical cytometers, as well as the Aria cell sorter He has more than 20 years of experience in flow cytometry and cell sorting and has been trained at Becton Dickinson on the operation of FACSAria I. Dr. Livak is responsible for general management of the facility, training personnel and users, operating the cell sorter and providing technical and experimental consultation and guidance.

Karen Underwood, B.S. Research Specialist
Mrs. Underwood had worked in cancer research at the University of Maryland for several years before she assumed her position at the Facility in 2011. She is responsible for all aspects of day-to-day operations at the Facility, including data acquisition, data analysis and occasional cell sorting. She is also responsible for training users on the use of analytical flow cytometers and maintaining and quality controlling the instruments.

Services	**Time**	**Instrument Type:**
Sample acquisition	daily	FACScan, LSR II, Canto II
Data analysis	daily	FlowJo workstation
Cell sorting	daily (min 48hr res)	FACSAria I
DIVA operation training	by appt	LSR II, Canto II
Experimental consultation	by appt	analytical or sorting

Pricing (Effective December 1, 2012)

Service	Operator	Unit	Fee
Data Acquisition	Facility Operator	15 min	$100/hr
	Investigator	15 min	$50/hr
Data Analysis	Facility Operator	15 min	$60/hr
	Investigator	15 min	$20/hr
Cell Sorting	Facility Operator Only	30 min	$120/hr
Training on DIVA	Facility Operator Only	60 min	$100/hr
Experimental consultation	Facility Operator Only	60 min	$100/hr

Contact:

Phone: (410) 328-3915
E-mail: *flowcore@som.umaryland.edu*
Ordering: *http://cf.umaryland.edu/freezer/promo_fcs.cfm*
Web site: *http://www.umgcc.org/research/flow_cytometry.htm*

Cellular Physiology Core (SON)

Instrumentation includes:

1) Sutter P97 pipette puller
2) AxoClamp 200B
3) Aurora Scientific in vitro muscle contractility system
4) Two tissue culture hoods and two cell culture incubators

Contact:
Chris W. Ward, PhD, Director (410) 706-3618
ward@son.umaryland.edu
Susan G. Dorsey, PhD, Co-Director (410) 706-7250
sdorsey@son.umaryland.edu

Veterinary Services (UMB)

Services provided and turnaround time:
The staff of Veterinary Resources will provide numerous technical services on a variety of species. Rodents are the most frequently used animal models on campus. Because of this, the staff commonly provides technical assistance on a fee-for-service basis for rodent blood withdrawal, administration of anesthetics, tail clipping, breeding, and weaning to support investigators in their research activities. We have experience developing mouse monoclonal antibodies to specific determinants, and developing polyclonal antibodies in rodents, rabbits and other species, including small molecule antibodies in llamas. Turn around time is specific to each project, and each project is custom tailored to fit the need of the investigator. All technical requests are conducted in a reasonable time.
Before starting any research project, our program typically provides assistance with any of the following: special caging or experimental techniques, selection of appropriate animal species to carry out specific animal techniques, animal models of human diseases, anatomical and physiological peculiarities of animals used in research, techniques of anesthesia, analgesia, chemical restraint, and dosages, techniques of blood and other sampling and drug or chemical administration, pathological and clinical effects of intercurrent animal disease, estimates of animal purchase prices and future per diem rates.
Support may also be provided for surgery, pathology and radiology on a number of species, including large animal studies. Our experience and ability to assist investigator needs, as they relate to laboratory animal medicine, is very extensive. Inquiries and prior arrangements can be arranged by contacting our office. Through pre-research consultations, budgeting for such support can be included in research grant applications.

Location, hours of office operation:
MSTF G-100
10 South Pine Street
Standard business hours: 8am-5pm

Pricing:

ANIMAL SPECIAL SUPPORT:

Mouse Weaning, Tail Clipping and Bleeding (Including cost of anesthesia)	Technician Fee: $52.82/hour
Tissue Processing for All Species	Technician Fee: $52.82/hour
Euthanasia for All Species (i.e. administration of anesthesia solution and carcass disposal)	Technician Fee: $52.82 /hour

(Any other special support will incur a technician fee of $58 dollars/hour, plus the cost of any additional materials, anesthesia or time.)

VETERINARIAN SUPPORT

Veterinarian	Surgical/Medical Support	$162.77 /hour
	After 5PM or before 8AM.	$245.76 /hour
Veterinary Technician	Surgical/Medical support	$66.83 /hour
	After 5PM or before 8AM	$99.17 /hour

ANESTHESIA MACHINE RENTAL

Isoflurane Anesthesia Machine Rental	$70.06 /session + anesthetic Drug cost

ROOM USE:

Surgery Room Use (typically large species use) – maintenance only (non-disposables inclusive: EKG, IV pump, etc.)	$93.78/session
Necropsy Room Use – maintenance only	$72.22 /session

NECROPSY:

Rodent, Complete Necropsy	$54.06 First animal, $21.98 ea. add
Histopath/slides	Cost + 25%
Non-Rodent, Complete Necropsy	$301.82 /session
Histopath/slides	Cost + 25%
Non-Rodent, Necropsy Minimal	$174.62/session
Histopath/slides	Cost + 25%

PROVISION OF SUPPLIES:

Research Supplies	Cost + Overhead (25%)
Surgical Supplies	Cost + Overhead (25%)
Pharmaceutical Supplies	Cost + Overhead (25%)
Tissue Processing Supplies	Cost + Overhead (25%)

MISCELLANEOUS:

Histopathology Slide Review and Report	Cost + overhead (25%)
Radiograph/X-Ray Film Support	$62.52 /first plate $53.90/add'l plate
Re-Derivation Service Fee	Please call to discuss

Training available through the core:
We offer training on numerous animal procedures. The most frequently requested training is our Humane Animal Handling. To inquire about specific training procedures, please contact us directly.

Contact:
Louis DeTolla, V.M.D.,M.S., Ph.D., DACLAM (410) 706-8537 MSTF, Room G100
detolla@vetmed.umaryland.edu
http://vetmedicine.umaryland.edu

Mouse Functional and Behavioral Core Facility (SON)

Instrumentation:
1) Columbus instruments mouse grip strength system
2) USCD Paw thermal Stimulator
3) Two Stoelting von Frey Hairs and elevated wire mesh platforms

Contact:
Susan G. Dorsey PhD RN FAAN, Co-Director (410) 706-7250 SON 727
sdorsey@umaryland.edu

Physiological Phenotyping Core- PPC (SOM)

The Physiological Phenotyping Core (PPC), previously known as the Small Animal Physiology Core (SAPC), offers services in *in vivo* measurements of cardiovascular and extra-cardiovascular (e.g. pulmonary, sympathetic, EEG) function in mice and larger animals, either under anesthesia or in a conscious and unrestrained condition.

SERVICE CATALOG

WE PROVIDE 3 FORMS OF SERVICES:

1. Surgeries and Experiments (Cat # PPC-A, PPC-B, PPC-C, and PPC-N)
2. Equipment and Facility Rental (PPC-R)
3. Technical Support: Training and Consultation (PPC-T)

Contact:
Ling Chen, M.D., Ph.D.
Assistant Professor of Medicine and Physiology
Manager of the PPC
(410) 706-4920
Lchen@medicine.umaryland.edu
MSTF, Room 816C
PPC Website: http://medschool.umaryland.edu/ppc

DESCRIPTION OF SERVICES

ACUTE EXPERIMENTS (PPC-A)

When anesthesia is required, isoflurane inhalation is used to minimize inhibition of the autonomic function (compared to injectable anesthetics). Thermal support and continuous monitoring of core temperature and ECG, and if necessary, mechanical ventilation and fluid administration are provided. Data are collected and stored digitally via multi-channel physiological systems, with or without physiological and pharmacological intervention. We currently measure the following variables:

- Catheter-based Hemodynamics
- Regional blood flow
- Pulmonary function
- Biopotentials
- Autonomic function

BIOMICROSCOPY (PPC-B)

Ultrasound is versatile and provides a high throughput imaging modality for various organs and tissues. Clinical ultrasound units have low ultrasound frequencies (8-12 MHz) for long penetration distance, but provide low spatial resolution that is inadequate for small animals like mice.

Visualsonics Vevo 2100 (13-75 MHz) is a high frequency ultrasound system that offers a near-microscopic spatial resolution at ~30 microns (so-called biomicroscopy), and high temporal resolution up to 1000 frame per sec at M-mode unmatchable by MRI and CT. It also enables contrast imaging and 3D-Mode Imaging & Volume Analysis. The imaging can be performed with light sedation, or even in conscious (unsedated) animals when necessary.

- **Cardiac ultrasound imaging**
- **Ultrasound imaging of blood vessels and blood flow**
- **Imaging-guided injection, extraction, and gene transfer**
- **Specific applications to support**
  - **Cancer**
  - **Neurobiology**
  - **Nephrology**
  - **Hepatology**
  - **Musculoskeletal**

CHRONIC EXPERIMENTS AND MODELS (PPC-C)

Implant Surgery
Implant surgery usually requires in vivo measurements in conscious and free moving animals that obtain the most relevant physiological data (without acute anesthesia and surgery). We implant the following devices in mice with 15 g body weight or larger animals.

- Telemetry indices (DSI transmitters)
- Tethered devices, including flow probe (Transonics)
- Osmotic pump, programmable Micro infusion pump, vascular access port for drug delivery or blood sampling

Chronic Experiments
The PPC has the expertise and equipment for long-term recordings of telemetry or non-telemetry (tethered) data in implanted animals, with or without physiological manipulations including hypoxia, hyperoxia, dietary treatment, and drug infusion. Multiple data systems are available, including DSI telemetry system, BioPac system, Dragonfly swivels, Transonic flowmeters, Triton system, and Omega-24 sleep system. The core has a specific “quiet facility” that provides an environment with minimal interruption to enable the study of circadian rhythm in rodents.

Animal Models
The PPC has substantial expertise in microsurgery for acute and chronic animal models. The examples of various procedures include:

- *Cardiac Models:* Coronary ligation for myocardial ischemia/reperfusion, infarction, post-infarct hypertrophy, or heart failure; Pressure or volume overload, including transverse or abdominal aortic constriction; neonatal aortic banding; aortico-caval fistula:
  Toxic cardiomyopathy by administration of monocrotaline, angiotensin II, adriamycin, epinephrine, and aldosterone.
- *Vascular Models:* Carotid ligation, Arterio-venous fistula
- *Other Models:* Chronic sustained or intermittent hypoxia or hyperoxia; Adrenalectomy; Carotid arc denervation; Thymectomy; Unilateral nephrectomy

NON-INVASIVE MEASUREMENTS (PPC-R)

The following equipment is available through the PPC:

- Vevo 2100 System
- BioPac MP System
- Telemetry System
- Transonic Flowmeter
- Cardiac output computers
- Tailcuff Blood Pressure System
- Environment System
- Surgical Suite
- Other equipment that is available includes: Triton multi-channel data system, Omega-24 sleep data system, Mouse or Rat Heart Perfusion System.

TECHNICAL SUPPORT (PPC-C)

We provide consultation on study design, IACUC protocols, etc. Moreover, we provide training on surgeries and procedures performed in the PPC.

µQUANT CORE FACILITY (IHV)

Overview:

The µQUANT Core Facility provides quality immunological analyses of biological analytes to researchers within the IHV and SOM, and to other collaborators locally and nationally. 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; and quantitative PCR.

Facility Mission:

We have devoted significant time to trouble shooting all protocols used and have developed laboratory SOP's. While assays are not routinely run under GLP conditions, run staff is GLP trained and can readily adapt/perform analyses under suitable conditions. Where economically feasible we bulk purchase supplies and use commercial materials, therefore, the manufacturer's in-house quality control process can be thought of as an extension of our services. Core ELISA assays are run on manufacturer supplied pre-coated ELISA plates and your antigen detected with the supplied, lot number matched, detector antibodies and standards. Non-Core assays, those with insufficient usage to leverage significant enough discounts, are primarily run on in-house coated ELISA plates.
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.

Assay Philosophy: Consistent Results at the Lowest Cost.

Equipment Available:

- SpectraMax M2 tunable wavelength 6-96 well Fluorescent/ Colorimetric Kinetic Plate reader
- Wallac Victor 2 Multi-analyte plate reader (2 injectors)
- Turner BioSystems Veritas Microplate Luminometer (1 injector)
- Biacore T100
- AKTAexplorer
- BioRad IQ5 real-time PCR machines

Contact:
Brian M. Taylor, PhD
µQUANT Core Facility
Lab: S-632, Office: N-562
Phone: 410-706-4648
Fax: 410-706-4694
brtaylor@ihv.umaryland.edu
http://www.ihv.org/research/facility.html

Translational Laboratory Shared Service (SOM/UMGCC)

Clinical Support: Our laboratory assists clinicians in various domains, especially Phase I/II clinical trials and assay development.

- Processing of clinical trial materials, including peripheral blood, bone marrow, pleural effusion, buccal mucosa, tissue biopsy and isolation of plasma, serum, PBMC, circulating tumor cells, antigen specific cells (e.g. CD138).
- Isolation of DNA/RNA/protein from tissue biopsy or peripheral blood or bone marrow.
- Analyses of pharmacodynamic (PD) endpoints in tumor or surrogate tissues. Assistance in sample collection and processing for PD analyses.
- Archiving and storage of clinical samples.
- Development and optimization of biochemical, molecular or cellular assays that are tailored and validated according the translational research question associated with a clinical trial, the development of standard operating procedures including sample handling and processing, as well as instructions for research nurses and collection logistics.

Proliferation/cytotoxicity assays: The TLSS provides a spectrum of *in vitro* proliferation assays that are all run in a multi-well format to enable high-throughput testing of potentially novel and established anticancer agents in cell-based screens. Over 50 established tumor and normal cell lines are available, which have been characterized for a large number of currently highly attractive molecular targets.

Drug screening: Proliferation assays are used to test anti-proliferative efficacy of new compounds on a tailored panel of cancer cell lines using the WST-1 assay (detecting mitochondrial function) and the SRB assay (measuring total cellular protein). The IC50 values for each drug are calculated using GraphPad Prism software.

Drug combination studies: The cell proliferation assays are further employed for drug combination studies (two or more drugs), that are performed based on the fixed IC50 ratio method by Chou and Talalay. The Calcusyn software package calculates combination indices, CI, which indicates synergistic, additive or antagonistic effect of drug combination. Combination of radiation with known or unknown agents is a new addition to the services offered by TLSS
Other In Vitro Assays (cell based) offered:

- Cell viability using trypan blue exclusion
- Clonogenic Assays
- Cell cycle Assay using Flow Cytometry (propidium iodide staining)
- Apoptosis Assay using Flow Cytometry (Annexin V/PI staining)

Migration, Invasion and Problem Assay by xCELLigence System: Real-Time, Label-Free Cellular Analysis enables quantitative real time monitoring of cell proliferation, migration and invasion in response to various treatments: gene expression knock down with shRNA, gene transfection or drug toxicity. The system is applicable to the majority of adherent cells.

Protein-based assays: Testing the effects of an experimental agent on the down-stream cellular targets (protein expression, phosphorylation, cell signaling) includes Western blot analysis and ELISAs.

***In vivo* assays:** The TLSS has an IACUC approved umbrella animal use protocol “Animal Models for Studying Tumor Biology and for the Evaluation of Pharmacodynamic and Pharmacokinetic Endpoints of Novel and Experimental Cancer Therapies” approved for three years (#0111008,

until January 2014). For routine in vivo studies that are run in the TLSS (listed below), an amendment to IACUC is all that is required to conduct the study.
Any tumor line or drug can be used in the following approved procedures considered key in preclinical anticancer drug development:

- Determination of the maximal tolerated dose (MTD) of a novel agent
- Establishment of human tumor xenografts or murine tumor lines from model cell lines (e.g. target transfected) and tissues
- Isolation of plasma for Pharmacokinetic analysis of novel agent.
- Tumor efficacy experiments in traditional s.c. nude mouse xenografts of a test compound *versus* standard agents alone or in combination
- Orthotopic models in mammary fat pad and prostate cancer
- Imaging of mice with the Xenogen system after injection with Luciferase transfected cells
- Coming Soon: radiation treatment of cancer in mice

Equipment and procedures which are unique to the TLSS include:

- Synergy HT (Biotek) High-throughput plate reader for absorbance, fluorescence, luminescence, and UV/VIS detection
- Leica DM4000 microscope with fluorescence light and phase contrast light sources, cooled camera with monochrome and color filters, automated x,y,z stage, and imaging software (Openlab, Improvision)
- An IACUC approved umbrella animal use protocol "Animal Models for Studying Tumor Biology and for the Evaluation of Pharmacodynamic and Pharmacokinetic Endpoints of Novel and Experimental Cancer Therapies" for following procedures considered key in preclinical anticancer drug development exists (#0111008): allowing quick turn around of in vivo
- xCELLigence Real Time System to measure cell proliferation, cell migration and invasion in Real Time.
- Cell Colony Counter (Microbiology International) to measure the cell proliferation in soft agar or methycellulose.
- A LABCAT Tumor Tracking & Measurement Software version 8.0 for tumor data acquisition and processing.
- Equipment for RNA expression/DNA analyses (PCR, Real-time PCR, electrophoresis)
- Equipment for protein expression analyses (Western blot, ELISA)

Personnel:
The TLSS has scientific personnel, which is well experienced with *in vitro* and *in vivo* approaches to evaluate the effect of novel agents on cancer. This expertise is made available to small biotech and pharmaceutical companies that have limited laboratory capacities or lack qualified laboratory personnel.

The TLSS is located in room BRB 9-020G-H (800 square feet), on the 9th floor of the Bressler Research Building.

Contact:

Rena Lapidus PhD	rlapidus@som.umaryland.edu	(410-328-8092)
Mariola Sadowska, Ph.D.	msadowska@som.umaryland.edu	(410-328-8091)
Brandon Cooper	bcooper@som.umaryland.edu	(410-328-3914)
Eun Yong Choi	echoi@som.umaryland.edu	(410-328-3914)

Drug Development Core Facilities and Resources

Clinical Pharmacology Unit (SOP)

The Clinical Pharmacology Unit (CPU) in the Department of Pharmacy Practice and Science, School of Pharmacy is a multi-disciplinary clinical research resource for UMB investigators, contract research organizations (CROs) and pharmaceutical industry. The CPU designs and conducts Clinical Pharmacology trials focusing on PK/PD, drug metabolism, renal function evaluation, and drug-drug interactions. Data obtained from clinical trials (Phase I-IV) are analyzed using NONMEM, WinNonlin, and SAS.The CPU also provides consultation for regulatory submissions, provides scientific input for clinical protocols, clinical development plans, investigator brochures, and clinical pharmacology sections of IND and NDA submissions. The CPU independently develops clinical pharmacology analysis plans, evaluates clinical trial data using advanced exploratory data analyses techniques, performs clinical trial simulations and applies novel pharmacometric principles to clinical trial data.

Faculty:
Kenneth Bauer, PharmD., Ph.D., Associate Professor - Dept. of Pharmacy Practice and Science
Thomas Dowling, PharmD., Ph.D., Assoc. Professor - Dept. of Pharmacy Practice and Science
Natalie Eddington, Ph.D., Professor and Dean of the SOP - Dept. of Pharmaceutical Sciences
James Polli, Ph.D., Professor - Dept. of Pharmaceutical Sciences
Joga Goburru, PhD, Professor - Dept. of Pharmacy Practice and Science

Research Services
The Clinical Pharmacology Unit offers:
Expertise in drug administration and drug-drug interactions resulting in recommendations aimed at maximizing the response and minimizing toxicity to the compound.

Information specific to the compound's administration routes, dosage, dose administration times, and concomitant medications with due consideration of clinical effect, disease condition, clinical toxicity, and the proposed biologic response markers.

Ability to offer recommendations on optimal time points to test each compound's effectiveness, efficacy and safety in administering the compound to humans.

Models for testing and projecting the drug pathway based on the concomitant drugs and the disease state.

Data analysis and reporting of the Pharmacokinetics of the compound(s) based on clinical trial intermediate and clinical outcomes data.

Scientific analysis of Pharmacodynamic Reports about the compound(s) and results for application to the Clinical Trial design and clinical results.

Pharmacogenetic study of Clinical Trials, and provide compounded analysis of these data. Evaluate and report Industry-provided clinical trial data using advanced analytical techniques.

Clinical trial outcome simulations based on the data provided by the Industry.

Pharmacometric modeling to clinical pharmacology studies to better inform the anticipated human-drug interaction.

Reports and publications on data analyses as requested.

Preparation of Clinical Pharmacology sections of the Food & Drug Administration recommendations for Investigational New Drugs and New Drug Applications, and Investigator Brochures.

Clinical Pharmacology expertise to investigators in academia and in industry.

Research Capabilities
The Clinical Pharmacology Unit Lab is capable of:
Conducting Renal Function Studies (GFR and ERPF) for baseline and post-intervention periods in a variety of patient populations including chronic kidney disease, heart failure, and liver disease.

Developing laboratory assays to test drug plasma concentrations, intermediate biomarkers and Clinical Trial clinical endpoints. (GLP is needed to validate and conduct assays in the Unit Lab)

Conducting the validated assay on samples provided by industry to test the absorption, distribution, metabolism, and elimination of the drug in the Clinical Trials subjects

Employing targeted *in vitro* and *in vivo* animal study techniques to test cell uptakes, transport, liver metabolism, and animal pharmacokinetic distribution and toxicology as surrogate studies in the preclinical examination of the compound prior to human testing.

Contact:
Joga Gobburu, Ph.D., Director
(410) 706-5907
jgobburu@rx.umaryland.edu

Computer Aided Drug Design (SOP)

The rapid identification of novel therapeutic agents for specific disease states is potentially the greatest step forward in health care that will occur in the 21st century. This potential is largely predicated by the availability of the human genome, along with the genomes of other organisms, including pathogenic species. The fields of genomics and proteomics will allow for this information to be used to identify novel molecular targets for the treatment of a wide variety of disease states. Fueling this process are developments in the biological, chemical and physical sciences. Advances in biochemistry, cell biology and molecular biology facilitate the identification of novel biological target molecules, and, importantly, the means to experimentally measure the activity of those target molecules. Advances in structural biology have allowed for the determination of the 3-dimensional (3D) structures of biological target molecules via the techniques of nuclear magnetic resonance (NMR) or X-ray crystallography, with over 16,000 3D structures currently available in the Protein Data Bank. Computer-aided drug design (CADD) approaches can use the information in the 3D structures of biological target molecules to identify chemicals with a high potential for binding to the biological target molecules. These chemicals may then be obtained and experimentally assayed to select those with the desired biological activity. The selected compounds are referred to as lead compounds and may then be subjected to additional structural optimization via structural biology, CADD and novel organic synthetic methods to obtain compounds with improved activities. Both the lead compounds and their optimized analogs represent chemical entities with a high probability of being developed into therapeutic agents and, therefore, are of great interest to pharmaceutical companies.

The University of Maryland, Baltimore, including the School of Pharmacy, contains a collection of scientists of varied backgrounds, including computational chemistry, structural biology, biochemistry, molecular biology and cellular biology that, in combination, represent the expertise required for CADD based studies. The CADD Center provides collaborative opportunities for biologists to apply CADD approaches to their research programs. These efforts focus on 1) the identification of chemical compounds with the desired biological activity and 2) structural optimization of the identified compounds to enhance their desired biological activity. Chemical compounds created from these steps will have the potential to be developed into research tools and/or therapeutic agents. Successful outcomes of this approach will include publication in scholarly journals and patent submissions on the biologically active compounds, laying the foundation for external funding via federal, private or industrial sources.

Contact:

Alex MacKerell, Ph.D., Director (410) 706-7442
amackere@rx.umaryland.edu
Jana Shen, Ph.D., Co-Director (410) 706-4187
jshen@rx.umaryland.edu
http://www.pharmacy.umaryland.edu/CADD

High Throughput Screening (HTS) Shared Service

Scientific Objectives:

The goal of the UMGCC High Throughput Screening (HTS) Shared Service (SS) is to provide investigators access to automated liquid handling equipment, sensitive high throughput detectors, and diverse collections of small molecule libraries to facilitate the identification of therapeutic targets and screen for chemical perturbagens as a step towards developing new drugs and therapies. The HTS SS can assist with the development of *in vitro* and cell-based assays or help adapt an investigator's existing assay into higher throughput formats. The equipment is also available for other high throughput biology projects that may require automated liquid handling such as screening siRNA, shRNA, or gene expression libraries for example.

Personnel and Contact Information:

Paul T. Wilder, Ph.D., Director
UMGCC High Throughput Screening Shared Service
108 North Greene Street, Room 439
Baltimore, MD 21201
Email: pwild001@umaryland.edu
Phone: 410-706-4353

Capabilities:

The HTS SS can provide varying levels of assistance on screening projects from developing novel screening assays, adapting existing assays to work on the HTS equipment, or simply providing training and access to the equipment and resources an hourly fee basis. The HTS SS regularly performs a wide range of in vitro protein-protein (fluorescence polarization competition assays, FRET, TR-FRET, AlphaScreens, AlphaLISA) and protein-ligand (lanthanide metal competition) assays. Cell based assays (include mammalian, bacterial, and yeast) for cell viability, luciferase activity assays, and cellular ELISAs for screening.

Equipment - Automated Liquid Handling Stations:

- **Beckman-Coulter Biomek FX**
- **Beckman-Coulter Biomek NXP**

Equipment - Multimode Microplate Readers:

- **BMG POLARstar Optima**
- **BMG PHERAstar Plus**
- **BMG PHERAstar FS**

Equipment – Other:

- **Bruker 800 MHz NMR with the B-ACS 60 Automatic Sample Changer (NMR Center)**

- **Miscellaneous**
  Equipment and lab space for performing both in vitro and cell based assays are available in the HTS SS facility including five water jacketed CO_2 incubators, two 6ft biological safety cabinets, inverted microscope, -20° C freezer, 4° C refrigerator, liquid nitrogen cryostorage, Thermo HN II centrifuge w/ microplate carrier, and a Thermo Savant SC250 Express SpeedVac.

Compound Libraries: The HTS SS currently has more than 57,400 small drug-like compounds available for screening composed primarily of commercially available compounds. In addition, a collection of small molecular weight, Rule-of-3, fragment library is also available. Inquire about library specifics.

Pricing: The costs of screening projects can vary greatly depending on the type of screening assay, the stage of development of the screening assay, and whether the investigator will have their own people perform the assay or use the HTS SS personnel. Therefore, the HTS SS personnel will work with the investigator to create an individual quote for the project. Below are the rates for hourly use of the equipment and the compounds if the investigator was performing the screen themselves but even then there is additional cost for training on equipment and for aliquoting the compound libraries must be done by the HTS SS personnel to maintain the integrity of the collections.

Equipment/consulting rates per hour (1 hour minimum)

Description	Internal Rate	External Rate
Beckman Coulter Biomek FX	$25	$30
Beckman Coulter Biomek NXP	$25	$30
BMG PHERAstar FS Microplate Reader	$20	$24
BMG PHERAstar Plus Microplate Reader	$20	$24
BMG POLARstar Optima Microplate Reader	$20	$24
Program/Training/Consulting	$80	$100

Screening compound cost

Number of compounds	Cost per 0.1 umole[a]
>40,000	$0.30
20,000 to 40,000	$0.35
10,000 to 20,000	$0.40
5,000 to 10,000	$0.45
<5,000	$0.50

[a]The compound pricing simply here is the cost of the compound but there is additional cost for the aliquoting of the compound including the personnel cost, plasticware and other disposables, and equipment time that will vary depending on the final assay.

Industrial Pharmaceutics Laboratory & GMP Manufacturing Facility (SOP)

Facilities and Capabilities:

The University of Maryland, School of Pharmacy has a fully equipped Industrial Pharmaceutics Laboratory (IPL). The IPL has three 500 sq ft fully equipped laboratories, one 500 sq ft GLP laboratory and six GMP pharmaceutical manufacturing suits. The laboratory is equipped to perform preformulation research, excipient screening, physical characterization of polymorphs, formulation and process development, GMP manufacturing, packaging and labeling of clinical supplies and the laboratory equipment needed to evaluation these dosage forms using official USP methods such as the dissolution test. We can manufacture from the small-scale to the pilot-scale, i.e., from gram quantities to *ca* 50 kg scale. We also have validated stability cabinets to conduct stability studies in accordance with ICH guidelines.

Dosage Form Capabilities:

- The manufacturing suits are equipped with everything necessary to produce tablets, capsules, topical preparations, transdermal patches, nasal sprays, suppositories, liquid perpetrations, film strips, pellets, spray dried particles, lyophilized drug products and we have facilities for pan and fluid bed coating tablets, pellets and granules. We do not produce sterile products
- We can formulate and manufacture immediate and controlled release dosage forms.
- We have extensive experience manufacturing placebo liquids, capsules and tablets, transdermal patches under GMP conditions, and over encapsulated tablets, of reasonable size, and permanently seal the capsule shells for blinded studies.
- The capabilities of IPL include research on the quality and performance of botanicals and other dietary supplement formulations.
- Botanical products are among the most difficult types of formulations for which to develop placebos, because if the patient were to open a capsule and see a white powder they would immediately know it was a placebo. Thus, the color and taste have to be matched to the original product, which can be very challenging for botanical products that have a strong characteristic taste and appearance.
- In addition we have experience developing taste masking systems for pediatric formulations.

Services:

The services provided by IPL include:

- Basic and applied research that focuses primarily on the design and optimization of immediate release and extended release oral solid dosage forms for both their performance as drug delivery systems and their manufacturability
- Formulation and process development for the above dosage forms
- GMP manufacturing, packaging and labeling; followed by release testing, for the support of clinical trials
- Analytical method development, including physical tests, for analysis of dosage forms
- Stability testing in accordance with ICH guidelines
- IND/CMC document preparation for FDA filings

Pricing:

Current pricing is given on our webpage:
http://www.pharmacy.umaryland.edu/facilities/gmp/fees.html

Contact:

Stephen Hoag, Ph.D., Director (410) 706-6865 Pharmacy Hall, Room 603S
shoag@rx.umaryland.edu

Pharmacokinetics Biopharmaceutics Laboratory (SOP)

Scientists within the Pharmacokinetics Biopharmaceutics Laboratory (PBL) are recognized experts in pre-clinical and clinical pharmacokinetics, pharmacodynamics, human drug metabolism, and clinical efficacy evaluations. Over the last 15 years, the PBL has performed over 50 clinical pharmacology studies including bioavailability, bioequivalency, pharmacokinetic, pharmacodynamic, and special populations (e.g., renal dysfunction, menstrual cycles, genetic polymorphism). The PBL was instrumental in performing the fundamental studies that are the basis for the following FDA Regulatory Guidances including: SUPAC-MR (Scale Up and Post Approval Changes for Modified Release Formulations), SUPAC-IR (Scale Up and Post Approval Changes for Immediate Release Dosage Forms) and In Vitro-In Vivo Correlation (IVIVC). Each of these guidances have been supportive in streamlining the drug development process. As stated, the PBL has conducted numerous pre-clinical, translational and clinical studies in collaboration with the Pharmaceutical Industry, NIH and the FDA. Further, the laboratory currently holds grants and/or contracts that focus on mechanisms of drug delivery, disposition, drug efficacy and surrogate biomarker assessments.

Contact:
Natalie Eddington, Ph.D., Director (410) 706-6710 Pharmacy Hall, Room 730
neddingt@rx.umaryland.edu

Center for Nanomedicine and Cellular Delivery (SOP)

Research in the center is focused on the development of diagnostics for rapid monitoring, targeted cancer therapies, localized drug delivery, improved cell material interactions, scaffolds for tissue engineering, and gene delivery systems. Nanomedicine aims at controlling the rate and/or location (at the organ, tissue, cellular or subcellular levels) of drug release. This is particularly important to enhance the delivery of potent agents to their target while minimizing toxicity to other normal tissues. By targeting the delivery of therapeutic agents to their target site it is possible to maximize efficacy of drugs and reduce toxicity. Often compounds that are highly toxic fail to reach clinical trials because of their adverse effects. By linking the discovery effort with appropriate nanomedicine delivery strategies at the early stages of drug discovery, there is a chance to “salvage” some of the highly potent drugs by targeted delivery. By and large controlled delivery systems are comprised of some polymeric biomaterial that controls the rate and/or site of drug release. The faculty in the Center, have over ten years of experience in polymeric, targeted and cellular delivery of drugs.

Contact:
Peter Swaan, Ph.D., Director (410) 706-0103 HSF II, room 543
pswaan@rx.umaryland.edu
http://www.pharmacy.umaryland.edu/nanomedicine

Basic and Clinical Science Resources

CLINICAL RESEARCH SHARED SERVICE

Clinical research is an essential part of the mission of the University of Maryland Greenebaum Cancer Center (UMGCC). The mission of the Clinical Research Shared Service is to enhance the quality and facilitate the conduct of this research. The Clinical Research Shared Service participates in the development, activation, conduct and monitoring of clinical trials involving people with cancer at the UMGCC. The activities of the facility include:

- Supporting the scientific review of proposed research projects through the Clinical Research Committee (CRC)
- Submission of approved projects to the Institutional Review Board (IRB) of the University of Maryland Baltimore
- Patient registration and data management
- Preparation for third party audits, and all institutional and federal regulatory reporting
- Monitoring of accrual to clinical trials
- Supporting the Data and Safety Monitoring Committee
- Correspondence and reporting to the IRB
- Supporting the spot auditing of investigator-initiated research for data safety and good clinical research practices
- Supporting the Response Verification Committee to verify radiographic response

The Clinical Research Shared Service maintains a strong relationship with the IRB. By written agreement, the IRB will not review any trial that involves cancer patients unless it has been previously approved by the Clinical Research Committee (CRC) of the Cancer Center, and signed off by the Cancer Center Director. The IRB receives all correspondence from the chair of the CRC to individual principal investigators regarding reviewed protocols, and all reports and audit results of the Data and Safety Monitoring Committee.

Director: Ed Sausville, M.D., Ph.D.
Clinical Research Protocol Office: **Program Director:** Galina Tucker, M.D.
gtucker@umm.edu
http://www.umgcc.org/research/clinical_research.htm

Dermatopathology/Histology Laboratory (SOM)

Mission:
To provide high quality histology glass slides in a timely manner, and to render accurate diagnoses of our clinical dermatopathology services. The lab also provides reliable materials to assist and collaborate with research projects on campus. The laboratory is ASCP certified and follows all CLIA regulations. A comprehensive quality assurance program has been established for the histopathology laboratory to ensure high standard health care services.

Facilities:
The laboratory occupies about 2000 square feet of space. The Histology Core Laboratory is located at Biomedical Park and the Managing Office is at 419 W. Redwood Street, Suite 240. It is a non-profit laboratory owned and operated by the Department of Dermatology, School of Medicine. The laboratory is open from 8:30 am to 4:30 pm, Monday through Friday, and closed on weekends and regular campus holidays.

Instrumentation:
Shandon Excelsior Tissue Processor, Hiscentre 3 Embedding Center, Finess 325 microtome, Varistain Gemini automatic slide stainer, Consul versatile automatic cover slipper, Olympus BX41 microscope with Qcolor 3 digital camera.

Services Provided:
1. Routine process and H&E stain
2. Routine process and unstained slides
3. Tissue processing and embedding
4. H&E staining only
5. Frozen section
6. Microscopic diagnosis
7. Special Stains, including PAS, Gram, mucin, AFB, Fite, Giemsa, Melanin, Elastin, Trichrome, etc.
8. Immunohistochemistry stains including Cytekeratin, Melan A, Ki-67, S-100, HMB-45, Smooth Muscle Actin, Vimentin, B- and T-lymphocytic markers, and any other cell markers with antibodies provided.
9. Immunofluorescent slides, including direct and indirect immunofluorescent stains, immunoblotting, etc.
10. Digital photography of microscopic and DIF images.

Specimen Requirements:
1. Tissue processing and embedding: Tissue fixed in 10% buffered formalin
2. Routine H&E stain: Formalin fixed tissue or unstained slides
3. Frozen section: Specimens in Michelle's Medium
4. Microscopic diagnosis: Fresh or formalin fixed tissue, paraffin block, stained or unstained slides.
5. Special stains: Paraffin block or unstained slides
6. Immunohistochemistry stains: Paraffin block or unstained slides
7. Immunofluorescent Studies: Tissue in Michelle's Medium (Direct) or Serum (Indirect)

Personnel: Grace F. Kao, MD, a board certified dermatopathologist Director of the laboratory
Clinical Professor of Dermatopathology, Dept of Dermatology, U of MD, SOM
Bahram Sina, MD, a senior dermatologist and board certified dermatopathologist, is the laboratory consultant.
Carolyn A. Durkowski, HT (ASCP), Laboratory Administrator
Sharon Andres, RN., MBA is the Senior Clinical Administrator of the Department of Dermatology.
Anthony Gaspari, MD, Chairman of the Department of Dermatology, supervises the overall operation.

Schedule of Fees:

Service	Turnaround (Hours)	Unit	Prices
Routine process and H&E stain	24	Slide	$12.00
Routine process and unstained slide	24	Slide	$7.00
Tissue processing and embedding	24	Block	$6.00
H&E stain only	2-6	Slide	$3.00
Frozen section without stain	2-6	Slide	$15.00
Frozen section with H&E stain	2-6	Slide	$20.00
Histochemistry stain	24	Slide	$18.00
Immunohistochemistry stains	48	Slide	$20.00*
Immunofluorescent studies	48	Slide	$20.00
Microscopic diagnosis	24	Case	$30.00
Photograph (Microscopic digital image)	24	Picture	$5.00

* $20.00 for the first slide, $10.00 for each additional slide

Contact:
Grace F. Kao, MD. (410) 328-6098 419 W. Redwood St., Ste 240
gkao@som.umaryland.edu

General Clinical Research Center

Scientific Objectives:
The University of Maryland General Clinical Research Center (GCRC) is the centerpiece of the University of Maryland Institute for Clinical and Translational Science. The GCRC provides the infrastructure to support the clinical and translational research needs of the University of Maryland and serves as the primary location for inpatient and outpatient clinical research on the UMB campus.

GCRC services are available 24 hours a day, seven days a week to meet the needs of IRB-approved research protocols. The GCRC maintains an equipped research vehicle to support off-site or community projects.

Research projects may be federally-funded, industry-sponsored, or grant-supported and may include inpatient, outpatient and off-site studies. Studies may range from simple to complex.

The GCRC staff includes licensed nurses and patient care technicians experienced in phlebotomy, infusion therapy, tissue biopsies and other complex procedures. Research participants may be pediatric, adult or geriatric and either have a disease process or be healthy volunteers. Participants may come from the local community or be recruited nationally or internationally.

GCRC services include access to the Investigational Drug Service, hospital dietary, hospital laboratories, genomics, data management, biostatistical and administrative support. Each service adheres to all national and institutional practice standards and guidelines.

The GCRC staff can also provide protocol and budget assistance to investigators either before or after IRB approval.

Facilities:
Outpatient Area:
* 5 comfortable recliners with privacy curtains
* 5 phlebotomy chairs
* Nursing station with computer workstations
* DEXA (Duel Energy X-Ray Absorptiometry) Facility
* Three private Exam Rooms
* Conference Room
* Reception and Waiting Areas
* Specimen Processing Laboratory with:
    * Countertop Refrigerated Centrifuge
    * Laminar Flow Hood
    * Refrigerator and –70 Freezer

Inpatient:
* Five inpatient Rooms (~11 JCAHO approved beds), 24 hour nursing care
* Kitchen/Activities Lounge
* Specimen Processing Laboratory
* Nursing station with computer workstations

Contact Information

General Clinical Research Center
University of Maryland School of Medicine
22 South Greene Street
University of Maryland Medical Center
Room S10D13
Baltimore, Maryland 21201
Email: gcrc@medicine.umaryland.edu
Phone: 410-328-7648
Fax: 410-328-8749
http://medschool.umaryland.edu/GCRC/

Dawn Fox, R.N.	Jennifer Marron, R.N.	Robert Mitchell
Nurse Manager	Protocol Manager	Administrative Director
410-328-7648	410-328-7648	410-328-7365

Histology Core Facility (SOM/CVID)

The histology core is directed by Ms. Elizabeth Smith and provides services in necropsies and perfusion fixation of various research animal species (rodents, rabbits, etc), processing of tissues and cells, embedding for paraffin and frozen sections, microtomy and cryotomy sectioning, and both routine and special staining. Consultation service is also available to provide advice concerning tissue processing, embedding orientation, and routine or special staining. Optimization of antibodies against newly discovered antigens for immunohistochemistry on frozen and paraffin sections and on cultured cells is also available. Equipment in the facility includes a Renaissance automatic tissue processor, Leica EG 1160 embedding center, a microtome cryostat and rotary microtomes for paraffin sections. The core also houses a Nikon Eclipse E 400 microscope with DS camera

Contact:
Elizabeth Smith E: V:(410) 706-8185 F:(410) 706.8234
esmith@som.umaryland.edu
http://medschool.umaryland.edu/cvid/cores.asp

Molecular Diagnostics Laboratory/Division of Molecular Pathology

Clinical Diagnostic Services:

The Molecular Diagnostics Laboratory (MDL) at the University of Maryland Medical Center offers molecular diagnostic testing in all areas of molecular pathology including infectious diseases, genetic disorders, and cancer detections. Our laboratory is certified by Clinical Laboratory Improvement Amendments (CLIA ID#: 21D0923512), the College of American Pathologists (CAP ID#: 1351414) and the Maryland Department of Health and Mental Hygiene (Permit Number 837). MDL is located in University of Maryland Medical Center, Rm P2G01H (nearby Shock Trama), 22 South Greene Street, Baltimore, MD 21201. To request a clinical diagnostic test, please contact Cynthia Hildenbrand, Lab Supervisor (8-8539) or Dr. Richard Y. Zhao at 8-0054. A list of the current molecular diagnostic tests is as follows:

Infectious Diseases	Genetic and Familiar Disorders	Hematology/Oncology
Human Immunodeficiency Virus Type 1 (HIV-1) Quantitative RT-PCR (viral load measurement)	Factor II Mutational Analysis by PCR	Immunoglobulin Gene Arrangement by Southern Hybridization (VDJ Southern)
Human Immunodeficiency Virus Type 1 (HIV-1) Genotyping	Factor V Leiden Mutational Analysis by PCR	Immunoglobulin Gene Arrangement by PCR (VDJ PCR)
Human Immunodeficiency Virus Type 1 (HIV-1) Virtual Phenotyping	Cystic Fibrosis (CF)*	T-cell receptor (TCR) gene arrangement analysis by Southern Hybridization (TCR-b, JH, Jκ Southern)
Hepatitis C Virus (HCV) Qualitative RT-PCR	Ashkenazi Canavan Disease (CD)*	T-cell receptor gene arrangement analysis by PCR (TCR-γ PCR)
Hepatitis C Virus (HCV) Subtyping	Ashkenazi Gaucher Disease*	Short Tandem Repeat (STR) analysis
Herpes Simplex Virus Type 1 and 2 (HSV-1/2) Qualitative PCR	Ashkenazi Tay-Sachs (TS)*	kRAS mutational analysis
Cytomegalovirs (CMV) Quantitative Real-time PCR	Ashkenazi Niemann-Pick (NP)*	CYP2C9/VCORC1 mutational analysis
Polyomavirus BK Quantitative Real-time PCR	Ashkenizi Familial Dysautonomia (FD)*	
Toxoplasma gondii Qualitative PCR		

*special request only

NICHD Brain and Tissue Bank for Developmental Disorders(SOM)

Scientific Objective:
The Bank serves as a resource for human tissue to support basic and medical research. The focus of the Bank is the collection of brain and systemic tissue from individuals with developmental disorders as well as controls. The Bank has collected tissue from over 3500 individuals. Over 100,000 brain and peripheral specimens are available as either formalin fixed or frozen samples stored at –80^{o}C.

Services:	Average Turnaround Time
Human tissue, fixed or frozen	7-14 days

The tissue is distributed only with demographic information. It does not have any donor identifiers.

Transfer of tissue requires a Material Transfer Agreement obtainable at the web site. The Material Transfer Agreement requires: signature of as IRB official or a copy of a letter indicating that your study has been approved or exempted by the IRB.

A handling fee of $100 is charged per tissue sample.

Personnel:
H. Ronald Zielke, Director
Anthony Weldon, Outreach Coordinator
John Cottrell, Tissue Coordinator
Robert Johnson, Assistant Tissue Coordinator

Over 800 researchers in 23 countries have received tissue from the Bank. Over 500 publications have been published on research based on tissue received from the Bank.

Contact:
H. Ronald Zielke, Ph.D. (410) 706-1755 Bressler, 13th floor
btbumab@umaryland.edu
http://btbank.org

Pathology Biorepository Shared Service

Scientific Objective

Pathology Biorepository Shared Service (PBSS) provides access to a consistently excellent quality of banked patient samples (tissue and other preparations) while maintaining patient confidentiality. Samples to be used for research purposes are available to investigators that have University of Maryland, Baltimore Institutional Review Board (IRB) approval. Through access to tissue specimens, investigators can perform analyses (such as genomic or proteomic studies) aimed at understanding the biology of normal and diseased tissues, ultimately translating knowledge gained to diagnostic and clinical applications. PBSS provides pathology, histology, and histotechnology consultation services to assist clinical investigators in the procurement, analyses, and clinicopathologic correlation of human tissue specimens. Additionally, PBSS offers translational research support in the form of tissue processing and embedding, sectioning and staining, tissue microarray construction, immunohistochemistry, antibody work-up, image analysis (quantitative IHC), and photomicrography.

Location

University of Maryland Medical System
Room NBW58, Anatomic Pathology
22 S Greene St , Baltimore, MD 21201 Phone: 410-328-5558

Directors: Olga Ioffe, MD and Paul Staats, MD
Tissue Services: Carol Robles, PA (ASCP)
Histology: Kimberly Tuttle, HT (ASCP)
Administrative: Katie Warfield

CURRENT SERVICES AND PRICE STRUCTURE, FY2012
(Revised in May 2012 to reflect rate recalculation)

ADMINISTRATIVE LABOR RATE	$55/HOUR
PROFESSIONAL LABOR RATE	
Pathologist Review & Interpretation of Slides	$165/HOUR

TISSUE PROCUREMENT/PROCESSING	**#UNITS**	**PRICE/UNIT***
Fresh or Frozen Tissue Specimen	_____	$100.00/unit
Fresh/Frozen Tissue Including Clinical Data	_____	$120.00/unit
Bone Marrow/Blood cell isolate	_____	$100/unit $20 (addn'l units same patient)
Serum/Plasma	_____	$40/unit $10 (addn'l units same patient)

HISTOLOGY SERVICES		
Retrieve archived blocks <u>with</u> provided case list (per case)	_____	$80.00/1st block of case
(Cerner search, pathologist review & selection of blocks)	_____	$10.00/addn'l block same case
Retrieve archived blocks <u>without</u> provided case list (per case)	_____	Per hour + $80/1st block of case
(May be subject to Administrative Labor Rate)	_____	$10.00/addn'l block same case
Process and Embed Block, no slides; (tissue received in cassette)	_____	$30.00/unit
Process and Embed Block, no slides; (tissue rcvd fresh/formalin)	_____	$40.00/unit
H&E Stained Paraffin Section	_____	$7.00/slide
Unstained Paraffin Section	_____	$5.00/slide
Additional Unstained Paraffin Section	_____	$2.00/slide
Double-thickness Unstained Paraffin Section	_____	$10.00/slide ($2.00/each addn'l)
H&E Stained Frozen Section	_____	$20.00/slide
Unstained Frozen Section	_____	$16.00/slide

Additional Unstained Frozen Section	_____	$4.00/slide
Plastic 100 Count Slide Box	_____	$25.00

SPECIAL STAINS (email or call for information on levels)

Level 1 (PAS, Trichrome…etc)	_____	$20.00/slide
Level 2 (PAMS…etc)	_____	$30.00/slide
Level 3 (LFB…etc)	_____	$50.00/slide

SPECIAL SERVICES

Tissue Array (May be subject to Administrative Labor Rate)

Case Review	_____	$20.00/case
Cores Transfer	_____	$10.00/core
TMA slides w/custom array	_____	$20.00/complete slide
TMA slides	_____	call for available arrays

Immunohistochemistry :

The PI supplies the primary antibody unless PBSS already had the primary antibody optimized. PBSS antibodies are for use on human tissue only. There are no guaranteed results from using this service. Fees will be accessed on work done, not outcome. Please provide antibody spec sheets with your order.

Development & Titration of new Antibody	_____	$600.00/antibody
Antibody/Reagent Provided (human tissue)	_____	$40.00/slide
Antibody/Reagent Provided (animal tissue)	_____	$50.00/slide
PBRC Antibody (human tissue only)	_____	$100.00/slide

DNA Studies

Roll	_____	$50.00/50um
2mm core	_____	$50.00/core

Photography/ Scanning (May be subject to Administrative Labor Rate)

Photo	_____	$25.00/ea.
Aperio scanning 20X	_____	$12.00/Slide
Aperio scanning 40X	_____	$25.00/Slide

*Subsidized pricing for UMGCC members, pathology department members- inquire PBSS

Translational Phenotyping Core (SON)

Pre-Clinical Assays

Nocifensive Testing:
Hargreaves and Hot/Cold Plate
Von Frey Fibers, Plantar Anesthesiometer
Temperature Preference Gradient
Randal Selitto Meter
Dynamic Weight Bearing

Neuromuscular Functional Testing:
Digi-Gait Analysis System
Grip Strength
Rotarod
Rodent Activity Wheels—Volitional Activity

Stress, Anxiety, and Depression Testing:
Anxiety: Open Field
Anxiety: Elevated Plus Maze
Anxiety: Cage Activity
Anxiety: Startle Test Station
Depression: Open Field
Depression: Tail Suspension
Ultrasonic Vocalization Detection

Physiology Testing:
Plethysmometer
Metabolic Treadmill
ECG for Mice
Current Perception Threshold—Sensory Fiber Functional Testing

Audiology Testing:
ABR: Auditory Brainstem Response

Clinical Tests

Sensory Testing:
Neurometer CPT/C
Pathway Pain & Thermal Sensory Evaluation System
Von Frey Sensory Evaluators
Pinprick Detection
Vibration Detection Using Rydel-Seiffer Tuning Fork
Grip Strength Using Jamar Dynamometer
Algometer
Lauda Water Bath
Deep Tendon Reflex Using Reflex Hammer

Functional Testing:
GaitRite Platinum 16' Gait Analysis System
Biodex System 4 Pro Orthopedic Testing and Rehabilitation System
Matrix T5X Treadmill
Quark CPET System
Biocom HRV Live!

Clinical Suites/Antropometric Testing:
Clinical Suite With Phlebotomy Cart
Height/Weight Scale
Body Composition Analyzer
Blood Pressure Monitor
Digital Thermometers
Eppendorf Centrifuge 5702 R

Contact:
Susan G. Dorsey, PhD, Director (410) 706-7250
sdorsey@son.umaryland.edu

Katie Shanks, MS Coordinator
shanks@son.umaryland.edu

Information Technology, Informatics & Statistics

Biostatistics

Scientific Objectives:

The Division of Biostatistics and Bioinformatics in the Department of Epidemiology and Public Health is an academic unit with expertise in the areas of biostatistics, medical bioinformatics, and mathematical modeling. Members of the division are engaged in research in a wide variety of substantive and methodological research. In addition to performing their own research, members of the division serve as a resource to the University community in the following ways:

- Participating as collaborators in research projects with other investigators, generally contributing their biostatistical and/or methodological expertise to the projects.
- Teaching biostatistics and epidemiologic methods to medical students, graduate students and researchers on campus
- Providing short-term statistical consultations.

Services and Technologies Provided:

The Biostatisticians and Bioinformatician are available to help investigators in the following ways:

- Study Design and Proposal Writing. This includes sample size calculation, hypotheses and aims specification, and development of the analyses plan. We are happy to write the data analysis and sample size sections of your proposals.
- Study implementation including randomization.
- Statistical Analysis, summary, and interpretation. Results are communicated to investigators via memoranda and manuscript-ready tables and figures.
- Statistical Programming. Major statistical software are available including SAS, Splus, R, Stata, StatXact and East. The Biostatistics Shared Service also develops computer programs for complex statistical problems.
- Biostatistics Training. Introductory seminars can be provided in topics of your choice and tailored to your level.

Contact us:
For more information about our Division, go to our website:
http://medschool.umaryland.edu/epidemiology/div_bio.asp

For information on acquiring Biostatistics service, please click on:
http://medschool.umaryland.edu/epidemiology/div_bio_bqrc.asp
or e-mail Susan Holt at sholt@som.umaryland.edu

Center for Information Technology Services
IT Resources for Researchers

The Center for Information Technology Services is pleased to provide resources and services to researchers at the University of Maryland Baltimore. The following are available IT resources:

Internet

UMB supports a research cyberinfrastructure that includes interconnections with campus, regional, national research, and education networks. UMB researchers have access to National Lambda Rail (NLR), and Internet2. The Mid-Atlantic Crossroads (MAX) is the regional optical network that connects UMB to the NLR and the Internet2. MAX provides services at 10 Gbps to universities in Maryland, DC, and Virginia as well as nearly 50 federal agencies including NIH and NLM. UMB is also a host to the Maryland Education and Research Network (MDREN) which provides high speed connections to other public and private education institutions in Maryland as well as to Maryland's state government network, Network Maryland. UMB co-founded, with Johns Hopkins, the Baltimore Education Research Network (BERNet) that serves a consortium of local research universities with low cost, high speed connections to a GigaPop in Baltimore City and connections to MAX.

Network

UMB connects 65 buildings and all its schools, departments, institutes and programs to the 10 Gbps campus fiber-optic backbone matching the capacity available from the commodity Internet, MAX, and NLR. UMB connects to those networks through redundant routers and firewalls so connections automatically fail over if a single pathway is unavailable. The core network infrastructure is redundant and most research departments on campus are taking advantage of this capability by connecting their building infrastructure to both cores reducing or eliminating downtime associated with equipment failure.

Computing Facility and Resources

UMB maintains a state-of-the-art, off-campus computing facility to support its research and educational missions. It has been engineered specifically to accommodate high-performance computing. Redundant, diverse 10 Gbps DWDM fiber-optic links from the 300 West Lexington building to the campus core network "hub" connect this facility to existing high-performance grid computing and storage resources available in UMB schools, departments, programs, and institutes. The facility has ample room for future growth that focuses on sharing, efficiency, and making enhanced capabilities available for research and education. CITS also maintains a 16-node high performance computing cluster in the 300 West Lexington Building that is available to researchers on an *ad hoc* basis. The cluster will be enhanced for researchers, as needed. All principal investigators are offered data backup services to provide a safe and secure place to back up research data. CITS offers one terabyte (TB) of free backup storage to each active principal investigator. Additional storage is available at a highly subsidized one-time cost.

Access Infrastructure and Services

An infrastructure has been built to allow the use of the UMID to access UMB enterprise applications as well as many school and department systems. Additional work is underway to connect more UMB and UMCP systems to a common access infrastructure and enable the use of

a common ID. In an effort to support access to significant partners and sponsors, UMB has established a membership with the Internet2 InCommon Consortium. With the help of InCommon, the UMB enterprise directory can integrate with the directories of other participating organizations. This means that researchers can access resources such as NIH databases by using the same login credentials used for campus IT services. There are now 48 NIH applications that are available via this integration. The following applications are part of the 48 available apps:

Human Salivary Proteome wiki, Annual Progress Reporting Science Information System (APRSIS , Clinical Translational Sciences Award (CTSA), STAR METRICS, MRI Scheduler, Public Reviewer, The database of Genotypes and Phenotypes (dbGaP), PubMed, Flow Cytometry Experiment and Reagent Management System (FERMS), Address Lookup Tool (ALT) for National Children's Study, and Web Collaboration

Wireless network access

UMB has joined the Eduroam wireless consortium and has enabled Eduroam wireless for UMB. Eduroam (**edu**cation **roam**ing) is the secure, world-wide roaming access service developed for the international research and education community. Having started in Europe, eduroam has gained momentum throughout the research and education community and is now available in 54 countries. Eduroam also gives the faculty, staff, and students the ability to connect to any wireless system in the University regardless of the building you are in. Eduroam also allows students, faculty and staff from participating institutions to obtain Internet connectivity across campus and when visiting other participating institutions by utilizing their local login credentials (UMID) on their laptop or Smartphone. This allows persons with UMB identities to access wireless networks at any participating member organization with a single set of credentials. Locally, this includes the UMCP and UMBC campus of the University System of Maryland.

UMVibe

CITS provides a free collaboration tool, called UMVibe. The application allows faculty to form teams across organizational boundaries to share and group edit content as well as to manage team activities on a common calendar. This enables researchers to work with colleagues in other departments, schools, universities, and research centers without regard to geography or time zones. All content shared among collaborators is secured on campus equipment behind firewalls and other security devices. All data is encrypted when being transmitted.

Collaborate audio/video conferencing

CITS provides a web-based teleconferencing system called Collaborate. This allows spur-of-the-moment or scheduled web or telephone conferencing with the ability to share desktops, content, and video.

Software Licenses

The Office of Software Licensing, in CITS, provides enterprise pricing for software used at the desktop level. Examples of software available to researchers at volume discounts are *Mathematica* and *ARCGis*. For statistical analysis, we offer *SAS*, *SPSS* and *STATA*. In addition, anti-virus software from Symantec, office productivity software from Microsoft, and presentation software from Adobe are all available at reduced rates. Campus demand and the ability to offer a volume discount are the drivers for offering any of the software products available through this office.

Web applications

Many research projects require development of data management systems as well as public facing applications. The Office of Web Development, in CITS, is able to provide these services. Developers are able to apply contemporary web application tools and standards to development of custom systems that collect and analyze data or serve out research findings to a broader community.

VPN Web Client

Another service that is available is a virtual private network (VPN) web client. Versions are available for most contemporary platforms and enable remote users to securely access the campus network and information resources from anywhere.

IT Help Desk

The IT Help Desk, in CITS, provides support to faculty, students and staff for all Enterprise (campus-wide) applications. Help with accessing Enterprise applications (such as UM Mail, COEUS, and Effort Reporting) is available daily, Sunday through Saturday, from 8 a.m. to 5 p.m. The IT Help Desk is located in the HS/HSL room 540. They can be reached by phone (410 706-4357), email (help@umaryland.edu), and fax (410 706-4191). Support can also be obtained by accessing the IT Help Desk at http://www.umaryland.edu/helpdesk.

Technology Training

The Enterprise Training Group (ETG) works closely with CITS enterprise application development teams, creating supporting documentation and designing and delivering training for system end-users. Training may be delivered in a classroom, online, or, when called-for, on an individual consulting basis. Sometimes the ETG develops and maintains training materials for the organization which owns the system, and in turn they deliver the training.
Supported applications include:

- the **UMVibe** collaborative authoring tool
- the **Collaborate** teleconferencing system
- the **COEUS** proposal and grant management system
- **eUM Financials**
- the **HRMS Payroll** system,
- and many others.

Numerous short training videos called “Snippets” are available at http://www.umaryland.edu/helpdesk/snippets/index.html, while self-paced UPK (User Productivity Kit) tutorials on numerous systems can be accessed at https://devfinweb.umaryland.edu/upk/player/toc0.html.

Clinical and Translational Research Informatics Center (CTRIC)

Objectives:
The Clinical and Translational Research Informatics Center (CTRIC) is a service center within the Department of Epidemiology and Public Health (EPH) in the University of Maryland's School of Medicine (UMSOM). The primary objective 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 offered, supporting 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 UMMC Clinical Data Repository; quality assurance/control; data analysis; research design; and assistance with grant writing.

Hours: Monday through Friday 7:00am – 5:30pm

Services Offered:
Data Capture
CTRIC employs both web-based and paper form technologies, which minimize manual data entry in order to increase the speed and accuracy of collected data entered into the database. Common tools include Cardiff TeleForm, Remark Web Survey, and FreezerPro. Manual keying of data is also an option. Researchers select the means by which they would like to collect data, while CTRIC provides the software, hardware, and data entry staff to match the needs of each particular project.

Custom Database Creation and Data Storage
CTRIC can organize study data from across various locations 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 (Oracle, PostGreSQL, SQL, 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.

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

Access to data in the UMMC Clinical Data Repository
UMMC has more than 32,000 inpatient visits and 300,000 outpatient visits every year, with much of the resulting data stored in the data repository. Researchers who are interested in accessing this vast resource for research purposes can be provided with guidance through the process of obtaining IRB approval, submitting a data request, and responding to questions from the data repository.

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. For those researchers who wish to analyze the data themselves, CTRIC can provide consultation for the appropriate analytic strategy.

Research Design
CTRIC staff can assist in making a variety of decisions about how to best structure a study and collect data, and are available to provide consultation throughout the design of a given project. CTRIC can also give assistance with power and sample size calculations.

Grant Writing
CTRIC is a resource for expert advice on grant writing; staff members have ample experience assisting and writing various grant proposals.

Staff:
Director
J. Kathleen Tracy, PhD, MSTF, Room 334F, Phone: 410-706-3461
ktracy@epi.umaryland.edu

Program Manager
Teresa E. Yates, Phone: 410-706-3461 tyates@epi.umaryland.edu

Additional Staff
Deborah Greenberg, Senior Research Analyst, Phone: 410-706-4540
dgreenbe@epi.umaryland.edu

Tamar Pair, Research Specialist, Clinical, Phone: 410-706-6842
Tpair@epi.umaryland.edu

Nicholas Schluterman, Research Analyst, Phone: 410-706-2497
Nschluterman@epi.umaryland.edu

Lynda Ireland, Research Coordinator, Phone: 410-706-4540 lireland@epi.umaryland.edu

Tim Zeffiro, Research Assistant, Phone: 410-706-2497 tzeffiro@epi.umaryland.edu

Simon Magaziner, Research Assistant smagazin@epi.umaryland.edu

Pricing:
CTRIC services are compensated via funding profiles (personnel on grants), sub-contracts, service agreements, or on a fee for service basis. The current hourly fee is $85.

Informatics Resource Center (SOM)

The ***Informatics Resource Center (IRC)***, under the direction of Anup Mahurkar, provides genomics and bioinformatics services to the UMB campus. The IRC works closely with Owen White, PhD, the Director of Bioinformatics for School of Medicine and the informatics leadership at IGS including Michelle Giglio, PhD, the Director of Analysis, and Samuel Angiuoli, PhD, Director of Software Engineering. The IRC includes a staff of over forty scientists, engineers, and analysts that work together to conduct research and development in bioinformatics and provide analyses. The IRC staff is organized along scientific platforms and functional areas of expertise. Typically, biologists lead scientific platforms and coordinate the engineering and analysis required for individual projects. The major scientific platforms supported by the IRC include prokaryotic, viral, eukaryotic, and mammalian genomics, metagenomics, informatics research, and systems biology. The IRC has built expertise in a number of functional areas including assembly, annotation, genome visualization, transcriptomics, epigenomics, structural variant detection, comparative genomics, and statistical modeling.

Analysis Services

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

- ***Genome assembly and annotation*.** There are pipelines available for both prokaryotic and eukaryotic organisms. Both reference-based and reference-independent protocols are used. Reference-based analysis relies on the transfer of information to the species under study from a closely related species. Reference-independent methods generate assemblies and annotation *de novo*. The annotated product in all cases includes predicted protein coding genes with functional annotations including protein names, gene symbols, EC numbers and Gene Ontology terms as well as prediction of non-coding RNAs.

- ***Metagenomic analysis*.** 16S phylogenetic analysis to determine community composition and whole metagenome annotation to find functions and pathways present in the community.

- ***Genome variation analysis.*** We have analysis pipelines for single nucleotide polymorphism (SNP) and copy number variant (CNV) detection.

- ***RNA-Seq alignment and visualization.*** The RNA-Seq alignment pipeline includes the use of one or more of the short read aligners such as Mosaik, BowTie/TopHat, BWA, or GSNAP to align the RNA-Seq reads against the reference genomes to identify gene and isoform expression patterns. The alignments are typically loaded into IGV (Integrative Genome Viewer) or other such tools for visualization.

- ***Differential expression analysis.*** IRC has pipelines in place to conduct gene and isoform level differential expression analysis using microarrays or RNA-Seq. These pipelines provide differential gene expression that is then used to identify differentially enriched pathways in particular conditions using DAVID, or Ingenuity Pathway Analysis.

Custom Programming and Analysis: In addition to using the standard pipelines, IRC staff can develop custom pipelines and analysis tools to meet the needs of individual projects. The IRC staff has expertise in web development, database development, and statistical programming.

Computational Infrastructure

Supporting the informatics at IGS is a state-of-the-art computational infrastructure that includes a computational grid, an internal 10-gigabit network, clustered database servers, and a hierarchical storage management system. IGS is connected to the rest of the campus by a high-performance switched 10 Gbps network. All UMB buildings are connected to the LAN backbone and core switches via fiber cabling. IGS, as part of UMB, maintains a 10 Gbps link to the National Lambda Rail (NLR), a 1 Gbps connection to Internet2, the high-speed network designed to facilitate collaboration and communication among research institutions, as well as the aggregated bandwidth of 20 Mbps to the regular Internet network.

The computational grid is built primarily around ten high-performance high-memory multi-processor machines (64-256 GB RAM, 4 CPU multi-core processors) for memory and compute intensive applications such as genome assembly, and multiple genome alignment and ninety high throughput computational nodes (16 GB RAM 2 CPU multi-core Intel Xeon processor machines) for running distributed applications such as BLAST, and HMMsearch. The grid scheduling is managed by Sun N1 Grid Engine (SGE) distributed computing system. To address the ever expanding data sets generated by next generation genome sequencing technologies at a reasonable cost we have deployed a hierarchical storage infrastructure consisting of 3 tiers of random access storage and a fourth tier of serial access tape media storage for archival and data backup. Total storage is nearly petabyte.

The IRC has recently deployed one of the largest public academic clouds, the Data Intensive Academic Grid, to enable bioinformatics analysis to be conducted in a computational cloud. This cloud includes over 1500 cores for high-throughput computational analysis and over 300 cores for high-performance analysis. To support large datasets the infrastructure includes over 500 TB of central high-performance storage. The scientific community can access this resource as a traditional grid or as a computational cloud like Amazon EC2, or through Ergatis, a pipeline management system.

This computational infrastructure is available on a fee-for-service or collaborative basis to the larger campus community through the IRC.

Contact:
Anup Marhurkar, Director 6-5682
Irc-info@som.umaryland.edu
http://www.igs.umaryland.edu/research/bioinf/intro.php

Pharmaceutical Research Computing (PRC)

Pharmaceutical Research Computing (PRC) is a research center within the Department of Pharmaceutical Health Services Research at the University of Maryland School of Pharmacy. Our mission is to provide computer programming, data management and analytic support for faculty, postdoctoral fellows, graduate students and other health services researchers. PRC offers a full array of data support services, including procuring data, investigating data integrity and completeness, cleaning data, creating and validating analytic files. In addition, our PRC staff is able to provide input on pharmacotherapeutic issues, operationalize variable definitions (drugs, diagnosis, procedures), perform statistical analyses, participate in project management, and manuscript development.

Extensive experience working with large administrative claims data, secondary datasets, and primary data including pharmacy and medical information is a PRC hallmark. PRC's team includes information technology specialists, programmers, and a statistician, as well as pharmacists from the University of Maryland School of Pharmacy. Their clinical expertise in pharmacotherapeutics, knowledge of reference files (e.g. drug dictionaries, ICD-9-CM, CPT, HCPCS, and revenue center codes), and understanding of research methodology add unique strength to the Center. Together, the entire team provides important contributions to study design, operationalization of variables and data analysis.

Our experienced staff includes:

- Christine Franey, MPH-Research Analyst
- James Gardner, ScM-Programmer & Statistician
- Patricia Stewart, BS-Programmer
- Lori Walker, BS-Programmer
- Corinne Woods, RPh, MPH-Research Pharmacist
- Jeanne Yang, MCP-Programmer
- Ilene Zuckerman, PharmD, PhD-Executive Director & Pharmacist

To maintain confidentiality of all data and to meet HIPAA compliance standards, PRC has implemented the following procedures to safeguard data:

- Only personnel authorized by the Principal Investigator have access to data.
- All authorized personnel are required to provide evidence of completion of HIPAA training and to complete a confidentiality form for each study that will be maintained in the office.
- Study data will be loaded on to PRC's secure server only after the PI provides PRC a copy of the Institutional Review Board approval or exemption letter and Data Use Agreement.
- If data require the use of patient identifiers, PRC staff will work with the PI to limit the number of essential identifiers to be loaded on to the server.
- Original data are stored in a locked safe with limited access. Archived and backup data are stored with limited access in either an on-site or an off-site locked safe.
- At the end of the study, PRC staff deletes any data per the instructions of the PI. Original data are returned to the PI. In addition, any hardcopy materials with patient identifiers are shredded.

The PRC computing environment consists of a number of dedicated servers communicating over a private gigabit-speed network, with the goal of providing security and efficiency in data processing. To increase security, there are two fully redundant servers that serve as gateways to control network traffic in and out of the private network. These servers each have 2GB of RAM and 160GB of disk. Connected to these gateway servers are four servers that serve as the backbone of our system. Primary data manipulation and statistical analysis, primarily using SAS, are carried out on a Sun Microsystems x4540 with two six-core AMD Opteron 2435 "Istanbul" processors running at 2.6 GHz, 32GB of memory, and 48TB of disk storage configured as ZFS mirrors This system is running Solaris 10 and uses Sun's "zones" technology to provide production and test virtual systems. All the servers and equipment are maintained in a dedicated, environmentally-monitored server room complete with separate air-conditioning and emergency power. Routine and archival backups are completed on a daily and monthly basis, respectively. Archival backups are encrypted and copied offsite

PRC's services are available at established cost-based prices on a per-project basis.

Contact:
Ilene Zuckerman, PharmD, Ph.D., (410) 706-3266 Saratoga Street Offices, 12th floor
izuckerm@rx.umaryland.edu
Christine Franey, (410) 706-6327 Saratoga Street Offices
cfraney@rx.umaryland.edu
Corinne Woods, (410) 706-5396 Saratoga Street Offices,
cwoods@rx.umaryland.edu

Visit our website at:
http://www.pharmacy.umaryland.edu/PRC/

SOM Information Services

Information Services (IS) provides exceptional customer support to faculty, staff, and students in the Dean's Office, in many of the academic departments, programs, centers, and institutes of the School of Medicine. A selection of our services is listed below.

- Manage the SOM network, both wired and wireless, maintaining security, and accessibility.
- Order and maintain desktops/servers/printers.
- Provide PC and Mac desktop support (operating system patches, antivirus protection, and technical support).
- Provide file storage space and file back-up/restore services.
- Host your file server or provide a file server to support research initiatives.
- Provide assistance with ordering and activating work issued Smartphones and other mobile devices.
- Maintain separate network area for protected health information or federally regulated research data.
- Maintain a web content management system and issue accounts so departments can create and maintain web sites or we will provide web site support.
- Maintain a toner maintenance and printer/fax maintenance contract.
- Develop custom applications in support of research and administrative missions.
- Develop, maintain, and support the CICERO research administration applications.

Contact:
Office of the Chief Information Officer
100 N. Greene Street
(410)706-2881

Help Desk
(410)706-3998
help@som.umaryand.edu
Help Desk hours of operation:
7:30 a.m. until 5:30 p.m., Monday – Friday.

Resources for Research and Compliance

BIORESCO (Biomedical Research Supply Core) (SOM)

Scientific Objective:
To conserve time, money, space and effort for the University of Maryland, Baltimore and UMB BioPark researchers, by maintaining a central supply core facility and expediting service which thrives upon its ability to innovate and re-create itself in accordance with the requirements of the University and its staff. The Program enables scientists to "do science" instead of procurement and accounting. We endeavor to become a "one-stop shop" for researchers and their staff. Additionally, the Program assists funding opportunities between University entities and our commercial vendors.

BIORESCO is your **"one-stop shop"** for research laboratory needs. In addition to securing products at discount with no shipping charges, we offer:
UMB Core Facility Services (schedule/billing)
Calibration for pipettors and balances
Peptide and Oligonucleotide Synthesis
Emergency Freezer Storage (-20,-80)
Free Packing and shipping materials for all temperatures
Dry ice for sale

For a complete listing of Participating Vendors and UMB Core Facilities, please visit our website at freezerprogram.org.

Contact us @ (410) 706-0322
freezerprogram.org
http://cf.umaryland.edu/freezer
Carol McKissick, MBA – Admin. Director Sanjay Uchil, MS – Logistics & Commerce

Environmental Health and Safety (UMB)

The office of Environmental Health and Safety (EHS) supports the university with the following programs and services:

- Biosafety and Institutional Biosafety Committee Administration
- Chemical Safety
- Environmental Management
- Fire Safety
- Hazardous Materials Incident Response
- Insurance Programs
- Occupational Safety
- Radiation Safety and Radiation Safety Committee Administration
- Waste Disposal; chemical, biological, and radioactive
- Workers Compensation Administration

Hours of Operation: 8:00am – 4:30pm.

Contact:
James J. Jaeger, Ph.D., Director
714 West Lombard Street, Baltimore, MD 21201
Voice: (410) 706-7055 Fax: (410) 706-8212
After Hours Emergencies should be referred to University Police at 711
http://www.ehs.umaryland.edu

Human Research Protections Program (HRPP) (UMB)

MISSION

The mission of the UMB's Human Research Protection Program is to cultivate a culture of conscience in the research community to ensure the highest levels of protections and advocacy for research participants by:

- actively engaging and working cooperatively with the Institutional Official, Institutional leaders, and all components of the HRPP
- facilitating ethical and scientifically sound research institutional oversight and IRB review processes
- contributing to the knowledge of investigators and research personnel through education and training programs
- communicating with sponsors
- serving as a consistent resource for all current, past, and prospective participants.

Download the Human Research Protections Program Plan.

ABOUT HRPO

The Human Research Protections Office (HRPO) is located within the School of Medicine and reports functionally and administratively to the Chief Academic and Research Officer and Senior Vice President. The HRPO is the coordinating office for the Human Research Protections Program, and provides support for the UMB Institutional Review Board (IRB) which conducts ethical and scientific review, compliance, and oversight activities for over 1,000 clinical research protocols. The office also provides education and training for over 2000 investigators and staff engaged in research involving human subjects.

Staffing structure for the Human Research Protections Office includes six IRB Analysts, six Research Compliance Monitors, Four Clinical Protocol Analysts, one Education & Support Specialist, one Information Systems Engineer, and two Program Managers who report to the Executive Director. The Executive Director is the designated Human Research Protections Administrator and exercises operational responsibility, on a day-to-day basis, for the institution's program for protecting human research subjects. Two full-time Office Clerks provide administrative support for this office.

Access CICERO

A series of videos have been produced to assist in the CICERO submission process.

- There is a 10 minute introductory video clip illustrating how to obtain a CICERO account, and some of the new features and functions of the site: WMV or M4V
- An example of how to create a sponsored study, including information about completing the application, is included in this **training video**.

If you are requesting Principal Investigator (PI) or Researcher roles for Human Research, you are REQUIRED to watch the 10-minute video that outlines some of the basics of the CICERO system, and highlights many of the new features you will experience.

BRAAN

As of November 30, 2009, BRAAN PROTOCOLS are available in READ ONLY mode.
You can no longer submit any transactions in BRAAN. All protocol activity must now be submitted through CICERO.
If you need functional assistance with BRAAN or CICERO, please contact the HRPO at 410-706-5037. New study team members who need to review archived BRAAN protocols, **can request access to BRAAN**.
Login problems? Contact the School of Medicine Help Desk, 410-706-3998 between the hours of 7:30 a.m. to 5:30 p.m. or email **Help@som.umaryland.edu**.

INVESTIGATOR TOOLKIT

The investigator toolkit is a resource for investigators to use when designing, writing, and organizing their research protocols. The investigator toolkit provides investigators with essential documents and/or tools necessary for conducting research on human subjects. Below are the toolkits available, categorized according to the funding or sponsorship.

- Investigator Manual How-To (Video)
- Investigator Manual
- Worksheets and Checklists
- Reportable New Information Bulletin (Revised 6-28-2011)
- Industry Sponsored Research
- Federal or Other Funded Research
- Investigator Initiated Research
- Consent & Assent Form Templates
- Additional Research Documents

Notice Regarding Data Use Agreements (DUAs):
Data Use Agreement (DUA) negotiation/execution is the responsibility of the Office of Research and Administration (ORD). If you wish to have a DUA put in place with a government agency or a non-profit organization, please contact the Sponsored Programs Administration (SPA) team (Team A-E) responsible for your Department's grants & contracts. If you wish to have a DUA put in place with a company, please contact Amshu Siddalingaswamy in the Center for Clinical Trials & Corporate Contracts at 410-706-1932 or **asidd001@umaryland.edu**.

Office for Research (School of Medicine)

Mission:
The Office for Research contributes to the research mission of the School of Medicine by facilitating and enhancing the ability of the faculty to conduct research. The staff is always willing to assist the School of Medicine community in its research endeavors. Some of the services provided The Office for Research are listed below.

Primary Research Functions:
Grant Routing (Coeus) for the Office of the Dean
PI Eligibility Requirements/Waivers
F&A (Indirect Costs) Waivers
Intercampus Seed Grant Competitions

Other Services:
Assistance in locating equipment throughout the School of Medicine.
Assistance in compiling information for Program Project Grants, Center Grants, Training Grants, etc.
Assistance in searching for possible collaborations between investigators, departments, centers, etc.

Contact:
Thomas Hooven, Exec. Director for Research Admin., Bressler 14-016, (410) 706-5485
thooven@som.umaryland.edu
Susan Hobbs, Director, Research Administration & Compliance
shobbs@som.umaryland.edu
MaDonna Perry, Program Administrator, Office of Research & Stem Cell Center
mperry@som.umaryland.edu
Cathleen Boyle, Reporting & Compliance Analyst
csmith@som.umaryland.edu

Office of Animal Welfare Assurance (OAWA)

The Office of Animal Welfare Assurance is located within the School of Medicine and reports functionally and administratively to the Dean, School of Medicine. The OAWA is the regulatory oversight office for the SOM Animal Care and Use Program, and provides support for the UM SOM Institutional Animal Care and Use Committee (IACUC) which conducts ethical and scientific review, compliance, and oversight activities for ~ 600 animal use protocols. The office, in collaboration with Veterinary Resources, also provides education and training for ~1000 investigators, staff and students involved in research utilizing laboratory animals.

The OAWA's responsibilities include:

- IACUC Administration
- Animal Welfare Inspections and Compliance
- Regulatory reporting
- Training
- Outreach and Communications

The OAWA is committed to ensuring the health and welfare of the animals used in research and teaching at this institution and is committed to the advancement of science. In doing so, the OAWA staff work closely with faculty to assist and facilitate their requests such that they can conduct scientifically justified research that is in full compliance with the Animal Welfare Act, Public Health Service (PHS) Policy on Humane Care and Use of Laboratory Animals, the Guide for the Care and Use of Laboratory Animals and all other applicable regulations, policies and procedures.

All IACUC matters should be directed to this office. *The UM SOM IACUC is the IACUC of record for…School of Medicine, School of Dentistry, School of Nursing, School of Pharmacy, IMET Aquaculture Research Center and the Baltimore VAMC.*

Contact Us:

655 W. Baltimore Street
BRB, Mezzanine Ste. M023
Baltimore, MD 21201
410-706-7859 / 4365
410-706-6577 (FAX)

IACUC@som.umaryland.edu
http://medschool.umaryland.edu/IACUC/

Office of Research and Development (UMB)

The **Research Career Development Program *(RCD)*** offers workshops, classes and seminars in subjects that are critical to an academic research career, including Grant Writing, Publishing Your Research, and Identifying Sources of Funding for Your Research. We also offer a seminar series in scientific leadership.

Research Skills Courses

- **Intensive Grant Writing Class***(9 session course)*
- **PREV617 Grant Writing Course** *(7 session course)*
- **Grant Writing Class: Writing a Career Development ("K") Award***(9 session course)*
- **Scientific Writing Course***(6 session course)*

Research Skills Workshops

- **How to Choose a Research Problem**
- **Grant Writing Workshop for New Investigators***(1 day)*
- **Tips for Writing an R03/R21 NIH Grant Application***(1Ž2 day)*
- **How to Write a Career Development (K) Award** (*1Ž2 day)*
- **How to Write an NRSA Fellowship Application** *(1Ž2 day)*
- **How to Write and Publish a Biomedical Research Paper***(1Ž2 day)*
- **Identifying Funding Sources for Postdocs***(Monthly)*
- **Identifying Funding Sources for Faculty***(Monthly)*

Professional and Career Development Workshops/Seminars

- **Scientific Leadership and Project Management**
- **Research Leadership for Career Development (K) Scholars**

CONTACTS:

Wendy Sanders, MA
Assistant Dean for Research Career Development
Email: wsanders@som.umaryland.edu

Stacie Mendoza, BS
Specialist, Research Information
Email: ssmall@som.umaryland.edu

OFFICE:
685 W. Baltimore Street, MSTF 319
Baltimore, MD 21201
Phone: 410-706-5434

WEBSITE:http://medschool.umaryland.edu/career/

PromptPrint Copy Center

University of Maryland
School of Medicine
660 West Redwood Street
Howard Hall Basement
410-706-7182
PromptPrint@som.umaryland.edu

PromptPrint Copy Center offers an array of printing and copying services at competitive prices. We have the document production know-how you need to produce high quality, professional documents. PromptPrint provides affordable solutions for you. No project is too big or too small. You can submit your job electronically or come in to our conveniently located copy center on the University of Maryland campus. Contact us for more information about our services.

Some of our services include:

- Scientific Posters
- Color Printing
- Binding
- 2- & 3-Part NCR Forms
- Scanning CD Copying
- Mounting

Contact:
Carmen W. White, MPA PromptPrint Copy Center
Howard Hall Basement X6-7182
PromptPrint@umaryland.edu

Office Research Career Development

The **Research Career Development Program *(RCD)*** offers workshops, classes and seminars in subjects that are critical to an academic research career, including Grant Writing, Publishing Your Research and Presenting Your Research. We also offer a seminar series in scientific leadership.

COURSES, WORKSHOPS AND SEMINARS:

Research Skills Courses

- **Intensive Grant Writing Class** *(9 session course)*
- **PREV617 Grant Writing Course** *(7 session course)*
- **Grant Writing Class: Writing a Career Development ("K") Award** *(9 session course)*
- **Scientific Writing Course** *(6 session course)*

Research Skills Workshops

- **How to Choose a Research Problem**
- **Grant Writing Workshop for New Investigators** *(1 day)*
- **Tips for Writing an R03/R21 NIH Grant Application** *(½ day)*
- **How to Write a Career Development (K) Award** (*½ day)*
- **How to Write an NRSA Fellowship Application** *(½ day)*
- **How to Write and Publish a Biomedical Research Paper** *(½ day)*
- **Identifying Funding Sources for Postdocs** *(Monthly)*
- **Identifying Funding Sources for Faculty** *(Monthly)*

Professional and Career Development Workshops/Seminars

- **Scientific Leadership and Project Management**
- **Research Leadership for Career Development (K) Scholars**

CONTACTS:
Wendy Sanders, MA, Assistant Dean for Research Career Development
Email: wsanders@som.umaryland.edu

Stacie Mendoza, BS, Specialist, Research Information ssmall@som.umaryland.edu

OFFICE:
685 W. Baltimore Street, MSTF 319
Baltimore, MD 21201
Phone: 410-706-5434

WEBSITE: http://medschool.umaryland.edu/career/

Veterinary Resources

All veterinary support at The University of Maryland, Baltimore campus is provided by Veterinary Resources or through the Program for Comparative Medicine. Veterinary Resources maintains oversight for the acquisition, care and use of all research animals on campus. All animal facilities and the care and use programs on campus are accredited by the Association for Assessment and Accreditation of Laboratory Animal Care, International (AAALAC) and meet federal laws and guidelines for the humane and appropriate care and use of laboratory animals. Animals are housed at nine locations. Each of these facilities is maintained by a staff of experienced laboratory animal technicians.
The primary mission of Veterinary Resources is to provide humane and scientifically appropriate care of research animals at The University of Maryland, Baltimore. The facilities and program of animal care and use are maintained in compliance with the Animal Welfare Act of 1966 and all subsequent revisions (regulated by the USDA), and Public Health Service (PHS) guidelines. Veterinary Resources provides support as economically as possible by having a centralized animal care staff and by wholesale purchase of feed, bedding, caging and husbandry supplies. PHS Resource Improvement Grants and other funding obtained by Comparative Medicine have helped support the resource. Veterinary Resources is the service division of Comparative Medicine.

Research Consultation:
Comparative Medicine will provide technical support such as blood withdrawal, administration of anesthetics, animal transportation, etc. to aid investigators in their research activities. Support may also be provided for surgery, pathology and radiology. Certain support is provided as a direct collaboration. Inquiries and prior arrangements can be arranged by contacting our office. Through pre-research consultations, budgeting for this support can be included in research grant applications.

Pre-Research Consultation: The program, through its faculty, has as one of its missions the provision of support for and advice regarding:

- Gross and Microscopic histopathology
- GLP Support (Good Laboratory Practice) – FDA regulations for IND Application/s
- Special caging or experimental techniques.
- Selection of appropriate animal species to carry out specific animal techniques.
- Animal models of human diseases.
- Anatomical and physiological peculiarities of animals used in research.
- Techniques of anesthesia, analgesia, chemical restraint, and dosages.
- Techniques of blood and other sampling and drug or chemical administration.
- Pathological and clinical effects of intercurrent animal disease.
- Estimates of animal purchase prices and future per diem rates.

We encourage such consultations prior to the preparation of grant and contract applications.

Contact:
Louis DeTolla, V.M.D., M.S, Ph.D., DACLAM (410) 706-8537 MSTF, Room G100
detolla@vetmed.umaryland.edu
http://vetmedicine.umaryland.edu

Resources for Faculty Development and Education

Building Interdisciplinary Research Careers in Women's Health Program (BIRCWH) (SOM)

The Women's Health Research Group manages UM's BIRCWH (Building Interdisciplinary Research Careers in Women's Health) grant from NIH, an early career development award designed to train junior faculty scholars in interdisciplinary research in women's health. Currently in its eleventh year, the UM BIRCWH program, called Maryland's Organized Research Effort in Women's Health (MORE-WH), provides salary and research support for Scholars as well as the opportunity to work closely with interdisciplinary mentor teams comprising senior faculty with established track records as women's health researchers. The University of Maryland Baltimore is an ideal training environment because of the strong basic, clinical and epidemiological research in women's health currently being conducted in four of the seven professional Schools (Dentistry, Medicine, Nursing, and Pharmacy) on the UMB Campus.

Contact:
Patricia Langenberg, Ph.D., Co-Principal Investigator, plangenb@umaryland.edu
Istvan Merchenthaler, MD, Ph.D., D.Sc., Co-Principal Investigator, imerchen@epi.umaryland.edu
Kate Tracy, Ph.D., Research Director, ktracy@epi.umaryland.edu

Paul Calabresi Clinical Oncology Training Program

Paul Calabresi Clinical Oncology Training Program, funded by the National Cancer Institute (NCI), supports tomorrow's leaders in clinical oncology research through the appointment of Paul Calabresi Scholars (Scholars) following a competitive application process. The award is named for the late Paul Calabresi, M.D., a founder of modern clinical oncology research, who was devoted to mentoring of fellows and junior faculty. The Paul Calabresi Clinical Oncology Training Program (Training Program) provides a wonderful opportunity for Calabresi Scholars to jump start their careers as oncology clinical researchers with protected time for research and training.

Research Areas
The Program will focus primarily on recruitment of Scholars with research interests in three thematic areas:

- Multimodality Treatment Strategies for Cancer;
- Drug Discovery and Development; and
- Underserved Populations & Cancer Treatment Disparities.

Contact:
Shannon Decker, J.D., M.P.H., Program Director, N9E34
sdecker@umm.edu 410-328-9161
http://www.umgcc.org/research/scholars_program/index.htm

Faculty Affairs and Professional Development (SOM)

The Office of Faculty Affairs and Professional Development was created to help faculty find the resources and answers they need to build successful careers at the School of Medicine. We will help campus faculty, community-based faculty and teaching residents develop skills as teachers, evaluators and mentors in our teaching programs.
We'll help faculty develop skills to navigate an academic career successfully, from new faculty orientation through promotion and tenure reviews to retirement.

Graduate Medical Education (GME):

- Serves as a liaison between the School of Medicine faculty and the sponsoring institution for GME programs; the University of Maryland Medical Center in providing oversight for ACGME; and other accredited GME programs
- Develops and implements curricula for faculty in competency-based teaching skills, evaluation, feedback skills and other areas.
- Develops and implements teaching skills programs for residents and fellows.
- Oversees external affiliation agreements for GME training.

Continuing Medical Education (CME):

- The office maintains the School of Medicine's accreditation as an approved provider of CME by the ACCME.
- The office helps School faculty plan and implement courses, from on-site Grand Rounds to live multi-day courses in offsite locations, employing traditional and innovative educational technologies and methods.
- The office provides expertise in the management of commercial support for CME activities, and for managing identified conflicts of interest.

Faculty Development:

- The office oversees a comprehensive faculty development program
- The office offers professional development opportunities for physicians planning careers in academic medicine, including programs for Women in Medicine and Minority Faculty in Medicine.
- Dr. Lowitt teaches workshops and provides individual consultation in Teaching Portfolio Development

Faculty Affairs

- Dr. Lowitt is available for individual consultation for faculty with questions or concerns regarding career development and planning
- The office provides resources for faculty who are planning external consulting with industry and monitors professionalism policy compliance
- The office serves as a liaison for SOM faculty and the UMB Campus for a variety of service projects and other activities.

Contact:

Nancy Ryan Lowittt, MD, EdM, Associate Dean for Faculty Affairs and Professional Development
nlowitt@som.umaryland.edu (410) 706-3681

Robertha Simpson, Director (410) 706-8633
rsimpson@som.umaryland.edu http://medschool.umaryland.edu/opd

Rich Tischler Ph.D., Executive Director of CME rtischler@som.umaryland.edu (410) 706-8634

Graduate Program in Life Sciences (UMB)

The Graduate Program in Life Sciences (GPILS) offers cutting edge research training in basic, biomedical, clinical and population sciences. We offer eight Ph.D. granting graduate programs and four M.S. level programs:

Ph.D. Programs

Biochemistry & Molecular Biology
Epidemiology & Human Genetics
Gerontology
Molecular Medicine
Molecular Microbiology & Immunology
Neuroscience
Physical Rehabilitation Science
Toxicology

M.S. Programs

Biochemistry & Molecular Biology
Epidemiology & Human Genetics
Molecular Medicine
Toxicology

See Also:

Dual Degree Programs
Ph.D. for Clinicians
Minor in Pharmacology

Our graduate programs cover the entire range of biomedical research, from the basics of protein structure and molecular biology, through integrative systems physiology, virology and vaccine development up to behavior, cognition, population based genetics, and the impact of the environment on human health. Our programs place a special emphasis on the importance of translational research.

Graduate programs are independent from departments and consist of faculty in the basic science and clinical departments of the School of Medicine, School of Dentistry, School of Nursing, a wide array of Internationally recognized Organized Research Centers and Institutes on campus including the Center for Vaccine Development, the Center for Vascular and Inflammatory Diseases, the Institute for Genome Science, the Maryland Psychiatric Research Center and the Institute of Human Virology in addition to collaborations with other University of Maryland campuses. This structure provides greater coordination between and within the graduate programs in order to better serve the training and education needs of our graduate students. Graduates of our programs develop successful careers in academic research, governmental and industrial research, academic policy & administration, patent law, scientific writing and editing, consulting and more.

The University of Maryland Baltimore is a leading research institution located a few blocks from Baltimore's Inner-Harbor, which is an ideal location within the nexus of biomedical research on the East Coast providing students with access to an unparalleled level of breadth and depth of research expertise. The Graduate Program in Life Sciences is collaboration between the University of Maryland's School of Medicine, Dental School and Graduate School.

Program Contacts:

Administration:

Dudley Strickland, Ph.D., Assistant Dean for Graduate and Postdoctoral Studies
Director, Center for Vascular and Inflammatory Diseases, Prof. Dept. of Surgery,
UM BioPark-1, room 214
(410) 706-8010, dstrickland@som.umaryland.edu
Tom McHugh, Academic Programs Administrator, 655 W. Baltimore St.,
Bressler Bldg. room1-005
(410) 706-6041 tmchugh@som.umaryland.edu
Rachael Holmes, Academic Coordinator, Bressler Building, room 1-005
(410) 706-6042 rholmes@som.umaryland.edu

Graduate Program Staff

Biochemistry and Molecular Biology
Foyeke Daramola, Program Coordinator, 108 N. Greene Street
(410) 706-8417 fdaramola@som.umaryland.edu

Epidemiology and Human Genetics
Danielle Fitzpatrick, Program Coordinator, 660 Redwood St., Howard Hall, room 135A
(410) 706-8492 dfitzpatrick@epi.umaryland.edu

Gerontology
Justine Golden, M.A., Program Manager, 660 West Redwood Street,
Howard Hall, room 200
(410) 706-4926 jgolden@pei.umaryland.edu
Molecular Microbiology and Immunology
June Green, Program Coordinator, 660 West Redwood Street,
Howard Hall, room 324-C
(410) 706-7126 jgreen@umaryland.edu

Molecular Medicine
Sharron Graves, Program Manager
800 W. Baltimore Street, Room 216, Baltimore MD 21201
(410) 706-6044 sgraves@som.umaryland.edu

Neuroscience
Jennifer Aumiller, M.Ed., Program Manager, 685 West Baltimore Street,
HSF Building, room 212
(410) 706-4701 neurosci@umaryland.edu

Physical Rehabilitation Science
Terry Heron, Program Coordinator , 100 Penn Street, Allied Health Building, Rm 115-c
(410) 706-5215 theron@som.umaryland.edu

Toxicology
Linda Horne, Program Coordinator, 660 W Redwood St., Howard Hall, room 134
(410) 706-5422 lhorne@som.umaryland.edu

M.S. in Molecular Medicine
Jennifer Goetz, M.A., Academic Coordinator, 655 W Baltimore St.,
Bressler Bldg, room 1-005 (410) 706-6042
JeGoetz@som.umaryland.edu

Medical Scientist Training Program (SOM)

Scientific Objective:
The goal of the Medical Scientist Training Program (MSTP) is to provide an outstanding curriculum and environment to foster the development of the next generation of physician scientists. MSTP students receive the rigorous research training provided by the Graduate Program in Life Sciences culminating in defense of their Ph.D. thesis, complemented by clinical training that leads to the M.D. degree. Graduates of our program are equipped to address the critical medical needs of society by making new discoveries and applying them to patients. These physician scientists are prepared for future leadership positions in academia, federal agencies and industry.

Training Plan:
The MSTP curriculum is designed to integrate clinical medicine with basic or translational research. The approach supplements and customizes the well-formulated curricula of the Medical School and the Graduate Programs. The guiding philosophy is that MSTP education is not merely the sum of medical and graduate school programs, but rather provides enhancements that illuminate the connections between clinical medicine and research. Additional activities provide career guidance and mentoring experiences that allow the students to progress toward their career goals as clinician-scientists with efficiency and confidence.

Contact:
Michael Donnenberg, MD, Director mdonnenb@umaryland.edu
Achsah Keegan, PhD, Associate Director akeegan@som.umaryland.edu
Jane Bacon, MS, Program Manager jbacon@som.umaryland.edu

Medical Scientist Training Program
HSF II, Room S-012
(410) 706-3990

N – STORM Facility - Super Resolution Microscope

Objectives:
To provide faculty and students super resolution microscopy (Nikon, N-STORM). Stochastic Optical Reconstruction Microscopy reconstructs a super resolution fluorescent image by combining precisely localized information of each fluorophore detected within a complex microscope specimen.

Applications:
- Achieving a resolution 10 times greater than a conventional optical microscope:
- N-STORM can uniquely generate an incredible image resolution of approx. 20 nm in x-y plane and 50 nm in z-axis plane.
- New possibility to gain insight into protein-protein interactions at a sub-cellular and molecular level cleverly combining various "activator" and "reporter" probes. This is particularly important with respect to pathogen-host cell interactions.
-

Instrumentation:
- Ti-E inverted microscope
- TOKAI system for live cell imaging (digitally controlled temperature and CO_2)
- White field and multi wavelength/multi-position TIRF with perfect focus for long term observation with perfect focus stability
- 3D deconvolution tools (high- speed Z-stacks)
- Ever higher 4 laser powers system: 405 (20mW), 488 (80 mW), 561 (80mW) and 647 (125mW) nm
- 2D and 3D reconstruction and object counting/tracking tools
- Flash 4.0 camera with 6.5x6.5 micron pixel size
- 10, 40, 60 and 100 x oil objectives (with temperature correction between 22 and 37oC)

Personnel:
Dr. Olga Latinovic is PI and director of the facility.
Ms. Kate Hammond is the research assistant.

Contact Information and to schedule training:
Dr. Olga Latinovic (410) 706-2769, IHV, Room S614
olatinovic@ihv.umaryland.edu

Pricing:
Training sessions for scope operation and super resolution techniques, $250/session
Superresolution microscope usage rate is $40 /hr for UM users and $60/ hr for others (all digital images, no additional negative and developing charges).

Faculty Advisory Committee:
Olga Latinovic, PhD, Assistant Professor, Microbiology and Immunology
Anthony L. DeVico, PhD, Professor, Medicine