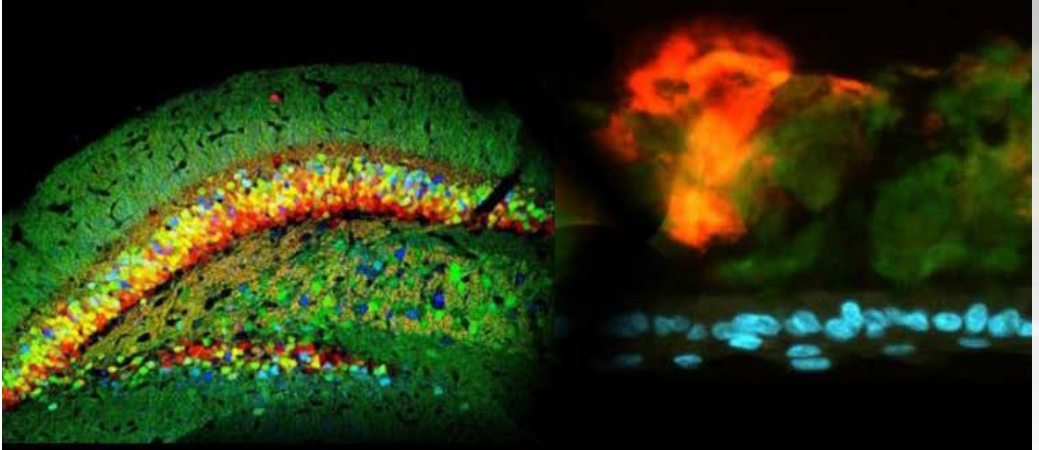

CORE FACILITIES at UNC *Summer | 2015*

Research Cores Newsletter

FROM THE OFFICE OF RESEARCH TECHNOLOGIES

The Office of Research Technologies provides operational support to UNC biomedical research core facilities, as well as oversight and reporting to the School of Medicine (SOM) Office of Research to assist with strategic planning goals and allocation of resources.

The Office maintains the core facilities website which includes a searchable database of cores and available instrumentation and services. ORT works closely with the SOM Office of Research (OoR) and administers the Core Facilities Advocacy Committee (CFAC), which makes funding and space recommendations to the SOM Vice Dean for Research.

CFAC recommendations resulted in over one million dollars of funding flowing into the cores, including new instrumentation, upgrades to existing equipment, emergency funding, assistance with service contracts, personnel expenses and method development grants. This past year, we assisted 10 cores with revising their recharge rates to be compliant with federal guidelines, assisted with 2 core consolidations, and added one new recharge account.

We hope you take advantage of the wealth of expertise, cutting-edge technologies, and high end instrumentation available in the core facilities at UNC.

UNC THE NORTH CAROLINA TRANSLATIONAL & CLINICAL SCIENCES INSTITUTE

UNC SCHOOL OF MEDICINE

CTSA Clinical & Translational Science Awards

Office of Research Technologies

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For more information on UNC cores, visit: www.med.unc.edu/corefacilities

Animal Clinical Chemistry / Gene Expression
Animal Histopathology
Animal Models Core
Animal Studies Core Facility
Atomic Absorption Spectroscopy
Biobehavioral Laboratory
Biomarker Mass Spectrometry
BRIC Human Imaging
BRIC Image Storage and Analysis
BRIC Small Animal Imaging
Biomolecular NMR Lab
Biospecimen Processing Facility
Center for Bioinformatics
CGIBD Gnotobiotics
CGIBD Advanced Analytics
CH Analytical & Nanofabrication
Cytokine Analysis Facility
Developmental Neuroimaging
Flow Cytometry Core Facility
Functional Genomics Core
High Throughput Sequencing
High Throughput Peptide
Histology Research Core Facility
Hooker Imaging Core
Human Pluripotent Stem Cell Fac.
Lenti-shRNA Core Facility
LCCC Genomics Core
Macromolecular Crystallography
Macromolecular Interactions Fac.
MH Proteomics Center
Microscopy Services Laboratory
Molecular Neuroscience Core
Mouse Behavioral Phenotyping
Mutant Mouse Resource Reg. Ctr
Nanomedicines Characterization
Oligonucleotide Synthesis
Pharmacometrics Core
Pharmacy NMR Facility
RL Juliano Structural BioInformatics
Rodent Advanced Surgical Models
Tissue Culture Facility
Tissue Procurement Facility
UNC CFAR Clinical Pharmacology
UNC Metabolomics Laboratory
UNC Microbiome Core Facility
UNC-CH Genome Analysis Fac.
Vector Core
Vironomics Core
Zebrafish Aquaculture Core

Core Customer User Surveys

Core Customer User Surveys are important tools for evaluating core services. If you receive core satisfaction surveys, please take the time to complete these brief questionnaires.

Your feedback will assist the core facility as well as the Office of Research Technologies & CFAC in improving and strengthening core services available for your research program. *Thank you!*

New Instrumentation

The Hooker Imaging Core is replacing the up-right configuration LSM 510 confocal with a new LSM 800 upright confocal and a high precision scanning stage.

The existing LSM 880 confocal microscope will be upgraded with a super-resolution AiryScan module.

MH Proteomics Center will install a new Thermo Electron Q Exactive HF standard mass spectrometer system.

NEW CORE SERVICES IN DEVELOPMENT

Funded by small grants from the Core Facilities Advocacy Committee (CFAC), six cores are developing new methodologies which will be offered as core services:

The **Biobehavioral Lab** in the School of Nursing plans to offer DNA extraction services from fresh or frozen saliva containing no preservatives. Although other cores isolate DNA, it is usually from samples collected in a device (Oragene tube) that preserves the DNA. Protein/hormone analysis cannot be performed on a saliva sample if collected by this method. Therefore, this service should be a novel service on campus.

BRIC Radiochemistry Lab will be producing 18F-FLT tracers for preclinical research. The core has been focused on providing PET agent for cancer research. Currently the only tracer that is being produced is 18F-FDG, which is an imaging agent for glucose metabolism. There is a need for non-FDG PET probes to obtain detailed additional molecular information. As a widely used cell proliferation PET probe, 18F-FLT could provide critical information in treatment monitoring, treatment planning, distinguishing cancer from inflammation, and patient stratification.

CFAR Virology, Immunology and Microbiology Core (CFAR VIM) is developing a flow cytometric assay for a more sensitive HIV-1 detection method for a variety of sample types. PrimeFlow RNA Assay is a new technology that allows detection of conserved viral sequences in a specific cell type in a relatively small sample volume.

The new technology combines the phenotypic characterization of HIV-1 infected cell types using fluorescently-labeled antibodies against specific cell surface markers with gene-specific in-situ hybridization of multiple probes to a conserved viral sequence and their branched DNA (bDNA) signal amplification method.

This is a technology that could be easily adapted to other pathogens, and thus be made available to the broader research community at UNC-Chapel Hill.

Human Pluripotent Stem Cell Core will streamline neuronal single cell transcriptional profiling by developing methods to fully dissociate human neuronal cell cultures. Current services in the Core use human pluripotent stem cells such as hiPS and hES cells. The advantage of using hiPS cells to model neuropsychiatric disorders is that their differentiation generates limitless quantities of live human neurons that carry genetic backgrounds known to result in these disorders. However, neuronal cell

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Dr. Raluca Dumitru, Director of the Human Pluripotenet Stem Cell Core, with visiting campers in the lab

FIVE UNC CORES WIN EQUIPMENT GRANTS IN FY15

Fiscal year 2015 was a successful grant writing year for our cores: six instrumentation grants were awarded to 5 core facilities totaling $728,400. Five of the grants are from the North Carolina Biotechnology Center in RTP, the sixth is from the NIH Shared Instrumentation Grant (SIG) program.

Biomolecular NMR Facility: The new Bruker Biospin Auto sampler changer allows the automated changing of up to 96 samples for high-throughput NMR experiments. This instrument will be crucial for identifying lead compounds in developing therapies for a variety of cancers.

Flow Cytometry's Intellicyte iQue Screener is a flow cytometer attached to a high throughput sampling arm to allow for rapid sampling and data analysis. When processing hundreds or thousands of samples it provides new information not available before, such as screening new libraries of small molecules for actions on cells or determining the mechanism of action of candidate drugs. Experiments that were previously prohibitively time-consuming will now be in reach.

Macromolecular Interactions Facility's (MacInFac) Fortbio Octet Red96 is a high throughput, multifunctional real-time analysis instrument which measures concentrations of proteins and other biomolecules in solutions, and rapidly monitor kinetics and affinity of bimolecular interactions. It will be extremely useful to a broad range of investigators for antibody and protein quantitation, to monitor protein-protein and other bio-molecular interactions and for small molecule screening in drug discovery research.

MHI Rodent Advanced Surgical Models Core grant is for a complete telemetry system that will be used to measure and quantify BP, ECG, temp, and activity in mice. The system includes data acquisition and analysis software with the ability to monitor 16 implantable transmitters simultaneously. The system also includes 20 implantable transmitters and necessary hardware for signal reception/integration.

Translational Pathology Lab will acquire an advanced, high-throughput fluorescence Leica_ARIOL scanner which will dramatically reduce the turn-around time for fluorescence IHC, and will enable the core to introduce the locus specific and miRNA FISH stains/scans as a new service.

Flow Cytometry also received a SIG to purchase an Amnis ImageStreamX flow cytometer that can image cells while doing high throughput fluorescence analysis. It is especially powerful for tracking nuclear translocation, characterizing cellular morphology and measuring rare events, such as circulating tumor cells or stem cells. Imaging mixed populations of cells to investigate cell signaling, cell-cell interactions, DNA damage, cell cycle, autophagy and co-localization are just a few of the potential applications.

These instruments will be open access and available to all researchers, look for them in the cores soon!

CITE our Cores

If you use UNC core facilities and data generated in our cores is used in a publication, please acknowledge the core's contributions towards the research.

For more information on guidelines for citing a core facility in a publication, please read the ABRF guidelines on citations. Core instrumentation acquired through S10 grants must also be referenced in all resulting publications .

The core can provide you with the appropriate citation.

Thank You

NCBC grants require a portion of matching funds from the institution.

We thank all those Departments, Centers and Investigators who contributed funds as well as letters of support for the grant submissions.

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populations are very heterogeneous, and in order to identify the precise cell type that is affected in these disorders and elucidate the cellular and molecular events that contribute to disease initiation and progression, single cell transcriptional analysis rather than population analysis is a must. Having this method available will provide investigators an invaluable service that will help improve the accuracy of other methods such as mRNA-seq.

The **Lenti shRNA and cDNA Facility** plans to establish a novel lentiviral vector system as a means to regulate U6-shRNA expression cassettes comprised in currently existing UNC shRNA libraries. The current lenti-shRNA system used by the Lenti-shRNA and cDNA Core limits the ability to expand cytotoxic shRNA-expressing cell populations in culture, to engraft these cells into animals, to study gene function in vivo, and to study differentiation pathways of stem and progenitor cells.

The project will develop the capability to facilitate rapid conversion of conventional U6-shRNA clones (in UNC lenti-shRNA libraries) to inducible lentiviral vectors. The novel vector system will broaden the spectrum of research applications in which the core is involved.

Nanomedicines Characterization Core (SOP) is working on development and validation of Single Particle Inductively Plasma Mass Spectrometer (SP-ICP-MS) applications for nanoparticles and nanomaterials.

SP-ICP-MS can be an effective method to characterize important parameters of nanoparticles in solution, including concentration, size, size distribution, and composition of nanoparticles.

SP-ICP-MS can be used as a platform for measuring ratio of free drug and drug-loaded nanoparticles, drug release, particles aggregation, particles stability, cell uptake of nanoparticles, and bio-distribution of nanoparticles in small animals.

The SP-ICP-MS combines benefits of ICP-MS, known for low detection limits and accuracy, with the ability to characterize individual nanoparticles in matrix without traditional sample digestion. The SP-ICPMS technology is of tremendous potential in the fields of drug delivery and nanomedicine.

UPDATE: MICROSCOPY SERVICES LABORATORY

The **Microscopy Services Laboratory** (MSL) was established in 1983 under Dr. Bagnell as an outgrowth of the Pathology Research Microscopy Lab. The MSL provides access to both Electron Microscopy and Light Microscopy instrumentation as well as instruction and specimen preparation. MSL also serves the UNC Hospitals with clinical electron microscopy.

The facility is currently installing a second Transmission Electron Microscope to alleviate the backlog on the core's single TEM. Dr. Bagnell will be retiring at the end of the year and we thank him for his exemplary leadership of this valued resource.

The incoming director is Dr. Pablo Ariel. He received his Ph.D. from Weill Cornell Medical College and The Rockefeller University and pursued post-doctoral training at Columbia University. He was recruited to the Rockefeller Bio-imaging Resource Center in July 2013 wherein he has served as an Optical Microscopy Specialist for the past two years.

Dr. Pablo Ariel

Throughout his career he has had a strong interest in sophisticated cellular and tissue imaging using a wide variety of platforms including TIRF-, 2-photon-, and light sheet microscopy.

Dr. Ariel was instrumental in developing the novel iDISCO tissue clearing technique, that when combined with light sheet imaging, allows remarkable visualization and precise quantification of vascular and neural networks in tissues.