LSUHS Core Resources Guide

January 2025

LSU Health Shreveport is committed to supporting cutting-edge research through our shared core facilities. These facilities house advanced technologies that are accessible to all research faculty, postdoctoral fellows, staff, and students on campus. Each core facility is expertly managed by dedicated faculty members or specialized staff who oversee daily operations, ensuring seamless access and optimal use of resources.

This Core Resources guide serves as a centralized resource, providing detailed information on each core facility, including available technologies, equipment, and contact information.

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The LSUHS Core Facilities main webpage can be accessed at https://research.lsuhs.edu/cores/

Center for Cardiovascular Diseases and Sciences (CCDS) Core Facilities

CCDS Surgical Models Core: This core provides a centralized service for performing technically challenging mouse models of cardiovascular disease, such as the middle cerebral artery occlusion (MCAO) stroke model, coronary artery ligation model of myocardial ischemia, the femoral artery ligation model of peripheral artery disease, and the partial carotid artery ligation model of disturbed blood flow.

CCDS Virus Production Core: This core provides a centralized service for generating AAV particles for cardiovascular and metabolic studies. The CCDS Virus Production Core operates on the 3rd floor of the Medical School building B and offers the production of custom AAVs for the use in CCDS laboratories on a fee-for-service basis. This Core Facility is overseen by Dr. Wayne Orr, Director of the CCDS.

End-User Core Equipment: The CCDS provides a range of end-user equipment that is available free-of-charge for a nominal fee. The equipment includes an Axion Biosystems Maestro Edge Multiwell Microelectrode Array System for measurement of cellular function and activity, MED64 Extracellular Electrophysiology System for brain and heart slices, NGC Quest 10 Plus Chromatography System (FPLC) for the purification of proteins, nucleic acids, and peptides, Oroboros O2k High-Resolution FluoRespirometer for measurement of mitochondrial function (complements the Seahorse in the Research Core Facility), Oxford Genesis Hematology Platform for 27-parameter analysis of blood from over 50 species, and a QT Pressure Arteriograph for quantifying function, reactivity, and mechanics in isolated perfused blood vessels. There is also equipment available to monitor cardiovascular health in human subjects in a fully non-invasive manner, including an EndoPAT 2000 system to measure vasodilation, a portable pulse oximeter, a portable 12 lead EKG, a wall-mounted manual blood pressure cuff, and a hand-held vascular Doppler. Each piece of equipment is under the supervision of a CCDS faculty member. Please contact Dr. Wayne Orr to find out how to access the equipment.

Center for Cardiovascular Diseases and Sciences (CCDS) Biorepository

The CCDS Biorepository is the latest core to be added to our Center. It is designed to receive samples from ongoing human subject studies for biobanking, and to distribute samples to both intramural and extramural investigators, with CCDS investigators receiving priority. It is currently in its infancy, but the goal will be to include tissue, blood and other samples as well as clinical data from patients with cardiovascular-related risk factors and diseases. *To access the CCDS Biorepository specimens or to deposit specimens into the Biorepository, please contact Arif Yurdagul (arif.yurdagul@lsuhs.edu).*

Center for Applied Immunology and Pathological Process (CAIPP) Core Facilities

CAIPP Bioinformatics and Modeling Core: The CAIPP Bioinformatics and Modeling Core is an NIH funded program within The Center for Applied Immunology and Pathological Processes (CAIPP). The Bioinformatics and Modeling Core is a primary resource center at LSUHSC-S supporting all ‘omics data

analysis, network modeling, and data science research. The Core operates as a fee for service facility and is available to all researchers at LSUHS. Services outside of LSUHS will require a prior contract agreement. The Bioinformatics and Modeling Core will also provide training and education opportunities.

CAIPP Immunophenotyping Core: The Immunophenotyping Core is an NIH funded program within The Center for Applied Immunology and Pathological Processes (CAIPP). The Immunophenotyping Core provides services that allow for isolation of cellular populations from complex tissues, automated quantification of cell numbers, quantification of GFP, DAPI, RFP, Cy5 or Cy7 positive populations, automated quantification of cytokine concentration in supernatants and biological samples, and high-quality flow cytometric and microscopic assay development and execution. In addition, the core maintains OMIQ, Flourofinder, FLOWJo licensure, BioRender, and GraphPad to allow flow cytometric data analysis and figure development. We have also generated an in-house antibody cataloging system to democratize antibody use and sharing across the campus, allowing individual labs to take advantage of high-parameter flow cytometry and spectral flow cytometry more easily. The Immunophenotyping core is located within the Microbiology and Immunology Department, ensuring users have all the necessary support. We also have free access to additional equipment such as Millipore water filtration units, walk-in cold rooms, and autoclaves, should you need them for your research. This collection of equipment and software allows the immunophenotyping core to offer cutting-edge services for immunophenotyping and any process that requires the isolation of cells from complex tissue to be used in further analysis, such as 10xGenomics. The Core operates as a fee for service facility and is available to all researchers at LSUHS. Services outside of LSUHS will require a prior contract agreement. The Immunophenotyping Core will also provide training and education opportunities.

In summary, the collection of technologies and personal expertise allow our core to enable faculty to generate high-quality and informative immunophenotyping data through training or by allowing our personnel (for a fee) to complete these experiments. This core is directed by Dr. Matthew Woolard (matthew.woolard@lsuhs.edu).

Cell Biology and Anatomy (CBA) Morphology Core

The Department of Cellular Biology and Anatomy maintains a state-of-the-art histology core facility for the processing, embedding, and staining of fixed and unfixed tissue sections. The facility is equipped with three Leica rotary microtomes and associated peripheral equipment for tissue sections. In addition, a Sorvall JB-4 microtome is available for cutting thin (0.5µm) sections embedded in methacrylate resin. The facility houses a complete Leica tissue processing/embedding system for high throughput paraffin embedding of tissues. The facility is capable of performing most routine stains, including Hematoxylin/Eosin, Alcian blue, Toluidine blue, Masson's trichrome stain, PAS, Oil Red O (frozen sections only), Picrosirius Red. A Leica Cryostat and Leica horizontal sliding microtome for the sectioning of frozen tissue specimens. The facility is run on a fee-for-service basis.

Center for Redox Biology and Cardiovascular Disease COBRE Core Facilities

The Animal Models and Histology Core: Directed by Dr. Karen Stokes, this core is divided into two sub-cores: 1) ***The Histology and Genotyping Sub-Core*** is located on the 3rd floor of the Medical School Building B in suite 3-330. It provides animal genotyping and histological services. For the genotyping service, the PI provides the primers (and protocol, if available), and turnaround is typically a few days. The histology service is for paraffin embedded samples – we provide processing, embedding and sectioning. Several histological stains to phenotype cardiovascular and liver tissues can also be requested; these include H&E, Masson Trichrome, Picrosirius Red, Oil Red O, etc. 2) ***The Cardiovascular Phenotyping Sub-Core*** is located on the 4th floor of the Medical School Building B in suite 4-341 and offers state-of-the-art techniques for vascular imaging and functional analysis. The current modalities are a VisualSonics Vevo 3100 Ultra High-Frequency Ultrasound Imaging System (measures include cardiac function, vascular stiffness, vessel diameters, reactive hyperemia responses), Perimed PeriCam PSI System and Perimed Periflux 5000, both with PimSoft for data analysis (used for perfusion and blood flow measurement), two TSE Telemetry Systems (for chronic measurement of blood pressure), a MPVS Ultra Pressure-Volume loop system (for cardiac function), an OxyletPro System with a single lane mouse calorimetry treadmill (for VO2 max determination during forced exercise), and a Coy Hypoxic Glove box (can fit more than 6 mouse cages at a time for hypoxia-reoxygenation protocols). Analysis workstations are available in the central area of the suite. Investigators can either pay for equipment access or for a dedicated Research Technician to perform the measurements and quantification. Surgery space is also available.

The Redox Molecular Signaling Core: Led by Dr. Wayne Orr, Director of the CCDS, this core occupies 3,375 sq. ft. of laboratory space on the 3rd floor of the Medical School building B and on the 6th floor of the BRI and is divided into two sub-cores: 1) ***The Analytic Redox Biology Sub-Core*** provides high quality, accurate measurements of reactive oxygen species (ROS), reactive nitrogen species (RNS), and reactive sulfide species in cell culture and tissue samples. High performance liquid chromatography (HPLC) systems coupled with UV-vis and fluorescence detectors are used to specifically quantify cellular and mitochondrial superoxide production, hydrogen sulfide pools, and thiols (glutathione, GSH/GSSG, cysteine, cystine, homocysteine, persulfides, and glutathionylation). In addition, this core facility employs a versatile and highly sensitive Sievers NO Analyzer (NOA 280i, GE) capable of measuring nitric oxide, nitrite, nitrate, nitrosoheme, and nitrosothiols in a variety of biological samples. 2) ***The Molecular Signaling Sub-Core*** offers services for isolation of primary cells, molecular cloning, site-directed mutagenesis, design and production of vectors for CRISPR/Cas9 modification, and for adenovirus and lentivirus production for transient or stable modification of cells. The core also provides access to equipment and expertise for exposing vascular cells to hemodynamic forces using parallel plate flow chambers, equipment for the study of cellular effects of hypoxia/reoxygenation injury (Coy Hypoxic Chamber). The CLARIOstar Plus High-Performance Multimode Microplate Reader is available with luminescence, fluorescence, and colorimetric capabilities.

The Oroboros Oxygraph-2k modular system for High-Resolution Respirometry is available for measurement of mitochondrial function. It offers the flexibility of testing multiple substrates/inhibitors additions during the same measurement, including for isolated mitochondria. It is highly sensitive, and modules allow for parallel recording of transmembrane potential changes and ROS production in parallel to the OCR.

Feist-Weiller Cancer Center Biorepository

The biorepository, a Feist-Weiller Cancer Center (FWCC) supported resource, provides a gateway through which institutionally supported investigators involved in IRB-approved research projects or clinical trials can acquire the human tissue samples or hematological samples required to support their research. The overall objective of FWCC Biorepository is to support translational research by functioning as the primary fresh-frozen tissue acquisition and processing facility for human solid tissue and hematopoietic specimens. To support future research studies, the FWCC Biorepository utilizes an IRB-approved protocol and consent form to prospectively collect and process high-quality specimens. The FWCC Biorepository works in collaboration with medical and surgical teams at Ochsner LSU Health Shreveport, the Department of Pathology to procure remnant tissue for research purposes, and investigators in need of biospecimens for their research. Additionally, FWCC Biorepository provides customized services and equipment to assist investigators in the procurement, analyses, and clinicopathologic correlation of human tissue specimens. FWCC-Biorepository Services include the following: Nucleic Acid Extraction, Cell Count Assays, Protocol Based Tissue/Blood Collection, Secured Continuous 24/7 Temperature Monitored Storage Services, and Whole Slide Scanning Drop-off Services. FWCC-Biorepository end user equipment that is available for rent includes the following: Olympus VS200 Slide Scanner, Galileo TM CK4500 Tissue Microarray Platform, Leica RM225 Microtome, Leica TP1020 Tissue Processor, and Thermoscientific Histostar Embedder. Fees and Service Contract Agreements may be required.

Feist-Weiller Cancer Center for Precision Medicine Genomics Laboratory

The Feist-Weiller Cancer Center's Center for Precision Medicine Genomics Laboratory is a CLIA/CAP accredited laboratory established in 2017 to offer clinical Next Generation Sequencing (NGS) to north and central Louisiana. The current test menu includes a large pan cancer DNA and RNA fusion panel for solid tumor testing. Reports to physicians include tumor mutation burden (TMB), microsatellite instability (MSI), FDA approved therapies and clinical trial recommendations. Although this is a clinical diagnostics lab, data can be mined for research purposes.

Feist-Weiller Cancer Center Innovative North Louisiana Experimental Therapeutics (INLET)

The Feist-Weiller Cancer Center's (FWCC) **Innovative North Louisiana Experimental Therapeutics program (INLET)** is a high-throughput, high-content screening (HTS) facility focused on the discovery

and development of a wide range of drugs and genetic targets that affect human diseases including cancer, fungal, bacterial and viral infection, neurological disorders and cardiovascular disorders. The primary mission of INLET is to assist investigators throughout LSU Health-Shreveport and the state of Louisiana in generating preliminary data to help in grant applications and paper submissions.

INLET houses two live-microscopy systems, the newer Incucyte® S3 system, and the older Incucyte ZOOM instrument. The two Live-Cell analysis instruments, the Incucyte® ZOOM and Incucyte® S3, can monitor cells in real-time for days, or even weeks, directly from a cell incubator. The image acquisition can be done in HD phase, green fluorescence, and red fluorescence at multiple time points, thus enabling non-invasive multiplex analysis. Incucyte Systems can acquire six plates at the same time, therefore accommodating multiple users and cell applications. The kinetic image-based applications can profile cell-specific time-dependent biological processes such as cell proliferation and viability, cell migration and invasion, and tumor spheroid analysis. Incucyte System is used in diverse areas of research, such as cancer biology, immunology, microbiology, cardiology, and COVID-19-related research. The Cellomics ArrayScan VTI high-content analysis system complements the high-throughput Incucyte System. This platform allows high-throughput drug screening and cellular compartmental analyses with over 30 application-based cell phenotypic assays. A significant advantage of the Cellomics VTI system is the 40X objective that enables visualization of cellular organelles and precise analysis of subcellular compartments.

INLET services based on the Incucyte ZOOM, Incucyte S3, and Cellomics VTI imaging platforms include screening assay creation, high-throughput and high-content compound screening, basic research support, data management and analysis, and hit-to-lead development. INLET personnel assist new users with the necessary access and training if required and help develop the appropriate protocols and analyses.

INLET also has the Biotek Synergy H1 and Synergy 4 plate readers. The new H1 reader has unique capabilities such as the ability to perform absorbance, fluorescence, and luminescence reads for endpoint and kinetic assays under temperature control up to 70C; tunable wavelength adjustment along with filter-based fluorescence, which allows for increased flexibility and sensitivity for many standard fluorescent assays; dual reagent injectors and shaking capability for timely addition of reagents during plate reads without the need to remove plates during time & light sensitive assay; software that allows for advanced reader control, including robust data analysis and flexible exporting capability to Excel table formats. Furthermore, five additional installation licenses are included in the purchase, negating the need to repurchase new software packages as the instrument ages.

Metabolic and Liver Disease Research Program Facilities

The state-of-the-art **mouse metabolic phenotyping core** initiated by the LSUHS Metabolic and Liver Disease Research Program represents a first of its kind facility that is equipped with the most advanced and sophisticated technologies available in the field. Central to this advanced facility are the

Bruker Minispec series and the Sable Systems Promethion platform. These systems leverage Time Domain Nuclear Magnetic Resonance (TD-NMR) technology, providing unparalleled precision in measuring lean tissue, body fat, and body fluid volumes in live mice. This non-invasive method facilitates longitudinal studies without the use of anesthetics, crucial for ongoing metabolic monitoring and interventions.

Sable Systems Promethion Platform

The **Promethion Live software** utilized will provide comprehensive reports on the mice while they are housed in the cabinets. The metabolic cages and cabinets also possess the feature of isotope tracing which allows for tracking the movement of labeled atoms through a chemical reaction. Specific features include food and water intake, energy expenditure/indirect calorimetry, running capacity, thermoneutrality and cold exposure temperature-controlled studies, metabolism and behavioral analysis, urine collection, and carbon and oxygen isotope tracing.

Bruker's Minispec LF50 Body Composition Analyzer

The **Bruker LF50 BCA Analyzer** utilizes Time-Domain Nuclear Magnetic Resonance (TD-NMR) to provide a precise measurement of lean tissue, fat, and fluid in living mice. A notable advantage of using the LF50 is that the animal is able to be carefully analyzed without the necessity for any anesthetics or procedures. The LF50 BCA can analyze mice up to 60 g, and will analyze the lean of tissue, fat, and fluid composition of the mouse. Analysis is rapid, taking less than 2 minutes, and with no sample preparation or anesthetics required, this reduces animal stress and allows for more frequent testing.

Research Core Facility (RCF)

Cellular Metabolism

Although this is not part of an independent sub-core, this system is available in the end-user real-time PCR facility. The **Agilent Seahorse XFe24 Analyzer** measures the oxygen consumption rate (OCR) and extracellular acidification rate (ECAR) of live cells in a 24-well plate format. OCR and ECAR rates are key indicators of mitochondrial respiration and glycolysis, as well as ATP production rate, and together these measurements provide a detailed view of mitochondria metabolic function in cultured cells and ex-vivo samples.

Flow Cytometry Core

The Flow Cytometry Core provides high standard cell sorting and analysis services. The **ACEA NovoCyte Quanteon cell analyzer,** a 4-laser (405 nm, 488 nm, 561 nm, & 637 nm) flow cytometer is capable of detecting up to 27 parameters (forward scatter, side scatter, and 25 fluorescence detectors). The silicon photomultipliers (SiPM) provide a stable 7.2 log dynamic range. Multiple input sources (5mL tubes, 96 and 384 well plates) make sample acquisition extremely flexible. Data can be directly transferred into an Excel spreadsheet, ensuring ease of data analysis. NovoExpress software is used for acquisition and analysis.

The **Invitrogen Bigfoot Spectral cell sorter** is a high-throughput sorter with 5 spatially separated lasers (349 nm, 405 nm, 488 nm, 561 nm, and 640 nm) and 55 detectors, including a dedicated small particle detector. The Bigfoot utilizes the newest technology of spectral flow cytometry, capturing the entire emission spectrum of each fluorophore rather than just the peak emission band. Sorting rates exceed 100,000 events per second, and sorting is configurable: from six-way sorting into tubes to multi-way sorting into 96-well or 384-well plates. The sorter is housed in an integrated BSL-2 biosafety enclosure for optimal safety. It uses Sasquatch Software (SQS) for setup, acquisition, and analysis.

Genomics Core

The **Genomics Core** offers state-of-the-art genomics services and support. The facility offers next generation sequencing, DNA/RNA shearing, sample QC, and qPCR services.

The Genomics Core houses three Illumina Next Generation Sequencers 1) an **Illumina MiSeq Next Generation Sequencer**, which is most suited for focused applications such as small genome sequencing, metagenomics, amplicon sequencing, and targeted gene sequencing. It can generate up to 15 GB of output with 25 M sequencing reads and up to 2 x 300 bp read lengths 2) an **Illumina NextSeq 550 Next Generation Sequencer**, a more flexible system, enabling the analysis of targeted panels, transcriptomes, and whole exomes. It can generate up to 120 Gb of output with up to 400 M single sequencing reads and up to 2 x 150 bp read lengths and 3) an Illumina **NovaSeq 6000 Next Generation Sequencer**, which offers the highest output and the lowest per base sequencing cost, making it ideal for applications requiring greater sequencing depth, such as single-cell RNA-Seq. It supports read lengths of up to 2 x 250 bp and can generate up to 10 billion single-end sequencing reads. It combines two-color chemistry along with patterned flow cell technology.

The **10X Genomics Chromium X** performs single cell partitioning and is capable of high throughput. It is compatible with all 10X single cell assays including fixed RNA. The **10X Genomics Visium CytAssist** simplifies the Visium spatial workflow by automating the transfer of molecules from FFPE tissue sections on standard glass slides to Visium Spatial Gene Expression slides, enabling spatial profiling insights to be gained from an expanded range of FFPE samples.

The Research Core Facility has three **Bio-Rad CFX Opus 96** Real-Time PCR Systems. Compared to older CFX models, these systems have improved thermal performance and an accurate shuttle system, optimizing data consistency. They have six filtered LEDs, each corresponding to a filtered photodiode. The excitation wavelength range is 450-684 nm; the emission wavelength range is 515-730 nm. They have a sensitivity of 1 copy of target sequence in human genomic DNA and a dynamic range of 10 orders of magnitude. CFX Maestro software is used for acquisition and analysis; the latest version offering advanced analysis tools for performing normalized gene expression.

The Research Core Facility has one **Bio-Rad CFX Opus 384** Real-Time PCR System. It has five filtered LEDs, each corresponding to a filtered photodiode. The excitation wavelength range is 450-650 nm; the emission wavelength range is 515-690 nm. It has a sensitivity of 1 copy of target sequence in human genomic DNA and a dynamic range of 10 orders of magnitude. CFX Maestro software is used for

acquisition and analysis; the latest version offering advanced analysis tools for performing normalized gene expression.

The Research Core Facility has one **Bio-Rad CFX96 Fast** Real-Time PCR Systems. The CFX96 is a six-channel real-time PCR system that combines advanced optical technology with precise thermal control to deliver sensitive, reliable detection. The system's solid-state optical technology (six filtered LEDs, each with a corresponding filtered photodiode) maximizes fluorescence detection for specific dyes in specific channels, providing sensitive detection for quantitation and target discrimination. Data is collected from all wells during data acquisition. At every position and with every scan, the optics shuttle is reproducibly centered above each well, so the light path is always optimal and there is no need to sacrifice data collection on one of the channels to normalize to a passive reference. Users can select multiple data acquisition modes, including a one-color fast scan for SYBR green. Thermal gradient features can be used to optimize reactions in a single run. CFX Maestro software is used for acquisition and analysis.

The Research Core Facility has one **Bio-Rad CFX384 Touch** Real-Time PCR System. The system's solid-state optical technology (5 filtered LEDs and 5 filtered photodiodes) provides precise quantification and multiplex target discrimination. All other acquisition and analysis parameters are identical to the CFX96 Fast System.

High-Performance Computing (HPC) Core

The HPC Core Facility provides researchers with advanced computational resources and expertise for data-intensive biomedical, clinical, and life sciences research. Offering state-of-the-art computing clusters, scalable storage, and high-speed data processing capabilities, the facility supports tasks such as genomics analysis, protein folding/docking, image processing, AI-driven research, and simulation-based studies. Expert staff provide consultation, workflow optimization, and training to help researchers maximize computational efficiency and advance their scientific discoveries. The equipment can be accessed via a conventional web browser, where different software is available pre-installed or by request.

Equipment: Our HPC cluster, Spartacus, includes **1.5 TB** of system RAM memory, **640 CPUs** (AMD EPYC 7742), 8 GPUs with 320 GB of total memory (NVIDIA A100-SXM4-40GB), and 600 TB of storage (DDN ES7990).

Mass Spectrometry Core

The Mass Spectrometry (MS) Core equipment is located in the Research Core Facility, Pharmacology Core Lab, and CTX building. Using orbitrap high-resolution mass spectrometry, the MS Core offer both targeted and untargeted metabolomics for the metabolomics approach. For protein analysis, our principal approach is bottom-up proteomics, which is a common method to identify proteins and characterize their amino acid sequences and post-translational modifications by proteolytic digest prior to analysis by mass spectrometry. In addition to the standard operating procedures that we have developed for many of our MS services, we also strive to continue to bring state-of-the-art mass

spectrometry-based analyses through input and requests from our users. This core has four LC-MS/MS systems, two GC-MS, and two HPLC-UV systems on campus, including a Thermo Orbitrap Exploris 120 LC-MS/MS system, a Waters XEVO-TQ (Triple quadrupole) UPLC-MS/MS system, a Thermo ISQ7610 GC-MS system, and a Thermo Vanquish HPLC system.

The **Thermo Orbitrap Exploris 120 LC-MS/MS system** is a liquid chromatography-high-resolution mass spectrometry (HRMS) platform that combines precise mass accuracy with advanced liquid chromatography (LC). It is designed for comprehensive analysis of complex samples, offering high sensitivity and resolution for identifying and quantifying metabolites, lipids, and proteins. Ideal for untargeted and targeted metabolomics, isotope analysis, and biomarker discovery, the system excels in applications such as metabolic profiling, pharmacokinetics, and proteomics. With its robust performance and advanced software, the Orbitrap Exploris 120 delivers reliable and detailed data for a wide range of scientific studies, including untargeted metabolomics, targeted Metabolomics, and large scale lipidomics.

The **Waters XEVO-TQ (Triple Quadrupole) UPLC-MS/MS system** is a high-performance platform combining Ultra-Performance Liquid Chromatography (UPLC) with Triple Quadrupole Mass Spectrometry (MS/MS) for precise quantification and identification of small molecules. It excels in targeted analysis, offering exceptional sensitivity for detecting trace compounds and accurate quantification using multiple reaction monitoring (MRM). Widely used in bioanalysis, metabolomics, and environmental studies, the XEVO-TQ system provides reliable, high-throughput results for applications such as drug metabolism, lipidomics, and polar metabolite analysis. Its advanced software ensures efficient data handling and method development, making it ideal for both routine and complex analyses, such as small molecule identification, targeted lipids and hexosylceramides analysis, polar metabolites and TCA cycle analysis, and targeted drug quantification.

The **Thermo ISQ7610 GC-MS system** is a high-performance platform that can be used to identify and quantify small molecular metabolites in samples such as human body fluids, food, and environmental samples. The ISQ7610 GC-MS system is commonly used in chemical research and bioanalysis for the detection and quantification of small molecules. Its high sensitivity, precision, and advanced software for automated compound identification and quantification ensure reliable and reproducible results across a broad spectrum of analytical applications, including pharmacometabolomics, polar and non-polar metabolism quantification, automated compound identification, and detection of volatile organic compounds.

The **Thermo Vanquish HPLC system** is an advanced platform for High-Performance Liquid Chromatography (HPLC), a powerful analytical method used to separate, identify, and quantify compounds within complex mixtures. It is widely applied across various scientific fields, including environmental analysis, food safety, biochemical research, and metabolomics, where precision and accuracy are critical. The system's high sensitivity and resolution enable the detailed analysis of small molecules, peptides, and biomolecules, making it a versatile tool for both routine and complex analyses.

With its ability to handle diverse sample types and complex matrices, the Vanquish HPLC system is ideal for bioanalysis, where it can monitor metabolites, assess environmental contaminants, and track metabolic pathways. Its robust automation, high throughput, and data processing capabilities make it indispensable for large-scale research projects. Additionally, it excels in long-term studies requiring reproducibility, such as monitoring the biochemical effects of substances, environmental exposure assessments, and food quality control. The Thermo Vanquish HPLC system is designed to deliver reliable results across various applications, ensuring accuracy and efficiency in high-performance analytical workflows, including amino acid and neurotransmitter analysis, organic acid and short-chain fatty acid metabolomics, chirality monitory, bioanalysis of pharmacokinetics and pharmacodynamics, and therapeutic drug monitoring.

Microscopy Core

The Microscopy Core provides researchers with equipment and expertise required for multidimensional imaging of cells and tissues at high resolution. Resources include confocal, multi-photon, and super-resolution microscopy, as well as equipment for live cell imaging and analysis.

The **Leica Stellaris8 STED** is a high-end confocal microscope with an extended spectral range from the blue up to near infra-red (Cy7) combined with STED (Stimulated Emission Depletion) super resolution system. The confocal components include pulsed White Light Laser (WLL) capable of excitation in any wavelength from 440nm to 790nm, an additional 405nm laser, Leica's Acousto Optical Beam Splitter (AOBS) and 5 spectral PowerHyD detectors (detection range from 405nm to 850 nm). The Stellaris 8 is equipped with several tools that allow it to achieve versatility and sensitivity. TauSense technology facilitates separation of fluorophores based on their lifetime properties and Lightning, a deconvolution-based strategy, allows for optimal extraction of image details and maximum resolution. The confocal image resolution can be improved up to 120 nm in the lateral dimension and 200 nm in the axial dimension. STED Super-Resolution microscopy system is equipped with three pulsed STED depletion laser lines: 592 nm, 660 nm, and 775 nm to cover the complete visible spectrum and two of Leica's STED objectives: HC PL APO 86x/1.20 W motCORR STED W, and Obj. HC PL APO 93x/1.30 GLYC motCORR STED W. STED Super-Resolution microscopy system is able to achieve resolutions less than 50 nm in the lateral direction and 130 nm in the axial direction.

The **Leica TCS SP5 Confocal Microscope** is a very flexible and fast confocal system for fixed samples. The system includes a Leica DMI 6000 CS fully automated inverted microscope with motorized stage, condenser, objective, and filter turrets. It is equipped with 5 lasers for excitation: violet diode (405 nm), multi-line Argon (458, 476, 488, 496, and 514 nm), green HeNe (543 nm), orange HeNe (594 nm), and red HeNe (633 nm). The spectral beam splitter has freely adjustable bandwidths for the collection of signal in 5 separate detectors simultaneously or sequentially. There is also a transmitted light detector for DIC. There are 9 available objectives, ranging from a 2.5x to a Plan Apo 100x/1.46 NA oil objective. The system runs on the LAS AF software (LAS AF 2.6.3), with FRAP, FRET, Mark & Find, 3D Visualization, Colocalization, and Live Data Modes.

The **Nikon A1R Confocal & SIM Super Resolution System** is a high-speed Nikon A1R confocal microscope combined with a SIM (Structured Illumination Microscopy) super resolution system for fixed and live sample-imaging. The resolution for conventional confocal reaches 200-250nm, while the resolution for super resolution system reaches 120nm. The microscope is capable of bright-field imaging, multichannel fluorescence imaging, large image stitching, multipoint acquisition, time-lapse acquisition, FRAP, FRET imaging, and 2D/3D deconvolution. To allow long hour live cell-imaging, the microscope is housed in an incubator with CO2, O2, and humidity controls. The 5 objectives range from 10X to 100X. The confocal components include 5 detectors and 4 lasers: 405nm, 488nm, 561nm, and 640nm in wavelength. The SIM components include a Hamamatsu camera and 3 LED lasers: 488nm, 561nm, and 640nm in wavelength and CFI SR HP APO TIRF 100XC NA 1.49 OIL W objective.

The **Olympus FVMPE-RS multiphoton imaging system** is purpose-built for deep imaging in biological tissue, aimed at revealing both detail and dynamics. It is an upright microscope with gantry frame, optimized for intravital imaging with a large space for live animals and experimental equipment. Innovative features for efficient delivery and detection of photons in scattering media enable high signal-to-noise ratio acquisition. The system is equipped with a dual wavelength laser with a tunable range from 680 nm to 1300 nm and a fixed wavelength line at 1045 nm (InSight X3 Dual-OL by Spectra-Physics). Hybrid scan unit consists of a high-speed acquisition resonant scanner and a high-definition galvanometer scanner. There are 7 available objectives, ranging from a 4X to a 60X, including truResolution 25X water immersion objective. High-sensitivity GaAsP detectors and Olympus dedicated multiphoton objectives allow for deep tissue imaging under in vivo and cleared tissue conditions up to 8 mm deep.

The **Olympus iXplore SpinSR is** a high-resolution and fast spinning disk confocal system built on an inverted IX83 microscope base, with fully automated objectives, stage, and filter turrets. The confocal components include 6 lasers: 405nm, 451nm, 488nm, 514nm, 561nm, and 640nm in wavelength. The microscope is equipped with two sCMOS cameras (Hamamatsu ORCA-Fusion Gen -III) for simultaneous acquisition in two channels. The Yokogawa CSU W1 spinning disk unit houses two disks (25 and 50 µm) to best fit different objectives (range from 10X to 100X). Motorized 3.2X Magnification Changer maximizes the performance of the objectives increasing optical magnification. The system is also equipped with a feedback stage-top incubation WSKMX chamber for temperature, CO2, and humidity control (Tokai Hit controller) for live cell imaging.

The **Zeiss AxioObserver/Apotome** system is built around a Zeiss AxioObserver Z1 inverted fluorescent microscope, fully automated, with component recognition to minimize errors. System components include X-Cite XYLIS, a Zeiss AxioCam 505Mono CCD camera with 14/12/8-bit dynamic range, extended sensitivity in the near infrared, a fully automated XYZ stage, a complement of objectives ranging from 10x to 100x, and five installed filter sets for DAPI, FITC, Rhodamine, Cy5 and Cy7. The Apotome attachment is designed for precise optical sectioning. The Apotome slides easily into the optical path and projects a grid onto the image plane, which is shifted laterally in three defined steps, with an image collected at each step. A software algorithm then removes any out-of-focus signal. The acquisition

software is Zen Blue, including plug-in options for Inside 4D, 3D Deconvolution, Colocalization, Mark & Find, Mosaic, and more.

The **Interherence VAHEAT** is a precise temperature control unit for optical microscopes. It combines local heating with direct temperature sensing, allowing for fast and precise temperature adjustment. It is capable of heating rates up to 100°C/s while maintaining the highest temperature precision. Sample is prepared on a smart substrate equipped with a transparent heating element and a precise temperature probe. This unit is not specific to any one microscope and can be adapted for most.

There are four **Off-line Image Analysis Workstations** in the Core Facility Computer Lab reserved for microscope users. These workstations contain specialized imaging software including Leica LAS AF 2.6.3, NIS Elements AR 4.13.04, Olympus CellSens Dimension V2, Zeiss LSM 510 ZEN 2009, Media Cybernetics' AutoQuant AutoDeblur deconvolution software (AutoQuant X3), including the AutoVisualize option, and full off-line versions of Zeiss LSM 510 AIM (confocal) and Zeiss Axiovision 4.8.2. Bitplane Imaris 9.8 Single Full with Clearview software (MeasurementPro, ImarisTrackLineage, ImarisColoc, ImarisXT, ImarisCell, ImarisVantage, and ClearView-GPU Deconvolution) is also available for use at an additional charge. The Imaris package includes advanced functionality to detect cells and their major compartments, discover intracellular relationships, study motion, explore cell differentiation using an interactive lineage tree.

Small Animal Imaging Facility (SAIF)

The Small Animal Imaging Facility (SAIF) provides state-of-the-art noninvasive imaging support to investigators who use small animal models in their research. Located on the 9th floor of the Medical School, the SAIF currently provides a spectrum of imaging modalities including optical imaging (bioluminescence and fluorescence imaging), X-ray imaging, computed tomography (CT), and positron emission tomography (PET). SAIF staff provide imaging support with experimental design, conducting animal studies including anesthetization and imaging acquisition, and processing and interpreting imaging data.

The **Mediso NanoScan PET/CT** is equipped with an imaging technology widely considered as the most advanced PET and CT detector construction, data processing and reconstruction chain in the industry. The relevant features of this system include: highest PET resolution ever (using the industry's most advanced pixelated modular LYSO detectors), state of the art Tera Tomo 3D PET image reconstruction engine, extremely fast, parallel workflow of data acquisition, image reconstruction and image quantification, high imaging throughput by large bore size and large field of view in both axial and transaxial directions, high sensitivity data acquisitions, high resolution and low dose cone-beam CT imaging, variable zoom and high power X-ray source, and integrated cardiac and respiratory gating capabilities for both PET and CT. Standalone use is possible for each modality. Post processing is done using InterView™ FUSION software which exports results in DICOM, PNG, JPEG, AVI, PDF, and CSV formats, supports dual, triple and quadruple fusion of PET/CT images, and provides GPU accelerated 3D MIP, Volume Rendering and Surface Rendering Techniques.

The **PerkinElmer IVIS Spectrum CT** is an in vivo imaging instrument for molecular and anatomical imaging. Capabilities include bioluminescent imaging, fluorescent imaging (reflectance and transmission modes), and low dose, ultra-fast micro-CT for small animals. The Living Image system software enables 3D optical tomography for fluorescence and bioluminescence, 3D volumetric tomography of CT images, and automatic co-registration of 3D reconstructions of luminescent or fluorescent sources (optical image data) with CT images (3D volumetric data). The ultra-sensitive CCD camera of the IVIS Spectrum CT enables bioluminescent imaging which detects the light emitted by living cells expressing a reporter gene such as luciferase. It allows noninvasive visualization and monitoring of cellular and genetic activity within a living organism, in real time. For fluorescence imaging, the instrument can operate in reflectance or transillumination mode. Filtered light from a broad-band lamp provides the excitation source in both modes. In the reflectance mode, light is delivered to four reflectors that are located on the ceiling of the imaging chamber. In the transillumination mode, the excitation light is delivered to an x-y translation assembly under the stage and focused to a 2 mm diameter beam that can be directed to a particular location on the underside of the animal subject. The system includes 10 excitation and 18 emission filters that enable spectral scanning of reporters over the range from 480-850 nm. The high-speed micro-CT system uses an X-ray source and a flat panel X-ray detector to produce high resolution 3D images of mouse skeletal structure and surrounding soft tissue. The IVIS Spectrum CT imaging system uses CT images to reconstruct the surface topography. The concentration and 3D anatomical location of fluorescent sources can be computed from CT images and transillumination fluorescent images. The 3D anatomical location and strength of luminescent sources are computed from CT and luminescent image data.

Transmission Electron Microscopy (TEM) Core

The **LSUHS Transmission Electron Microscopy (TEM) Core** is located on the 8th Floor of the Medical School in the Department of Cellular Biology and Anatomy Morphology Core Facility.

Equipment: The heart of the facility is a **JEOL 1400 TEM** equipped for digital image capture.

The JEOL 1400 is capable of 0.38nm point image resolution and 0.2nm lattice resolution when operated at 120kv. The microscope is equipped with single place or four place specimen holders. The routine magnification range for this scope is 200x to 1,200,000x. Image acquisition is accomplished using a mid-mounted AMT Nanosprint 12 CMOS camera (4096 x3008 square pixels, 6.8 x 6.8 µm pixel size) with real time drift correction. In normal operation, the frame rate (55fps) Nanosprint camera gives real time images during observation with minimal lag time. The acquired digital images are downloaded to a secure server for distribution to each specific user. Computers are available for offline image analysis.

Specimen Preparation Laboratory: A 700 sq.ft. laboratory is available for the preparation of tissue or cultured cells. The tissue preparation area in the facility is equipped with all the equipment necessary for processing and embedding tissues in TEM grade epoxy resins. A Leica EM UC7 Ultramicrotome and two Reichert Ultracut E ultramicrotomes are available for cutting thick (0.5µm) and thin (80nm)

sections. A Leica KMR3 Glass Knifemaker is used to make glass knives for rough trimming; the facility uses Diatome™ diamond knives for final sectioning at 80-100nm.

Personnel: Deborah McCarthy (Deborah.mccarthy@lsuhs.edu; Ph 5-4509) has 40 years of experience in TEM methods, having trained as an electron microscopy technologist. She is responsible for day-to-day operations of the facility and assisting users in TEM imaging. The scientific advisor/faculty oversight person of the facility has 40 years of experience using TEM and SEM (scanning electron microscopy) in laboratory investigations. There is a well-defined process/protocol in place to engage PIs and their staff to ensure success in tissue preparation, processing, and imaging.

Fees: The facility is run on a fee-for-service basis to all faculty and staff in the institution. Funding for the facility personnel is subsidized by the institution; operational expenses are covered by the user fees charged by the facility.

Equipment List

Center for Cardiovascular Diseases and Sciences (CCDS) Core Facilities

Axion Biosystems Maestro Edge Multiwell Microelectrode Array System

MED64 Extracellular Electrophysiology System

NGC Quest 10 Plus Chromatography System (FPLC)

Oroboros O2k High-Resolution FluoRespirometer

Oxford Genesis Hematology Platform

QT Pressure Arteriograph

Center for Redox Biology and Cardiovascular Disease Animal Models and Histology Core

Coy Lab 2 person InVivo Glove box

Leica RM 2235 Microtome

MPVS Ultra Pressure-Volume loop system

OxyletPro System with a single lane mouse calorimetry treadmill

Perimed PeriCam PSI System with PimSoft

Perimed Periflux 5000 with PimSoft

Thermocyclers: 3 Applied Biosystems GeneAmp PCR 9700; Bio-Rad T100

TSE Telemetry Systems (X2)

VisualSonics Vevo 3100 Ultra High-Frequency Ultrasound Imaging System

Center for Redox Biology and Cardiovascular Disease Redox Molecular Signaling Core

CLARIOstar Plus High-Performance Multimode Microplate Reader

Sievers NO Analyzer

Feist Weiller Cancer Center Innovative North Louisiana Experimental Therapeutics (INLET)

Biotek Synergy H1 Plate Reader

Biotek Synergy 4 Plate Reader

Cellomics ArrayScan VTI High Throughput Screening Module

Incucyte S3

Incucyte ZOOM

Metabolic and Liver Diseases Research Program Facilities

- Bruker LF50 Body Composition Analyzer
- Promethion Core Cab- Environmental Control Cabinet

Research Core Facility

- Agilent 4150 TapeStation
- Agilent Seahorse XFe24 Analyzer
- Flow Cytometry
  - ACEA NovoCyte Quanteon Flow Cytometer (x2)
  - Bigfoot Spectral Cell Sorter
- Imaging
  - Interherence VAHEAT Temperature Control Unit
  - JEOL 1400 Transmission Electron Microscope
  - Leica Stellaris 8 STED Confocal Microscope
  - Leica TCS SP5 Spectral Confocal Microscope
  - Mediso NanoScan PET/CT
  - Nikon A1R Confocal & N-SIM Super Resolution System
  - Olympus FVMPE-RS Multiphoton Microscope
  - Olympus iXplore SpinSR Spinning Disk Confocal Microscope
  - Zeiss AxioObserver Z1 Widefield/Apotome Microscope
  - PerkinElmer IVIS Spectrum CT
  - Leica EM UC7 Ultramicrotome
- Mass Spectrometry
  - Thermo ISQ7610 GC-MS System
  - Thermo Orbitrap Exploris 120 LC-MS/MS System
  - Thermo Vanquish HPLC System
  - Waters XEVO-TQ UPLC-MS/MS System

Next Generation Sequencing

- 10X Genomics Chromium X Controller
- 10X Genomics CytAssist
- Illumina MiSeq Next Generation Sequencer
- Illumina NextSeq 550 Next Generation Sequencer
- Illumina NovaSeq 6000 Next Generation Sequencer

Real-Time PCR

- Bio-Rad CFX Opus 96 Real-Time PCR Instrument (x3)
- Bio-Rad CFX Opus 384 Real-Time PCR Instrument
- Bio-Rad CFX96 Fast Real-Time PCR Instrument
- Bio-Rad CFX384 Touch Real-Time PCR Instrument

Reichert Ultracut E Ultramicrotome