Cell Culture	Service Name	Description
Carmel M. Burns Core Manager Location: NB1-25 Phone: 216-444-5814 Email: burnsc@ccf.org	Cell Culture Training	The Core provides training on good lab practice to new researchers. The training can be tailored to individual needs and includes aseptic technique and culturing and maintaining cell lines.
	Cryogenic Storage	The core can accommodate the storage of cryovials. The core offers this service to LRI researchers for backup storage of precious cell lines.
	Direct Mycoplasma Testing	This method uses an enriched agar to support the growth of colonies. Cells and supernatant are swabbed onto agar and incubated in a modular incubator chamber. Samples are viewed microscopically every other day for 2 weeks. Mycoplasma contamination is detected by the appearance of a "fried egg" - like growth.
	Indirect Mycoplasma Testing	The Core uses a quick method to detect mycoplasma. This kit detects the four most common types of mycoplasma to contaminate cells. This is useful in determining the type of mycoplasma present.
	Insect Cell Culture	The Core is equipped with a 27 degree C incubator that is an optimum temperature to support the growth of insect.
	Mycoplasma Testing	The core routinely performs a direct and indirect method of testing for Mycoplasma. The following 2 tests are done in parallel.
	Preparing your samples for Mycoplasma Testing	The cells should be grown without antibiotics for 3-4 days. Collect cells for testing by scraping the adherent cells and collecting about 5 mLs of cells and media. For suspension cells, grow without antibiotics and supply 5 mL for testing.
	Roller Bottle Cultures	The Core has the capability of producing large scale adherent cells cultured in either 850 cm” or 1750 cm” roller bottles grown on a roller apparatus in a 37°C warm room. This is a very suitable method when large amounts of cells are required. This method also works well with suspension cells.
	Spinner Cultures Cells	Useful for the production of large volumes of suspension cells. Vessels come in various sizes that are used in conjunction with a magnetic stirrer spinner base. The core can provide volumes from 100 mLs-10L.
	Sterility Testing	The Core offers sterility services using in-house prepared broths along with regular mycoplasma and endotoxin testing. Quarterly testing results are available.

Clinical Research Unit	Service Name	Description
June Cassano, BSN, MBA Sr. Director Res. Operations Location: JJN3 Phone: 216-445-6988 Email: cassanj@ccf.org	Clinical Research	Facilities and personnel to conduct clinical research studies. Pre-proposal consultations, protocol-specific nursing, pre-analytic lab, recruitment specialist consultation of special populations and project management.
Electron Microscopy	**Service Name**	**Description**
Judith Drazba, Ph.D. Staff, Core Director Location: NB1-46 Phone: 216-445-3760 Email: drazbaj@ccf.org	Electron Microscopy (Transmission)	Uses a beam of electrons (rather than photons) to investigate the ultrastructure in a thin section through a sample. Resolution down to 0.0001um (TEM).
	Electron Microscopy (Scanning)	Uses a beam of electrons (rather than photons) to investigate the surface structure of a whole-mount sample. Resolution down to 0.002um (SEM).
	Electron Microscopy (2D-EM Section Scanning)	Uses an electron beam in a scanning EM to generate a large TEM-like image of an entire section from a sample. Images are usually generated by stitching together many small, high resolution, tiles. Resolution down to 0.004 um.
	Elemental Analysis (with SEM, EDAX)	Determination of the elemental composition of a sample prepared for EM observation.
EM Sample Prep:	**Service Name**	**Description**
Judith Drazba, Ph.D. Staff, Core Director Location: NB1-46 Phone: 216-445-3760 Email: drazbaj@ccf.org	Transmission EM Sample Preparation	The preparation of a sample for cutting and staining that will allow for it to be observed in a transmission electron microscope.
	Thin Sectioning (for TEM)	The plastic embedded sample must be cut with a diamond knife into extremely thin slices for viewing in the electron microscope. Ultra-thin sections range from 50-100 nm in thickness, for TEM
	Thick Sectioning (for TEM)	Thick sections in the 1-2 um range can be stained and viewed in a light microscope to determine the right area of the specimen for ultra- thin sectioning.
	Glow Discharge (for TEM)	Removal of the positive charge from an electron microscope grid to prevent dispersion of sample.
	Immuno EM/ Immunogold Labeling (for TEM)	Labeling with gold-tagged antibodies for ultrastructural localization of proteins in cells and tissues using TEM
	Negative Staining (for TEM)	Particles of a suspension are adsorbed onto the surface of a specimen support, stabilized, and contrasted usually by heavy metal stains. By this approach, particles can be visualized down to sub-nanometer size and categorized based on their morphology.

	Scanning EM Sample Preparation (Critical Point Drying)	Process for drying a sample for scanning electron microscopy in a way that does not cause surface deformation.
	Sputter Coating	Samples for scanning electron microscopy are first prepared by depositing an ultra-thin layer of gold on the surface.
Volume (3D) Electron Microscopy	**Service Name**	**Description**
Grahame Kidd, Ph.D. Project Staff, Core Leader Location: NC3-154 Phone: 216-598-9760 Email: kiddg@ccf.org	Electron Microscopy (Scanning)	Uses a beam of electrons (rather than photons) to investigate the surface structure of a whole-mount sample. Resolution down to 0.002um (SEM).
Grahame Kidd	Electron Microscopy (volume EM) (3D-EM Ultrastructure)	Electron microscope systems to generate serial images of cells and tissue to examine cell ultrastructure in 3 dimensions. Called serial block- face scanning electron microscopy, stacks of images (volumes) are generated that are similar to those of confocal microscopes, but with 50-100x better resolution (0.004 um).
Grahame Kidd	Electron Microscopy (2D-EM Section Scanning)	Uses an electron beam in a scanning EM to generate a large TEM-like image of an entire section from a sample. Images are usually generated by stitching together many small, high resolution, tiles. Resolution down to 0.004 um.
Volume (3D) Electron Microscopy –Sample Prep	**Service Name**	**Description**
Grahame Kidd, Ph.D. Project Staff, Core Leader Location: NC3-154 Phone: 216-598-9760 Email: kiddg@ccf.org	Volume EM Sample Preparation	The preparation of a sample for cutting and imaging in a serial block-face scanning EM system.
Grahame Kidd	Thick Sectioning (for 2D-EM section scanning)	Thick sections are stained with heavy metal EM stains to allow backscattered SEM electron imaging.
Grahame Kidd	Immuno EM/ Immunogold Labeling for volume EM	Labeling with gold-tagged (or other) antibodies for ultrastructural localization of proteins in cells and tissues using serial blockface scanning EM.
Flow Cytometry Core	**Service Name**	**Description**
Kewal Asosingh, Ph.D. Associate Staff, Core Director Location: NB2-28a Phone: 216-444-0891 Email: asosink@ccf.org	10X or single cell omics	Single cell gene transcriptome analyses using 10x Chromium Controller.
	Flow Cytometry Consultation	Assistance with panel design, controls, troubleshooting, data analysis and interpretation, grant writing, budget, generation of publication quality figure according to the current standards of the International Society for Advancement of Cytometry (ISAC).

	Immunophenotyping and/ or enumeration of extracellular vesicles	Volumetric quantification of extracellular vesicles (micro-particles and exosomes) in biological fluids or cell culture supernatant using Apogee Micro Flow Cytometry or Zetaview nanoparticle tracking analyzer.
	Immunophenotyping of cells	Analysis of cell surface and or intracellular expression of markers (cytokines, CD proteins, phosphoproteins, etc.) using flow cytometry.
	Single cell suspension preparation	Assistance, guidance with the preparation of high quality single cell suspension for various assays.
	Quantification and or detection of expressible fluorescent proteins.	Analysis of florescent report genes using flow cytometry.
	Quantification and or detection of fluorescent probes of cell function.	Analysis of fluorescent cell function specific probes using flow cytometry.
	Sterile and BLS2 cell sorting	Purification of specific cell subsets using electrostatic cell sorting.
Genomics Core	Service Name	Description
Yu-Wei Cheng, Ph.D. Staff, Core Director Location: R4-058 Phone: 216-445-0757 Email: chengy@ccf.org MinHui Lim, Ph.D. Core Manager Location: R4-058 Phone: 216-346-3348 Email: limm3@ccf.org	Genotyping and Methylation Arrays	Clients provide the Core with arrays (Infinium) and DNA (generally 10 ul @ 50 ng/ul). The Core will process the DNA samples, hybridize to the arrays and produce relevant output files (at the Cleveland Clinic the Core can install the Illumina GenomeStudio software on a PC in your lab). Supported products: (most) Infinium and all GoldenGate products. E.g. Core Array Family Omni array Family Custom Genotyping. Bisulphite conversion can also be accomplished for methylation arrays if necessary.
	Nucleic Acid Quality/ quantity assessment	Characterization of the integrity of RNA and DNA samples using Agilent Bioanalyzer, Tapestation, or Fragment Analyzer systems. Samples may be destined for whole genome gene expression, genotyping, next gen sequencing library preparation and sequencing. Sample quantification via Qubit are also offered.
	Nucleic Acid Shearing Covaris Services	Nucleic acid fragmentation is a crucial first step in NGS sequencing workflow. Covaris S220 shears DNA without GC bias or thermal damage. The Adaptive Focused Acoustics™ (AFA) technology is firmly established as the fragmentation method of choice for NGS library generation.
	Single Cell Sequencing	In collaboration with the Flow Cytometry Core, the Genomics Core can prepare libraries and sequence single-cell mRNA libraries generated with the 10X Chromium.

	RNA sequencing	Extracted RNA libraries submitted to the Genomics Core can be prepared for RNAseq using either poly-a tail selection or rRNA reduction methods. Additional specialty services are also offered for challenging samples, including FFPE, low concentration, or degraded samples.
	Whole Genome Sequencing (WGS)	The Genomics Core offers a fully-automated PCR-free WGS workflow which can prepare high quality DNA samples for sequencing on our Novaseq system.
	Whole Exome Sequencing (WES)	Whole Exome Sequencing can be accomplished for submitted DNA samples using Agilent's SureSelect WES chemistry. This service can also be accomplished for FFPE samples.
	Walk-up Sequencing	For experienced users, the Genomics Core offers a walk-up sequencing service for all of our sequencing systems. Users can purchase an entire flow cell dedicated to their prepared libraries, and data can be returned to the investigator rapidly.
Glassware Core	Service Name	Description
Carmel M. Burns Core Manager Location: NB1-25 Email: burnsc@ccf.org	Biohazard Waste Processing	Live or contagious waste can be decontaminated by the autoclave process before disposal; this service is available through the glassware core.
	Glassware Services	Collection of glassware from labs daily storage of sterile glassware. Daily delivery and stocking of glassware in lab areas.
	Quarterly Testing of DI Water	DI water from through the Lerner complex is tested for Endotoxins on a quarterly basis.
	Sterilization and Autoclaving	Washing and sterilization of all types of glassware, sterile pipettes and Pasteurs, autoclaving of liquids and dry materials, washing and sterilization of special glassware, sterile tips and custom tips available, sterile DI water.
Hematology Analysis	Service Name	Description
Alan Pratt MT(ASCP) Core Manager Location: NE3-205 Phone: 216-218-9456 Email: pratta@ccf.org	Analysis of Whole Blood CBCs	Absolute and percent Reticulocyte (Retic), CBC plus white cell differential counts (CBC/diff), CBC/Diff plus retic (CBC/diff/retic), CBC/retic, Complete Blood Count (CBC).
Histology Core	Service Name	Description
Judith Drazba, Ph.D. Staff, Core Director Location: NB1-46 Phone: 216-445-3760 Email: drazbaj@ccf.org	Cryosectioning	Frozen tissue is cut into sections and placed on slides using a cryostat.
	Frozen Sectioning	Frozen tissue is cut into sections and placed on slides using a cryostat.

	Histology	The processing, wax embedding, cutting and staining of tissue for observation in a microscope.
	Paraffin Embedding	Placement of processed samples into wax blocks for sectioning onto slides.
	Plastic Embedding	Special form of histological tissue preparation that uses plastic resin rather than paraffin wax.
	Sectioning	The cutting of embedded tissue onto slides (also "cryosectioning").
	Tissue Processing	The preparation of tissue for cutting and staining that involves dehydration and infiltration with paraffin or plastic.
	Tissue Staining	Use of various dyes to render tissue visible and to mark particular features.
Hybridoma Core	Service Name	Description
Melanie Hoffner Shared Lab Resource Specialist Location: NB1-25 Phone: 216-445-6635 Email: hoffnem@ccf.org	Purifications	Purify monoclonal or polyclonal antibodies using Protein G or an epitope specific affinity column.
	Large-scale Antibody Production	Uses static cell culture system- the Integra Flask - to produce high concentration (>.5mg/mL) monoclonal antibodies. This can be done in serum free or using ultra low 1gG/1gM serum. Yields can be as high as 100mg/month/flask.
	Large-scale Antibody Purification	Can purify up to 80 mg of 1gG from one sample using a Protein G column.
	Liquid Nitrogen Storage of Cells	Storage for cloned cell lines. The stored cell lines must be mycoplasma free.
	Integra Culture System	For production of mAb from cell lines. This system is intended for production of 30-60mg of mAb per month in the smaller system and 100-200mg of mAb in the larger system. Average concentration is 1.5mg/mL. The production schedule average is 8 weeks.
Imaging Core	Service Name	Description
Judith Drazba, Ph.D. Staff, Core Director Location: NB1-46 Phone: 216-445-3760 Email: drazbaj@ccf.org	3-D Microscope Imaging	"Optical sections" or "Z Stacks" of samples can be obtained on confocal microscopes. The stacks can be reconstructed with software that allows 3-D visualization and analysis.
	Confocal Microscope	Laser- based confocal microscopes allow us to focus on a thin "optical section" within a sample, thus removing the out of focus light that comes from other layers of the sample. This offers not just a clearer image, but clarifies the location of the signal within a cell or tissue. Both samples on slides and live samples can be examined.

	Fluorescence Microscope	Microscopes with specialized illumination and detection that allow the imaging of fluorescently tagged specimens - both on slides and in wells, dishes and flasks.
	Image Analysis/ Quantitation	Various software programs allow microscope images to be examined for data such as area, intensity, volume, velocity, trajectory, etc. as required for 2-D, 3-D, and time-lapse experiments.
	Infrared Scanner (Odyssey)	Infrared scanning of gels, membranes, or slides on LI-COR Odyssey.
	Laser Capture Microdissection	Use of a specialized microscope equipped with lasers to cut and collect individual cells or small sections of tissues or cultured cells.
	Light Microscope	Samples can be viewed on a microscope using visible light for brightfield on fluorescence observation.
	Live Cell Imaging	Inverted microscopes allow the imaging of live cells in culture acquiring either still photos of time-lapse movies.
	Multi-Photon Microscope	A multi-photon microscope allows deeper penetration of light into a sample (up to 500um rather than the 100um of standard confocal) and can be used for tissue slices or pre-clinical research models.
	Slide Scanning	A large region of interest - or even the whole surface of a slide - can be imaged on a special scanner.
	Stereomicroscope	Dissecting microscope with color digital camera allows the imaging of large unmounted samples with brightfield and/or fluorescence illumination.
	Time-lapse Imaging	Inverted microscopes allow the imaging of live cells in culture over a determined period of time and at set intervals, producing time-lapse movies.
	TIRF Microscope	Total Internal Reflection Fluorescence with a microscope using a laser and specifically designed optics to view a thin region of a sample (less than 200 nm) attached to glass.
	Two-Photon Microscope	A multi-photon microscope allows deeper penetration of light into a sample (up to 500um rather than the 100um of standard confocal) and can be used for tissue slices or preclinical research models.
	Whole Slide Scanner	A large region of interest - or even the whole surface (microscope) of a slide can be imaged on a special scanner.

	Multiplex Whole Slide Scanning	Imaging whole formalin fixed paraffin embedded (FFPE) tissue sections and TMAs that have been stained with antibodies (up to 9 colors) for the purpose of visualizing, analyzing, quantifying, and phenotyping cells in situ. (See Multiplex IHC below for tissue staining.)
Immunohistochemistry	Service Name	Description
Judith Drazba, Ph.D. Staff, Core Director Location: NB1-46 Phone: 216-445-3760 Email: drazbaj@ccf.org	Antibody Titration	Experimental determination of appropriate antibody concentration for optimal imaging
	Immunohistochemistry	Staining tissues with antibodies to visualize the expression levels and distribution of specific proteins within cells and tissues.
	In situ Hybridization (ISH/FISH)	Chromogenic or Fluorescent in Situ Hybridization for localizing DNA or RNA in tissue.
	Multi-Plex IHC	Labeling tissues with 3-8 fluorescent antibodies simultaneously to localize multiple proteins in tissues.
	RNA Scope	Chromogenic or Fluorescent in situ Hybridization for localizing RNA in tissue.
Laboratory Diagnostics	Service Name	Description
Alan Pratt MT(ASCP) Core Manager Location: NE3-205 Phone: 216-218-9456 Email: pratta@ccf.org	Laboratory Testing	Automated clinical chemistry assays, Drugs of Abuse/Toxicology/Specific Proteins/ Metabolic Special Chemistry/ Fertility/ Pregnancy/ Therapeutic Drug/ Monitoring/ ELISA based testing
Media Preparation	Service Name	Description
Carmel M. Burns Core Manager Location: NB1-25 Email: burnsc@ccf.org	Bacteriological Media	Media used for the growth of bacteria.
	Buffers	A buffer is an aqueous solution that has a highly stable pH. (i.e. Phosphate and Tris Buffered Saline)
Media Preparation	Service Name	Description
Carmel M. Burns Core Manager Location: NB1-25 Email: burnsc@ccf.org	Cell Culture Media	A growth medium to support the growth of cells (i.e. RPMI and DMEM).
	Endotoxin Testing	The Endoscan V software system uses Kinetic Turbidimetrics to provide quantitative Endotoxin results for in process and end product samples. The assay sensitivity available for use is 0.06EU/mL using a standard curve of 5-0.05 EU/mL. The second method uses an endosafe-PTS - A rapid, point of use test system that utilizes Limulus Amebocyte Lysate (LAL) reagents in a test cartridge with a handheld spectrophotometer. The PTS can

		effectively be used to obtain fast, quantitative LAL results in about 15 minutes.
	FBS - Heat Inactivated or Regular	Fetal Bovine Serum, the most widely used serum - supplement due to its very low levels of antibodies and the fact that it contains more growth factors, allowing for versatility in many different cell culture applications.
	Insect Media	Media for insect cell culture.
	LB Agar Plates	Luria Broth agar plates are typically used as a growth substrate for the culture of bacteria. Selective growth compounds may also be added to the media, such as antibiotics. (i.e. Ampicillin and Kanamycin) Custom plates are also available.
	LB Broth	Luria Broth, a nutritionally rich medium used for the growth of bacteria.
	Specialty and Custom Media	A custom recipe prepared according to researchers instructions or guidelines.
	Sterility Testing	Verifying the sterility of our products or yours through QC broths, endotoxin and Mycoplasma testing.
Microbial Sequencing & Analytics Resource	Service Name	Description
Naseer Sangwan, Ph.D. Assistant Staff, Core Director Location: NE5 Phone: 216-445-4030 Email:sangwan@ccf.org	Nucleic Acid Isolation	The isolation of microbial DNA/RNA from various sample types (e.g. stool, tissue, saliva, urine, blood).
	Sequencing Library Prep. for Amplicon Based Sequencing	The amplification and sequencing of microbial biomarker genes. For example, the variable region of the 16S rRNA (e.g. V4), 18S rRNA gene, or the ITS region of fungi.
	Sequencing Library Prep for Whole Genome Microbial Sequencing. (i.e. shotgun genomics and metagenomics)	Library preparation that targets the total microbial gDNA. Basically, attaching appropriate sequence adapters and indexes to total community DNA fragments for de-multiplexing on an Illumina platform.
	Library Prep for Microbial Transcriptomic Sequencing	Converts microbial community mRNA into sequencing libraries compatible with Illumina's MiSeq. Notably, this library prep focuses on depleting rRNA from the sample before converting it to cDNA.
	NextGen Sequencing	High-throughput sequencing using Illumina's Iseq and/or MiSeq platform.
	BioInformatics	State of the art bioinformatics analysis and publication-ready visualization of microbial genomics and metagenomics data. a. Amplicon sequence data (e.g. 16s rRNA gene, 18S rRNA amplicon), (Qiime, DADA2, Deblur, FAPROTAX, PiCRUST, pyloseq, microbiomeSeq, ggplot2 etc.)

		b. Microbial genomics data 1. QC and adapter trimming, De novo (e.g. Spades) and reference-based (e.g. Unicycler) assembly, and validation 2. De novo and reference-based genome annotation c. Shotgun metagenomics data 1. Quality filtering and adapter trimming and de novo assembly 2. Taxonomy and functional analysis using raw sequencing and/or assembly data. 3. De novo microbial genome reconstruction from shotgun metagenomics libraries (i.e. MAGs) d. Meta-transcriptomics data 1. Quality trimming and adapter trimming 2. Reference genome/s mapping 3. Statistical analysis and visualization 4. Pathway and GSEA analysis
Molecular Biotechnology Core	Service Name	Description
Smarajit Bandyopadhyay, Ph.D. Project Staff, Core Director Location: NE5-204 Phone: 216-444-7095 Email: bandyos1@ccf.org	CD Spectroscopy	A Circular Dichroisms (CD) Spectropolarimeter (Model J-815 from Jasco) is a type of light absorption spectroscopy that can provide information on the structure of optically active biological macromolecules. CD spectra of proteins between 250 and 185 nm can be analyzed for different secondary structural types such as, alpha helix, parallel and antiparallel beta sheet, turn other random structures.
	Isothermal Titration Calorimetry	Isothermal Titration Calorimetry (ITC) is the gold standard for measuring biomolecular interactions. ITC simultaneously determines all binding parameters (n, K, δH and δS) in a single experiment – information that cannot be obtained from any other method. When substances bind, heat is either generated or absorbed. ITC is a thermodynamic technique that directly measures the heat released or absorbed during a biomolecular binding event. Measurement of this heat allows accurate determination of binding constants (KB), reaction stoichiometry (n), enthalpy (δH) and entropy (δS), thereby providing a complete thermodynamic profile of the molecular interaction in a single experiment. Because ITC goes beyond binding affinities and can elucidate the mechanism of the molecular interaction, it has become the method of choice for characterizing biomolecular interactions.

	Microscale Thermophoresis	The Microscale Thermophoresis (MST) technology allows measuring of every interaction type huge protein complexes to the binding of single metal ions. MST is a highly sensitive and powerful technique for quantifying molecular interactions. In a typical MST experiment, a microscopic temperature gradient is induced by an infrared laser, and the directed movement of molecules is detected by intrinsic fluorescence (Monolith NT. Label Free) or fluorescence of only one of the interacting molecules with attached fluorophore (Monolith NT.115), and quantified to determine the affinity constant (KD). This technology permits studying of the interaction of small molecules and proteins or membrane proteins stabilized in buffers of choice. Thus its high adaptability over other techniques renders it unique and unparalleled.
	Surface Plasma Resonance (SPR)	The cutting-edge technology, Surface Plasmon Resonance (SPR) has been used to monitor and quantify a variety of bio-molecular interactions in real time to determine on-rate, off- rate and the affinity constant. The Biacore S200 model is an instrument with high sensitivity that uses SPR technology for measuring the interactions of macromolecules like proteins with each other and with small molecules. In a typical experiment, the ligand molecule is immobilized on carboxy-methylated dextran over a gold film to create a suitable interaction surface, while the second partner (analyte) is captured as it flows over the immobilized ligand surface. Most ligands can be directly immobilized onto the surface of the chip via amino groups, carbohydrate moieties, or sulfhydryl groups. Others are immobilized indirectly through the use of biotinylation of the ligand (such as biotinylated peptides or oligonucleotides), or through immobilized monoclonal antibodies (such as anti-GST). Typical amounts of a protein ligand needed for an immobilization reaction is about 10ug. The immobilized ligands are remarkably resilient and maintain their biological activity.

Proteomics and Metabolomics	Service Name	Description
Belinda Willard, Ph.D. Associate Staff, Core Director Location: NE1-251 Phone: 216-444-7170 Email: willarb@ccf.org	Method Development	It is essential to provide accurate, reliable and consistent data in analytical services. Based on the need of investigators, we provide services for developing analytical methods using a) HPLC UV, b) HPLC Fluorescence, and c) LC/MS/MS for analysis of endogenous compounds and xenobiotics in biological matrices like plasma, urine and tissues.
	Molecular Weight Analysis	Determination of the molecular weight of a small molecule, peptide or protein.
	Post-translational Modification analysis: Global	Identification and quantitation of global post-translational modification sites from a complex samples such as cell lysates or tissue homogenates. These experiments are performed using modification specific enrichment. The post translational modifications that can be identified include phosphorylation, acetylation, and, ubiquitination.
	Untargeted Metabolomics	The unbiased analysis of small molecules (100-800 Daltons) derived from a variety of biological matrices such as plasma, urine, and cell extracts. These experiments involve the extraction of the small molecule metabolites, LC-MS/MS analysis, chromatographic alignment of the LC-MS data, and quantitative comparison of these metabolites across groups. The first involves the identification and quantitation of all metabolites based on the observed m/z ratio and retention time. This analysis results in the identification of 1000's metabolites. The identification of compounds of interest can be validated by follow up LC-MS/MS experiments. Analysis, chromatographic alignment of the LC-MS data, and quantitative comparison of these metabolites across groups. The data is analyzed with two different methods. The first involves the identification and quantitation of all metabolites based on the observed m/z ratio and retention time. This analysis results in the identification of 500 to 1000 metabolites many of which are unnamed compounds. The second method of data analysis involves the comparison of the observed metabolites to an in-house metabolite library. This method of data analysis results in the determination of the relative abundance of 100's of named metabolites in these samples.

	Protein identification and Quantitation	These experiments are performed with either in-gel, on-bead, or in-solution digestion usually using multiple proteases. Some examples of post-translational modifications that can be identified include phosphorylation, acetylation, methylation, ubiquitination, along with others. Identification and quantitation of proteins. These experiments can be performed on proteins in gel bands, affinity purified on magnetic beads, or in-solution. Protein quantitation can be performed using label free methods, isobaric tagging, or SILAC. For complex samples such as cell lysates or tissue homogenates, the samples can be pre-fractionated prior to LC-MS/MS to increase proteome coverage.
	Targeted Metabolomics	Targeted LC-MS/MS or GC-MS/MS analysis of small molecule metabolites in biological matrices. Several metabolite panels are available including amino acids, TCA metabolites, short chain fatty acids, fatty acids, oxidized fatty acids, along with others. Please contact the core to see if methods are in place for any metabolites of interest. The Metabolomics core will also perform method development for metabolites not currently available in a targeted panel.
Pre-Clinical Imaging Core	Service Name	Description
Charlie Androjna, D.Eng. Assistant Staff, Core Director Phone: 216-287-1738 Email: androjc2@ccf.org	Biospec 70/20 USR MRI	The Bruker Biospec 70/20USR is a 7T horizontal bore magnet that operates at 400 MHz and runs ParaVision™ 6.0.1 software. This micro-MRI system is designed for high-resolution MR spectroscopy and imaging of pre-clinical specimens. The 20 cm diameter bore and extra-long table offers imaging capabilities on various research sized models/in situ specimens. The facility has several different coil systems allowing for high resolution scanning at < 100 um voxel size.
	GE Locus RS Micro-CT	The GE eXplore Locus RS micro-CT system is designed for high resolution imaging (20-100 um) imaging of small research sized models/in situ specimens. CT applications include: (1) whole research models at 45 or 93 µm voxel size (2) specific regions within a research model at 20 µm voxel size and (3) in vitro specimens at 20 µm voxel size.

	Mediso nanoScan PET/CT	The Mediso nanoScan PET/CT acquires high resolution PET/CT or CT scans of small and large research models and 'ultra-zoom' CT scans of specimens. Its transverse field of view is up to 12 cm, and its bore diameter is 16 cm. Pre-clinical imaging is supported using chambers of various sizes; a "hotel system" is also available for scanning up to four research models at once.
	PerkinElmer IVIS Lumina III XRMS	The IVIS Lumina XR Series III systems provides an expandable, sensitive imaging system that is easy to use for fluorescent, bioluminescent, radio-isotopic and X-Ray imaging with multiple research models imaging at a one time. Ideal for researchers in the area of oncology, infectious disease, drug discovery, efficacy and/or toxicology research.
	PerkinElmer IVIS Spectrum CT	The IVIS Lumina XR Series III provides an expandable, sensitive imaging system that is easy to use for fluorescent, bioluminescent, radio-isotopic and micro-CT imaging with multiple research models imaging at one time. Ideal for researchers in the area of oncology, infectious disease, drug discovery, efficacy and/or toxicology research.
Laboratory Diagnostics	Service Name	Description
Alan Pratt MT(ASCP) Core Manager Location: NE3-205 Phone: 216-218-9456 Email: pratta@ccf.org	Phlebotomy	Limited phlebotomy services provided for consented subjects.
Pre-Clinical Behavior Core	Service Name	Description
Tom Jaramillo, Ph.D. Project Staff, Core Director Phone: 216-938-1548 Email: jaramit@ccf.org	Cognitive Testing	Morris Water Maze, Stimulus Conditioning, Novel Object Recognition, Y-Maze, Barnes Maze.
	Anxiety Testing	Elevated Plus Maze, Dark/Light, Open Field.
	Motor Testing	Rotarod, Grip Strength, Gait Analysis, Locomotor Activity.
	Social Interaction Testing	3-Box Social Interaction, Age-based, Genotype-based, Sex-based.
	Innate Behavior Testing	Olfactory, Nesting, Visual Acuity and Contrast Sensitivity, Vocalization.
	Repetitive Behavior Testing	Grooming, Marble Burying, Rearing Activity
	Sensorimotor Testing	Temperature, Startle, Pre-pulse Inhibition, Plantar.
	Depression-like Testing	Swim, Sucrose Preference, Suspension
	Circadian Rhythm Testing	Running Wheel.
	Metabolic and Weight Testing	CLAMS, Oxymax, EchoMRI.