Core Facilities at the University of Arkansas for Medical Sciences (http://tri.uams.edu/research-resources-services-directory/core-facilities-technical-services/):

1. **Biodosimetry Diagnostic Core (Director: Howard Hendrickson, PhD)**: Offers high-throughput analytical services for determining diagnostic amino acids and their precursors or metabolic products using ultrahigh-performance liquid chromatography-tandem mass spectrometry (UHPLC-MS/MS). Available biomarkers include citrulline and tetrahydrobiopterin. Determination of other small molecules is possible with additional method validation.

2. **Digital and Electron Microscopy Core (Director: Brian Storrie, PhD)**: Operates and maintains computer-controlled microscope workstations ranging from light to electron microscopy. Available equipment includes Zeiss LSM 510 Meta, AzioImager, and Axiovert S100TV microscopes and a FEI Tecnai F20 200keV electron microscope. (See **sidebar** below for Dr. Storrie's description of the Arkansas INBRE's role in fostering usage of his facility in science education and collaborations.)

3. **Flow Cytometry Core (Director: Andrea Harris)**: Provides cell sorting as well as biomarker, cell cycle, cell proliferation, membrane potential and other analyses. Available instrumentation includes the FACSAria with three lasers and detection of up to nine colors at one time and cell sorting of up to four populations at once. The FACSCalibur has four fluorescence detectors plus forward- and side-scatter detectors and is used for a variety of cell analyses.

4. **Proteomics Core (Director: Alan Tackett, PhD)**: Provides protein characterization by mass spectrometry. Services include identification of unknown proteins, quantitative comparison of proteins in biological samples, and mapping of post-translational protein modifications. Available instrumentation includes a Thermo Orbitrap Velos ETD, Thermo Orbitrap, Thermo LTQ XL ETD, a PerkinElmerSciex MALDI-prOTOF, a Waters Q-TOF Micro, and a vMALDI Thermo LTQ. Mass spectrometers are equipped with Waters UPLC systems or Eksigent nanoLC-2D systems. For mass spectrometric studies, the core has two user licenses for Rosetta Elucidator client software, powered by an Oracle 10G database, designated for laboratory workflow creation and data analysis. Data analysis resources include: a dedicated eight-core server for primary mass spectrometry peak statistics; a separate Redundant Array of Independent Disks array storage scheme for raw proteomic data storage; a Matrix Science 4-cpu license for Mascot protein identification software and Mascot Distiller; and four quad-core PCs for data analysis running Scaffold (Proteome Software), Bioworks (Thermo), and MaxQuant. The Proteomics Core is directed by Dr. Tackett. He took over this Core Facility in 2009. Since 2011, this core facility has been ranked the number one facility at UAMS. The experience gained in directing this core facility positions Dr. Tackett well for serving as Director of the Arkansas INBRE Research Technology Core.

5. **DNA Sequencing Core (Director: Allen Gies)**: This core makes DNA sequencing available to researchers so that they do not have to invest the funds and training of personnel to do it themselves. Available equipment includes the Operate 3100 Genetic Analyzer and supporting equipment (e.g., centrifuges, thermal cyclers, etc.). This core has recently added an Illumina MiSeq for deep DNA sequencing capabilities. Sequencing data analysis programs and expertise are in place.

6. **Genomics Core (co-Directors: Susan Kadlubar, PhD, and Charlotte Hobbs, MD/PhD)**: Provides access to state-of-the-art instruments and information-intense data for DNA, RNA, and microarray analysis. Available equipment includes the Agilent 2100 Bioanalyzer and Illumina iScan, BeadXpress, Cluster Station, and Genome Analyzer IIx systems. The core also uses a Tecan Robot for Illumina protocols and a Corbett Gene Extractor. Additional available equipment includes a SpectraMax Microplate Reader, Laser Capture Microdissection and Applied Biosystems 7900 Real-Time PCR. Sequencing data analysis programs and expertise are in place.

7. **DNA Damage and Toxicology Core (Director: Alexei Basnakian, MD/PhD)**: Provides expertise, equipment and facilities to perform DNA damage and toxicology studies related to toxic or hypoxic tissue/cell injury in drug development, diseases, or aging. In addition to offering standard cytotoxicity assays including *in vivo* toxicology testing with approved IACUC protocol, the core can measure oxidative

damage and quantify levels of apoptosis and necrosis in cells and tissues by using quantitative cytochemistry, immunocytochemistry techniques, and 3-D imaging.

8. **Experimental Pathology Core (Director: Stephen Post, PhD)**: Offers centralized, comprehensive histological services. The laboratory director, consultants and technicians have extensive experience in routine histology and immunohistochemistry involving both human and animal tissues. The core offers veterinary pathology and a wide range of tissue analyses including Aperio digital slide scanning and image analysis.

9. **Skeletal Phenotyping Core (Director: Larry Suva, PhD)**: Performs high-resolution skeletal imaging and analysis utilizing bone densitometry (DXA), peripheral quantitated computed tomography (pQCT) or microCT, and detailed histological analysis. Skeletons can be analyzed *in vivo* or *ex vivo*. When combined with histological evaluation, detailed insight into skeletal phenotype is obtained.

10. **Tissue Procurement Facility (Director: Stephen Post, PhD)**: Offers a diverse, high-quality human biospecimen repository with appropriate patient protections, best practice collection methodologies, clinical data capture mechanisms and integrated information technology. The facility is designed to enhance diagnostic, preventive and therapeutic research efforts.

11. **Bioluminescent & Fluorescent Imaging Core (Director: Larry Suva, PhD)**: Offers *in vitro* and *in vivo* biophotonic imaging services using bioluminescence and/or fluorescent molecules as reporters of gene or protein expression. The core maintains a Caliper Life Sciences IVIS 200 Imaging System, a highly sensitive CCD camera optimized for biophotonic imaging. The core has applications in many areas, including osteomyelitis, oncology, inflammation, and metabolism.

12. **Biotelemetry & Ultrasound Imaging Core (Director: Shi Liu, PhD)**: Offers invasive and noninvasive monitoring of cardiovascular function and tumor research using small animal models. The core maintains environmentally controlled, individual rodent housing, and 37 transmitters and 16 receiver stations for biotelemetry. The VisualSonic Vevo 2100 System is used for high-frequency, high-resolution digital imaging with linear array technology and color Doppler. This instrument provides frame rates in 2D up to 740 fps and superior resolution (30 micron) and image uniformity through the entire field of view.

13. **Molecular Imaging Core (Director: Michael Borrelli, PhD)**: Provides comprehensive services for noninvasive imaging with a 7 Tm Magnetic Resonance Imager (MRI) and a MicroPET (Positron Emission Tomography). These instruments can be used to image small animals, biological tissues, phantoms, appendages of human subjects, and many other samples. An on-site cyclotron and a fully staffed radiochemistry laboratory provide a wide range of standard radiolabeled PET imaging probes and can help develop and produce custom probes.

14. **Transgenic Mouse Core (Director: Charles O'Brien, PhD)**: A state-of-the-art resource offering generation of transgenic mice via pronuclear microinjection of DNA constructs supplied by users. Microinjections are performed in embryos obtained from C57BL/6 or CB6F1 (a cross between BALB/c and C57BL/6) mice. Personnel are also available for consultation regarding DNA construct design and animal husbandry. The core consists of dedicated laboratory space with a microinjection suite, cryopreservation lab, and isolator rack animal wards.

Core Facilities at the University of Arkansas at Fayetteville (http://protein.uark.edu/2135.htm):

1. **NMR Spectroscopy Core Facility (Director: Suresh Kumar, PhD):** Provides structural analysis of proteins and peptides by NMR. The NMR core facility includes new 700 MHz and 500 MHz NMRs with cryoprobes, as well as a 500 MHz NMR, and two 300 MHz solid-state NMRs. The 700 MHz NMR with cryoprobe was the first to be installed in the US, and offers significant advantages in sensitivity for the study of large proteins.

2. **Protein X-ray Crystallography Core Facility (Director: Joshua Sakon, PhD):** Solves protein crystal structures using equipment that includes a Rigagku Cu anode generator with a Saturn 99 CCD detector, a Rigaku Cr anode generator with R-AXIS IV detector, a Robotic Protein crystallization instrument, and computer cluster graphics systems. While many of the protein crystal structures will be completely solved in-house using new X-ray diffraction instrumentation, the larger, more difficult protein structures will require collection of diffraction data at national synchrotron facilities. The facility director is a registered user of the Advanced Photon Source at the Argonne National Laboratory.

3. **Chemical Synthesis Core Facility (Director: Matt McIntosh, PhD):** Offers custom small molecule synthesis important for drug discovery and design. Equipment in the Synthesis Core facility includes eight Radley 12-vessel parallel synthesizers, a CEM Explorer Automated Microwave Synthesis Workstation, an Agilent GC-MS, and Bruker Avance 300 and 400 MHz NMR spectrometers.

4. **Large-Scale Protein and Peptide Production Core Facility (Director: Ralph Henry, PhD):** Provides large scale growth capabilities by using high-density fed-batch culture technology, which can produce over ten times more protein per liter than traditional shaking culture methods. Such an approach is especially critical to meet protein labeling demands for NMR-based structure studies, where the use of large culture volumes to overcome "poor" protein expression prohibits the use of expensive ^{13}C and ^{15}N isotopic labels. Equipment in the core includes a production suite consisting of four Applikon Bioreactors, an Applied Biosystems gas phase protein sequenator and peptide synthesizer, Beckman analytical and preparative ultracentrifuges, two AKTA Explorer FPLC systems, and numerous HPLC units.
5. **Arkansas Statewide Mass Spectrometry Facility (Director: Jackson O. Lay, Ph.D.):** Provides high resolution mass spectrometry to solve challenging structural problems in proteins and small molecules. Instrumentation includes a Bruker Reflex III MALDI-TOF, and a Bruker Esquire-LC Ion Trap LC/MS. The new Bruker Apex Ultra 9.4 T FT/MS Fourier Transform mass spectrometer provides the highest resolution currently available for protein structure analysis. The unrivalled mass measurement accuracy and resolving power allow the solution of difficult protein characterization problems. The 9.4 Tesla FTMS is also important in providing the exact mass data that are crucial for determining the elemental composition and molecular structures of natural products and synthetic intermediates.