ICBR Facilities and Services – Boilerplates for Proposal Preparation

Contents
Overview Statement ...................................................................................................................... 2
Proteomics Division .................................................................................................................... 2
  Protein Biomarker Core ............................................................................................................. 2
  Mass Spectrometry Core .......................................................................................................... 3
Genomics Division ..................................................................................................................... 3
  Genetic Analysis and SNP Genotyping Core ........................................................................... 4
  Sanger Sequencing Core .......................................................................................................... 4
  NextGen Sequencing Core ....................................................................................................... 4
  qPCR or Real-Time PCR Core ................................................................................................ 4
  Gene Expression ...................................................................................................................... 5
Cellomics Division ..................................................................................................................... 5
  Electron Microscopy and BiImaging Core ................................................................................ 5
  Flow Cytometry Core ............................................................................................................... Error! Bookmark not defined.
  Hybridoma Core ..................................................................................................................... Error! Bookmark not defined.
Bioinformatics Division ............................................................................................................ 6
Education and Training Section ................................................................................................ 7
CyberInfrastructure Section ...................................................................................................... Error! Bookmark not defined.

Note: The contents of this document are designed to provide general overviews of ICBR, brief descriptions of ICBR Division and Sections, along with paragraph-sized descriptions of particular core services. Use of these descriptions with proposals is welcome and encouraged. Potential ICBR clients are strongly encouraged to work with directly with relevant ICBR staff to get additional specific details on budget items, staff expertise and equipment descriptions.
Overview Statement
The Interdisciplinary Center for Biotechnology Research (ICBR) at the University of Florida is a high-end technology and science research center staffed with over fifty scientists and technicians. The ICBR mission is to serve as a world-class research support center that provides scientifically knowledgeable, technically superb scientific services to University of Florida faculty, staff, graduate students, and other research partners throughout the state and nation. Founded in 1987, ICBR is dedicated to initiating and supporting the best of front line technology within the ever-changing and wide-ranging scope of the molecular life sciences and to do so in a central environment that is responsive to all core services issues such as equal and appropriate access, price structures and billing. To represent today’s biotechnology landscape, ICBR's research support laboratories are currently organized into four scientific divisions and two coordinating sections. The ICBR Divisions are: Proteomics, Genomics, Bioinformatics and Cellomics. Each is dedicated to the technology and science within their representative disciplines. The ICBR Sections are: CyberInfrastructure and Education and Training. Each section is dedicated to integrative and enabling activities that reach across all ICBR. ICBR provides more than 250 specific services in the areas exemplified by custom and high-throughput DNA sequencing and genomics, proteomics, mass spectrometry, gene expression, hybridoma, flow cytometry, electron microscopy, genetic analysis, bioinformatics and bioimaging from confocal microscopy to cryo-EM.

Proteomics Division
The Proteomics Division directed by Sixue Chen, PhD offers Biomarker Discovery, Mass Spectrometry and Protein Characterization. Proteomics and mass spectrometry have provided unprecedented tools for fast, accurate, high throughput biomolecular separation and characterization, which are indispensable towards understanding the biological and medical systems. Studying at the protein level allows researchers to investigate how proteins, their dynamics, modifications and interactions affect cellular processes and how cellular processes and environment affect proteins. The mission of our facility is to provide excellent services, education and training in proteomics and mass spectrometry. Please visit our facility website: http://www.biotech.ufl.edu/proteomics/

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Protein Biomarker Core
Biomarker Core provides a variety of services related to Biomarker Discovery, such as protein abundance analysis using gel-based 2-D Fluorescence Difference Gel Electrophoresis (2-D DIGE); protein separation using 1-D or regular 2-D gel electrophoresis and Western blotting; 2-D gel-based phosphor protein and glycoprotein profiling. For these services we have instruments such as Ettan IPGphor, Ettan DaltSix, Typhoon Trio* phosphor scanner, Investigator ProPic automatic spot picker. In addition, we have image analysis softwares such as GE’s DeCyder and Non-Linear Dynamics SameSpot Progenesis with Stats. Furthermore, the Core provides protein enrichment and abundant protein depletion from biological fluids such as plasma, CSF, and urine using different techniques such as combinatorial peptide (ligand) library, and assorted immunodepletion. We also provide liquid phase preparative IEF to fractionate protein or peptide mixture using an Agilent 3100 Offgel fractionator.
Moreover, the Core provides training on using Surface Plasmon Resonance (SPR) technology to study molecular interaction. We have Biacore 3000 for therapeutic drug discovery, antibody screening, and ligand fishing, and other applications including affinity measurements, binding kinetics, binding specificity, epitope mapping, and active concentration assay.

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**Mass Spectrometry Core**

The mass spectrometry core provides a variety of services related to protein fractionation, qualitative and quantitative mass spectrometry analysis, de novo protein sequencing and protein database searching. Protein sequencing and identification are routine procedures in the lab. The capabilities in quantitative proteomics include iTRAQ® (Isobaric Tags for Relative and Absolute Quantitation), cysTMT (Tandem Mass Tags), SILAC (Stable Isotope Labeling of Amino acids in Cell cultures), and a MRM (Multiple Reaction Monitoring) based absolute protein quantification. Along with our capacities of separating thousands of proteins and characterizing differential protein expression, we have a suite of state-of-the-art mass spectrometers available for biomedical and advanced technology research, including a MALDI-TOF (Matrix Assisted Laser Desorption Ionization- Time-of-Flight), a MALDI-TOF/TOF (4700 Proteomics Analyzer, AB), two quadrupole time-of-flight instruments (QSTAR XL and QSTAR Elite, AB), a quadrupole-linear ion-trap (4000 QTRAP, AB), and an advanced LTQ Orbitrap system. These instruments are mainly used for accurate molecular weight determination, protein identification, posttranslational modification, expression analysis (using in vitro isotope labeling, SILAC in vivo labeling, and label free). Our facility is also set up to provide Edman de novo N-terminal protein sequencing, and sample fractionation using HPLC. To ensure success and maximize productivity, the facility offers education, consultation, data processing and reporting, and support of grant application.

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**Genomics Division**

The Genomics Division of the University of Florida’s Interdisciplinary Center for Biotech Research (ICBR) offers state-of-the-art fee-based genetic analysis resources and expertise to both UF and off-campus researchers. The Genomics Division is comprised of multiple technology-based core laboratories: Sanger DNA Sequencing, NextGen Sequencing, Genetic Analysis and SNP Genotyping, Gene Expression, and Real-Time PCR. Resources for Sanger sequencing include Applied Biosystem’s (AB) 3730xl and 3130, while Roche’s 454 GS-FLX with XL-plus upgrade, LifeTech’s SOLID 5500xl and Ion Torrent PGM systems, Illumina’s Genome Analyzer, and Pacific Biosciences’ SMRT system are being used by NextGen Sequencing core for applications such as de novo sequencing whole genomes, transcriptomes, RNA sequencing, chromatin immunoprecipitation (ChIP) sequencing, methylation experiments, and metagenomics. Agilent and Affymetrix platforms are used for gene expression analysis, Illumina bead station for SNP genotyping, and ABI7900HT for RT-PCR studies. The facilities personnel also assist investigators in experimental design and some simple data analysis.

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Genetic Analysis and SNP Genotyping Core
The ICBR Genetic Analysis and Genotyping Laboratory (GA/GT) provides a variety of basic molecular biology services such as DNA isolations, PCR reactions, and PCR purifications for sequencing. We also set up most types of fragments for analysis on the AB3730xl automated sequencer; providing the buffers and size standard. The AdvanCE FS96 is a 96 capillary instrument used to analyze fragments with greater than trinucleotide repeats. In addition, GA/GT designs, characterizes, and processes microsatellite loci used for individual identification, population studies, and geneflow. GA/GT has an Illumina BeadArray Reader used to analyze SNP and gene expression samples in a high throughput fashion.

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Sanger Sequencing Core
Founded in 1988, the Sanger DNA Sequencing Core of the Interdisciplinary Center for Biotechnology Research (ICBR) solicits DNA samples from all over the United States for sequencing on fee basis. Automated DNA sequencing is performed using ABI big dye chemistry and ABI 3730xl and 3130xl genetic analyzers. The services include standard DNA sequencing on user provided purified single or double stranded plasmid DNA or PCR products, sequencing on large size clones, 96-well sequencing on bacterial cultures and PCR products, and load only DNA sequencing. The primer walking and sequence alignments for inserts greater than 2kb are also available. We also offer technical advice on the best strategy for individual sequencing project and troubleshooting of sequencing reactions.

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NextGen Sequencing Core
The NextGen Sequencing Core belongs to the Genomics Division of the Interdisciplinary Center for Biotechnology Research (ICBR). Its services include a wide array of applications using cutting-edge next generation DNA sequencing technologies such as Roche’s 454 GS-FLX with XL-plus upgrade, LifeTech’s SOLID 5500xl and Ion Torrent PGM systems, Illumina’s Genome Analyzer, and Pacific Biosciences’ SMRT system. The ever-broadening range of applications includes de novo sequencing of whole genomes, targeted sequencing, transcriptome sequencing (RNA-seq), chromatin immunoprecipitation (ChIP) sequencing, methylation experiments, and metagenomics. The facilities personnel provides free consultation on cost considerations, plate configurations, and platform-specific applications.

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qPCR or Real-Time PCR Core
ICBR provides two different instruments to support the real-time PCR needs of the research community, the Applied Biosystems (ABI) 7500 FAST and ABI 7900HT. Both machines support SYBR® or TaqMan™ reagents allowing absolute, relative, relative standard or comparative Ct quantification. Applications include quantitative gene expression analysis, pathogen detection/quantification, allelic discrimination (SNP detection), and mutation screening. Flexibility for different budgets and technical skill levels is provided by offering two different types of service; walk-up self-service on the AB 7500 FAST for
researchers that want to set-up and run their own plates but not purchase their own machine, and technician assisted service on the AB 7900HT that supports 96 and 384 well formats, 384 TaqMan Array and FAST 96 well.

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**Gene Expression Core**
The ICBR Gene Expression (GE) provides a variety of services related to Affymetrix and Agilent array process including whole genomic wide gene expression arrays, miRNA array, DNA arrays, Gene Regulation Analysis arrays. GE also offers RNA-Seq, SAGE, small RNA and Sequence Capture libraries construction for different NextGen Platform. GE also has Agilent Bioanalyzer used to do quality assessment for DNA and RNA samples. In addition, we also provide cDNA normalization service for NextGen application.

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**Cellomics Division**
The Cellomics division of ICBR is devoted to assisting investigators in the study of cell structure, function and generation and application of cellular products. The Cellomics cores are: Electron Microscopy and BioImaging, Flow Cytometry and Hybridoma.

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**Electron Microscopy and BioImaging Core**
The Electron Microscopy and Bio-Imaging Core provides microscopic imaging services on a fee-for-service basis. The core is equipped with a set of microscopes having imaging capability from whole tissues to macromolecules. They include FEI F20 cryoelectron microscope, FEI Spirit cryoelectron microscope, Hitachi H-7000 transmission electron microscope, Hitachi S-4000 scanning electron microscope, Zeiss Pascal LSM5 confocal laser scanning microscope, Olympus BH2 compound epifluorescence microscope with, and Meiji dissecting microscope. All the microscopes have digital cameras that capture high-resolution images. A full range of ancillary instruments for sample preparation such as high-pressure freezer, automatic tissue processor, and ultramicrotomes are also housed in the core. Our main services are transmission electron microscopy and scanning electron microscopy analyses. Imaging projects are carried out by core staff members or by individual researchers after appropriate training.

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**Flow Cytometry Core**
The Flow Cytometry Core provides a variety of tools and expertise for cellular measurements. The laboratory incorporates numerous flow cytometers, from simple entry-level devices (FACS Calibur or CyFlow-C6, BD Biosciences, San Jose, CA) to high-end 5-laser, 16-parameter instruments to analyze (LSR-II, BD Biosciences) or sort cells (Aria-II, BD Biosciences). In addition to flow cytometers, the laboratory
offers a laser confocal scanning microscope (TCS-SP5, Leica Microsystems, Exton, PA). The microscope is well equipped with a variety of excitation lines from near UV to red and can collect 3 to 4 emission colors (depending on dye combinations), with viable cell time lapse and extensive computed parameter capabilities, including FRET, FRAP, image stitching, and 3D reconstruction. The laboratory offers two sites: a main site at the Cancer/Genetics Research Complex, and a satellite laboratory at the McKnight Brain Institute. Staff members are available for consultation in planning cytometric assays and carrying out the analytical portion of the assay, including analysis of the resulting data. Samples must be prepared for cytometry in the investigator’s laboratory, although if needed, some preparation capabilities exist at the Cancer/Genetics site. Training in analytical instrument operation for Investigator’s staff is also available.

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**Hybridoma Core**

The primary service of this core is the development of new mouse monoclonal antibodies. All phases of hybridoma development are carried out by this laboratory: immunization of mice, fusions, screening (ELISA and western blotting), single cell cloning, mycoplasma testing and isotype determination. Other services include high density *in vitro* antibody production, purification and labeling of monoclonal antibodies. Assistance is also available for developing immunoassays and for determining antigen:antibody binding constants using the Octet QKe from ForteBio (BioLayer Interferometry).

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**Bioinformatics Division**

The Bioinformatics Division, directed by Fahong Yu, Ph.D. offers bioinformatics and biostatistics consulting and data analysis services to help researchers toward an in-depth understanding of large-scale data sets acquired from next-generation sequencing (NGS: 454, SOLiD, Ion Torrent, Illumina GAIL, and PacBio systems), gene expression, and mass-spectrometry analytical technologies. We collaborate with researchers in designing experiments and analyzing complex datasets by applying various data-analytical and theoretical methods, mathematical modeling and computational simulation techniques. We have developed multiple comprehensive pipelines that enables researchers to process large-scale data, including metagenomics (characterization of microbial communities found in harsh Arctic climates, termite guts, and premature infants), transcriptome and genome annotation (project-based EST/genomic sequence assembly, annotation, and gene prediction), microarray-based data analysis (statistical and functional data analysis from major microarray platforms of various species), and other peer-reviewed NGS data analysis (e.g., RNA-Seq, DNA-Seq, and ChIP-Seq).

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Education and Training Section

The ICBR Education and Training Core Laboratory is a state of the art training facility equipped to teach a diverse range of topics and techniques. Student work areas are designed to be mini-lab benches containing all the basic items students need experimentally such as pipettes, vortexers and electrophoresis units. Each work area is also supplied with a laptop computer and wireless internet access so bioinformatics projects can be integrated into the course material. The classroom has a Syngene G:BOX chemiluminescent camera, Olympus BX40 fluorescent microscope with attached DP70 camera, and a Bio-Rad CFX96 qPCR machine. The instructional audio visual podium features a Smarttech Symposium™ interactive pen display, TELEX® wireless microphone system, digital projector and DVD/VCR player. The preparatory lab area attached to the 2100 sq. ft. classroom is fully equipped for basic molecular biology or microbiology applications including mammalian tissue culture. In addition to courses regularly taught by our ICBR staff disseminating the latest techniques in use at ICBR in the area of Proteomics, Cellomics and Genomics several courses are taught for undergraduate and graduate student credit. The room and Education and Training core lab employees are available for a fee to assist with course development, advertising, room and equipment rental to University of Florida staff and faculty as well as outside vendors.

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