Swanson Biotechnology Center

The Swanson Biotechnology Center (SBC) of the David H. Koch Institute for Integrative Cancer Research (KI) is a collection of 14 sophisticated operating units crucial to the Koch Institute's mission to combine advanced science with innovative technology to discover new solutions to the problems of cancer. Occupying 70,000 square feet over three floors of the Koch Institute's new 360,000 square foot advanced research and technology facility under construction on the MIT campus, and scheduled to open in December 2010, each of these units will provide key technical services to MIT's large community of cancer researchers: faculty, postdoctoral researchers, graduate students, undergraduates, and affiliated clinicians.

From routine essential support services to advanced technical and consulting services, the operating units of the SBC will support and enhance the leading edge cancer research being conducted on a daily basis. Many of the facilities will also offer training programs that enable Koch Institute staff, students, and postdoctoral fellows to acquire the technical and intellectual expertise needed to advance both their work and their careers.

Key Capabilities

ES Cell & Transgenics

This shared resource provides fee-for-service support to all MIT investigators who utilize novel mouse models to study human diseases such as cancer. The Rippel Mouse ES Cell & Transgenics Core Facility specializes in assisting researchers with the design, generation, maintenance, and analysis of mice containing designer mutations. The facility also provides skilled assistance with a variety of protocols utilizing mouse ES cells (establishment of new lines, differentiation into specific cell types). Services include:

- Gene targeting in ES cells, including assistance with targeting design and analysis
- Injection of DNA, ES cells, or virus into pre-implantation mouse embryos
- Mice containing tissue-specific Cre, FLP, or reporter genes as well control and wildtype strains
- Assistance, training, and reagents for ES cell, embryo and mouse analysis
- Detailed methods for protocols used with mouse/ES cell studies

Applied Therapeutics & Whole Animal Imaging

The Applied Therapeutics & Whole Animal Imaging facility assists and accelerates the process of moving scientific breakthroughs from the benchtops of the Koch Institute to the clinics for cancer patients. Our primary goal is to support and encourage the translational efforts using refined mouse models of human cancers to test:

- biosensors for tumor detection and monitoring
- diagnostic assays
- cancer vaccines
- drug delivery systems and tumor-targeting modalities
- chemotherapeutic response and drug resistance

In addition to providing assistance with design, approval and execution of relevant preclinical trials, the facility also provides access to instrumentation for in vivo, whole animal imaging, including bioluminescence, microCT, and small research animal MRI technologies.
Key Capabilities

Nanotechnology Materials

This unit will provide support for new materials discovery and optimization, enabling development of drug- and gene-delivery vehicles, imaging, nano- and microparticles, and devices. Services will include in vivo testing in conjunction with the Applied Therapeutics & Whole Animal Imaging Core, as well as a range of tools for physical and chemical characterization of all types of nanoparticle systems.

Histology

The Histology facility assists investigators in producing quality histological slides from frozen, paraffin-embedded, and resin-embedded tissues, thus enabling investigators to better evaluate the pathologic consequences of various mutations or treatments. Services range from hematoxylin and eosin-stained and special stained slides, to advice and assistance in performing immunohistochemistry, immunofluorescence, and in-situ hybridization.

Microscopy

The Microscopy facility is a centralized resource housing state-of-the-art imaging equipment, with a complete range of image acquisition and data analysis capabilities. Expert experimental advice, instrument training and access, and fee-based technical service are available for multiple imaging platforms:

- Standard light and epifluorescence microscopy
- Deconvolution-based high-resolution fluorescence microscopy (DeltaVision and OMX “super” DeltaVision)
- Confocal microscopy (spinning disk and scanning head)
- Multiphoton laserscanning microscopy
- Total internal reflection microscopy (TIRF)
- Spectral karyotyping (SKY) and fluorescent in situ hybridization (FISH)
- Laser capture microdissection microscopy
- Standard transmission electron and immunoelectron microscopy

Flow Cytometry

The Flow Cytometry facility provides high-speed cell sorting services as well as access, training, and support in the use of bench-top analysis flow cytometers.

High Throughput Screening

This unit will facilitate the development of a wide range of experimental assays into high throughput screening strategies. Support for assay development will include liquid handling robotic systems, high content imaging capabilities, and management of RNAi, small molecule and nanoparticle libraries.

Biopolymers & Proteomics

The Biopolymers & Proteomics facility provides researchers with integrated synthetic and analytical capabilities for biological materials, including DNA, proteins and nanoparticles. The unit encompasses a wide range of sophisticated technical expertise and state-of-the-art instrumentation. Services include:

- routine Sanger DNA sequencing
- next-generation sequencing (Illumina platform)
- mass spectrometry-based proteomics approaches for identification, characterization, or quantitation of proteins from simple to complex mixtures
- mass spectrometry-based mass measurement and mass mapping
- peptide synthesis and purification, including peptide arrays
- high-pressure liquid chromatographic analysis and purification
Key Capabilities

Microarray Technologies

The Microarray Technologies facility provides investigators with integrated facilities for microarray experiments on Affymetrix and Agilent platforms, including hybridization, scanning, processing and image analysis, and microarray validation tools such as RNA quality assessment and real time PCR.

Bioinformatics & Computing

The Bioinformatics & Computing facility provides researchers with assistance and training in a wide range of bioinformatics-related topics. Examples include assistance with experimental design and subsequent analysis of next-generation sequencing (Illumina platform) and microarray experiments, genome annotation projects, and other sequence and phylogenetic analysis applications. The unit also provides Koch Institute members with critical data backup as well as installation and maintenance of desktop hardware and a variety of software, including scientific applications.

Protein Engineering

This Facility will support phage- and yeast-display screening technologies for peptide and antibody affinity binding.

Shared Research Resources

The Shared Research Resources facility oversees maintenance of shared research spaces (cold rooms, warm rooms, tissue culture rooms and darkrooms) and distributed equipment (autoclaves, ice machines, X-ray film developers, etc). The unit also coordinates implementation of the MIT Environment, Health & Safety management system (EHS-MS) by providing safety inspections, laboratory safety, staff training and hazardous waste management. Finally, the unit oversees dedicated KI research spaces developed to provide oversight of, and enable safe working practices with, high titer VSVg-pseudotyped viruses, high-risk isotopes, and the cesium γ-cell radiation source.

Media Preparation

The Media Preparation facility provides Koch Institute laboratories with a wide array of high-quality custom-made bacterial, yeast, and tissue culture media.

Glassware Preparation

The Glassware Preparation facility provides centralized services to Koch Institute laboratories, with the primary goal of supplying sterile glassware at an exceptionally high, tissue culture-grade standard.
Honoring Robert A. Swanson ’69

The SBC commemorates the legacy of biotechnology pioneer and MIT alumnus Robert A. (Bob) Swanson ’69 and honors the role that Bob played in translating the genetic engineering revolution into an industry that changed the course of medicine, including cancer research and treatment. MIT and the Koch Institute seek gifts toward a goal of $25 million to fund the construction of the SBC’s technical facilities in the Koch Institute’s new building.

Please join us in honoring Bob Swanson’s immense contributions to the life sciences, by making a gift to the Koch Institute for the Swanson Biotechnology Center.

For more information on the Koch Institute and the Swanson Biotechnology Center:

Contact:  
Sharon Stanczak  
Director of Integrative Science Initiatives  
stanczak@mit.edu  
617.253.3272

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http://web.mit.edu/ki/