NATIONAL INSTITUTE OF BIOMEDICAL IMAGING AND BIOENGINEERING

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Mission:
Public Law 106-580 authorized the establishment of the National Institute of Biomedical Imaging and Bioengineering (NIBIB) to provide a research home for the discovery, development, and application of new biomedical technologies and techniques that will enable improvements in the fundamental understanding of biology and delivery of health care. The NIBIB brings the research communities of biomedical imaging, bioengineering, and the physical sciences together with the life sciences community to advance human health by improving the quality of life and reducing the burden of disease.

The mission of the NIBIB is to improve human health by leading the development and accelerating the application of biomedical technologies. The Institute is committed to integrating the engineering and physical sciences with the life sciences to advance basic research and medical care.

In support of its mission the Institute will:

- Develop new biomedical imaging and bioengineering techniques and devices to understand disease and to fundamentally improve the diagnosis, treatment, and prevention of disease.
- Enhance existing imaging and bioengineering modalities.
- Support related research in the engineering, physical and mathematical sciences through collaborations with other NIH Institutes and Centers and other Federal agencies.
- Encourage multidisciplinary research areas, such as target-specific imaging agents, telemedicine, modeling, biocomputation, biomaterials, tissue engineering, nanotechnology, biosensors, bioinformatics, and interventional procedures. The NIBIB will support interdisciplinary research teams through existing and novel mechanisms, while also sustaining individual investigator-initiated research.
- Support studies to assess the effectiveness of new biologics, materials, processes, devices, and procedures to determine the quality of a new technology and its most appropriate use and to guide the development of the next generation of technologies.
- Develop technologies for early, pre-clinical disease detection and assessment of health status. Early detection and treatment of disease, even before noticeable symptoms appear, has the potential to greatly reduce morbidity, mortality, and the cost of disease.
- Develop advanced imaging and engineering techniques for improved therapeutic approaches including image-guided, robotic-assisted microsurgery as a replacement for conventional surgery, and novel nanotechnology-based approaches for the delivery of drugs and gene therapy.

Beyond the research activities outlined above, the NIBIB will support training and education and the dissemination of health information to physicians and other health care providers, as well as the general public. In addition, the NIBIB will consider ethical issues in the use of new and emerging technologies for diagnosis and treatment.

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Selected Achievements and Initiatives:

Molecular Beacons: Molecular probes offer researchers a new tool to gather information about the fundamental actions and reactions that occur in cells and molecules. By using fluorescent probes that are compatible with biological material, researchers can obtain color images of cellular and molecular activity. One form of molecular probe that has generated recent interest is semiconductor nanocrystals. These microscopic particles exhibit unique optical properties that offer major advantages over conventional fluorescent dyes for imaging biological samples. Nanocrystals that transmit light near the infrared (IR) region of the spectrum are especially useful for biological applications, because near-IR light penetrates deeply into body tissues and produces little of the background "noise" that can obscure a light signal. Unfortunately, some nanocrystals synthesized to emit near-IR light signals are toxic, unstable, and susceptible to light bleaching. By specially coating these light beacons, scientists have found a way to suppress their toxicity, maintain and improve their ability to transmit light, and limit photobleaching. The new coatings make nanocrystals highly efficient at transmitting light in the near-IR region. Another research group, using molecular beacons, has developed a simple method to measure RNA synthesis in real-time. This new approach will aid in the understanding of various mechanisms that control RNA and protein production in cells. Once scaled up to high-throughput formats, the measurement of RNA synthesis will be useful in identifying new drugs that inhibit RNA production by bacteria or viruses. In addition, assays might be developed to identify an infectious agent and then quickly determine which antibiotics might be effective or ineffective against the particular strain that is present.

Biomaterials and Tissue Engineering for Degenerative Joint Disease: Damaged cartilage in knees and joints — caused by traumatic injury or the regular wear and tear of age — is nearly impossible for the body to repair on its own. Unlike other tissues, cartilage lacks the blood vessels that deliver nutrients and other healing substances to damaged regions. Medical treatment usually aims to alleviate pain and discomfort without mending underlying injuries. However, a newly developed liquid polymer gel that solidifies in 30 seconds when exposed to laser light could help the body use its own resources to replenish damaged cartilage. The biomaterial, which can be injected into torn cartilage tissue, adapts to the contours and size of the cartilage tear. Once cured to a solid, the polymer acts as a scaffold for the body's own cartilage-producing cells, which can eventually replace the biomaterial with new and functional cartilage.

Appropriations History
($ in thousands)

FY 2001	N/A
FY 2002	$111,681
FY 2003	$278,279 (+149.2%)
FY 2004	$287,129 (+3.2%)
FY 2005	$298,209 (+3.9%)

Extramural Research Project Grants
(Includes SBIR/STTRs)

FY 2001	N/A
FY 2002	273
FY 2003	682
FY 2004	680
FY 2005	633

Success Rate — Research Project Grants

FY 2001	N/A
FY 2002	N/A
FY 2003	19%
FY 2004	17%
FY 2005	15%

Research Training Positions Supported

FY 2001	N/A
FY 2002	3
FY 2003	65
FY 2004	130
FY 2005	172

Research Centers

FY 2001	N/A
FY 2002	2
FY 2003	24
FY 2004	26
FY 2005	24