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Series: Molecular Medicine Institutions

The Department of Molecular Medicine at The University of Texas Institute of Biotechnology

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An emerging center of excellence in biomedical research, The University of Texas Institute of Biotechnology (IBT), was established six years ago in the foothills of the beautiful hill country of southern Texas just outside metropolitan San Antonio. Located in the Texas Research Park, the IBT was the brainchild of the Texas Research and Technology Foundation (TRTF), a nonprofit organization founded to foster biomedical research in San Antonio and the greater South Texas region. The Chairman of the Board of Directors of the TRTF during the planning and construction of the IBT was Robert McDermott, Gen. USAF (ret). As envisioned, the IBT was to be a center of biomedical research excellence that would be a part of The University of Texas Health Science Center at San Antonio.

With the arrival of its first Director, Dr. Wen-Hwa Lee, and three other faculty members, the IBT opened its doors for research in 1991. Since its inception, the guiding principal of the IBT has been to foster a dynamic research environment in which scientists pursue basic biological principals important for improving human health care. With the establishment of the Graduate Program in Molecular Medicine in 1993 and the formation of the Department of Molecular Medicine in the Graduate School of Biomedical Sciences at the University of Texas Health Science Center at San Antonio, the implementation of Gen. McDermott's vision for the IBT was realized. The faculty of the IBT has grown to 15 scientists who, in addition to graduate education, provide training to fifteen postdoctoral fellows. The faculty are: Dr. Wen-Hwa Lee, Chair and Director; Dr. Steven G. Britt; Dr. Phang-Lang Chen; Dr. Barbara A. Christy; Dr. Robert J. Christy; Dr. Maria E. Gaczynska; Dr. Paul D. Gardner; Dr. Eileen M. Lafer; Dr. James D. Lechleiter; Dr. Eva Y.-H.P. Lee; Dr. Gina C. Schatteman; Dr. Z. Dave Sharp; Dr. Stephen X. Skapek; Dr. Patrick M. W. Sung; and Dr. Alan Tomkinson.

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At the heart of the research activities at the Institute of Biotechnology is the Graduate Program in Molecular Medicine, administered by the Department of Molecular Medicine. One of the first of its kind, the training program blends basic molecular–genetic training with instruction in issues relevant to clinical medicine. Currently, this interdepartmental and interdisciplinary program has 50 students. Students in the program are from schools throughout Texas as well as from leading institutions around the United States and the world.

The major research activities in the Department of Molecular Medicine focus on several major diseases. The first of these is cancer. A large group of investigators, headed by Dr. Wen-Hwa Lee and including Drs. Chen, B. Christy, E. Lee, Sharp, Skapek, Sung, and Tomkinson, is carrying out joint projects aimed at delineating the molecular genetic basis of cancer formation. Several genes under investigation include Breast Cancer 1 (BRCA1), BRCA2, and ATM (for mutated in ataxia telangiectasia). Families that carry mutations in these genes have an inordinately high risk of developing breast cancer and other forms of cancer. These genes most likely have roles in the development of sporadic cases of cancer as well. To exploit these genes in the development of new diagnostic and therapeutic techniques, the biological basis of their actions in normal and cancer cells must be understood. Researchers in the Molecular Medicine cancer group discovered that all three of these genes are involved in a process that is vital to normal cellular health, DNA repair. The integrity of DNA is

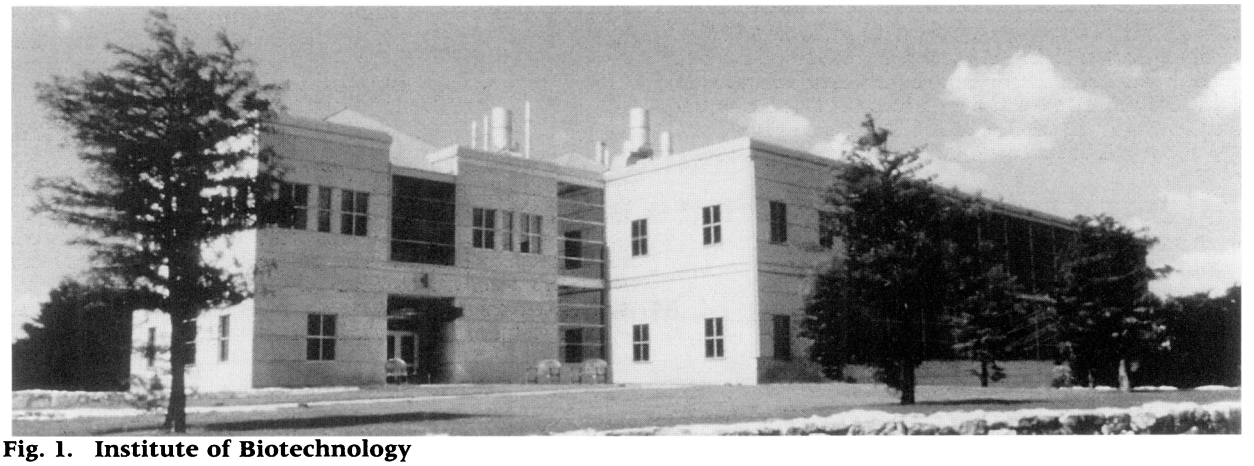

Fig. 1. Institute of Biotechnology

constantly challenged by a plethora of genotoxic agents in the environment. Normally, cells respond to the insults by activating efficient programs that repair the damaged DNA after which the cells recover and resume their regular activities. Individuals who harbor mutations in BRCA1, BRCA2, or ATM genes appear to have defects in the signaling pathways that mediate the response to genetic damage, leading eventually to the formation of cancer cells. The cancer research group has a number of collaborative projects to understand the cellular and molecular mechanisms involved in tumor formation. The objective of these studies at the cellular and molecular levels is to provide data which will be quickly translated to the bedside of cancer patients through a collaboration with a group of clinical researchers at the Health Science Center.

The second category of diseases under study in the Department of Molecular Medicine are neurological in origin and include such maladies as muscular dystrophy, blindness, memory loss, and a host of debilitating diseases of the central nervous system. The investigators in this group are Drs. Britt, Gardner, Lafer, and Lechleiter. Ongoing research involves understanding the development and function of the specialized connections, or synapses, between neurons. The brain is "hard-wired" by billions of synapses and each one has individual arrays of specific surface receptors that serve to receive neuronal signals. The neuroscience group is focused on understanding how neurons direct the construction of these specialized connections and how signal transmission at synapses results in downstream responses. Packaging of the signals and their subsequent release are areas of research for some in the neuroscience group, while others are elucidating the mechanisms by which the receptors that receive the signals are regulated. Another line of investigation by this group focuses on the intracellular processing and relay of the signals in the receiving cells. Defects in any of these processes have devastating effects on brain function. In a more specialized area of neuroscience research being conducted in the Department of Molecular Medicine, the signaling systems that are basic to vision, and the molecular basis of retina formation, are being studied.

In summary, researchers in the Department of Molecular Medicine at the Institute of Biotechnology are involved in several important lines of biomedical research that will hopefully contribute to the development of new and more effective strategies for prevention and treatment of human diseases. With additional appointments to the Department faculty and the completion of adjoining buildings housing the new South Texas Centers for Biology and Medicine and the Institute of Aging Research, the critical mass of scientists in the Texas Research Park is expected to quadruple within the next two years. Through synergistic interactions with Molecular Medicine faculty and expanded opportunities for our graduate students, Gen. McDermott's dream of a center of research excellence in south Texas will continue to extend its horizons along the frontiers of biomedical research.

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