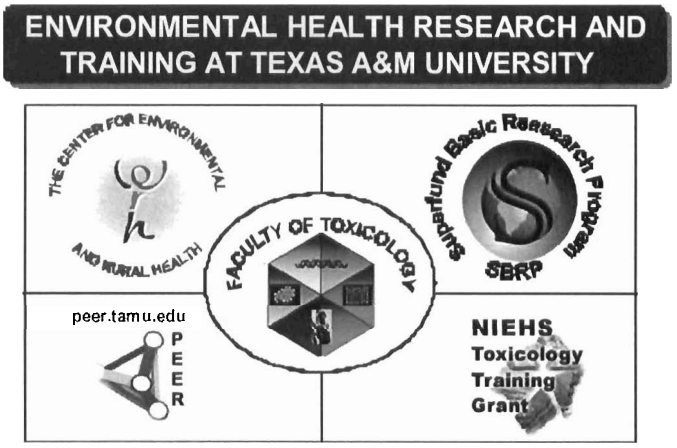
LANDMARK AREA OF EXCELLENCE: TOXICOLOGY, ONCOLOGY AND ENVIRONMENTAL HEALTH SCIENCES

Introduction and Significance

Toxicology research and training at Texas A&M University (TAMU) was initiated in 1970 and extensively reorganized in the late 1980s to reflect the interdisciplinary nature of the Toxicology Program on this campus. In 1989, faculty from 6 Colleges and 17 Departments within the University, the USDA Food and Animal Protection Laboratory, and Texas A&M University-Galveston formed the Interdisciplinary Faculty of Toxicology (IFT). The graduate degree was changed from Veterinary Toxicology to Toxicology, and responsibility for management of the graduate program was transferred from the Department of Veterinary Physiology and Pharmacology to the IFT. These changes were approved by the University and the State Coordinating Board. The new IFT represented a unique model for developing a graduate program that encompasses students and faculty from different administrative units (Appendix I). The IFT has since served as a successful graduate program with over 71 Ph.D. and 10 MS degrees awarded (64 of which were awarded in the College of Veterinary Medicine & Biomedical Sciences [CVM]) over the last 10 years. The IFT has had two external Academic Program Reviews, one in 1998 and the last in 2007, both of which rated the Toxicology Program as "outstanding." The major scientific themes of the IFT include cellular and molecular toxicology, reproductive and neurotoxicology, environmental health and food safety, oncology, and nanotoxicology research. All of these areas play an integral role in the other key ongoing environmental health sciences programs at this University. Currently, over 25 graduate students and 10 postdoctoral fellows participate in the Toxicology program, and operating funds for the program are now coordinated through the Office of the Vice-President for Research in collaboration with the Council of Participating Deans. Based on measures of external funding and the number of graduates, TAMU is now recognized as one of the national leaders in Environmental Health Science research and training.



Rationale

Research and graduate training in Toxicology and Environmental Health has been a priority of the CVM and was identified as a Signature Program in the previous Strategic Plan put forward in 2003. The goal of Vision 2020 is to elevate TAMU into the ranks of the top ten public universities in the nation by the year 2020. The IFT has fostered many of the Imperatives outlined in Vision 2020 and is contributing to the achievement of the culture of excellence. By organizing interdisciplinary groups and securing interdisciplinary center, program project, training and individual investigator grants, the IFT has elevated the faculty, their teaching, research and scholarship (Imperative 1) as well as strengthened graduate programs (Imperative 2). The IFT has been instrumental in expanding the breadth of research and interdisciplinary collaborations that incorporated a broad range of new initiatives ranging from community-based translational programs in Texas (Imperatives 9 & 12) to global environmental health focusing on unique environmental health problems in Africa, Azerbaijan, and China (Imperative 6). These programs have provided considerable funding to build new and expand upon existing research infrastructure along with biostatistics and computational tools and resources (Imperative 8). Several CVM toxicology faculty have left the university in recent years and have yet to be replaced. There are expanding opportunities and initiatives in oncology and nanotoxicology that should also be addressed. In

order to for this Signature Program to maintain preeminence in a highly competitive, multidisciplinary area, it is essential that outstanding new faculty be recruited to build upon strengths of the program.

Interdisciplinary Impact

The IFT as an interdisciplinary research and training program has directly contributed to the success of faculty in competing for major National Institutes of Health (NIH)-funded grants in the Environmental Health Sciences. In 1992, TAMU was awarded a training grant from the National Institute of Environmental Health Sciences (NIEHS) and this grant was successfully renewed in 1997 and 2002. The NIEHS Toxicology Training Grant application is currently in revision and seeking more interactions with clinical investigators and their trainees. This was one of the first NIH-training grants awarded to faculty at TAMU and has served as a model for the development of other training grants in the Life Sciences.

The Superfund Basic Research Program (SBRP) was initially funded by NIEHS in 1989 and has since been successfully renewed three times and is currently funded from 2000-2008. A renewal proposal is currently pending. The program has combined faculty from the Texas A&M Health Sciences Center (College of Medicine and Institute of Biosciences and Technology), and Texas A&M University Colleges of Science, Veterinary Medicine, Engineering, and Agricultural and Life Sciences. Research projects are directed at characterizing contaminant-sensitive genotypes, molecular mechanisms of endocrine disruption and birth defects, and genotoxic and non-genotoxic endpoints associated with diverse classes of chemicals occurring in Superfund sites along with two chemical intervention projects for groundwater purification and for biodegradation and detoxification of halogenated aromatic hydrocarbons and heavy metal mixtures.

The Center for Environmental and Rural Health (CERH) was funded by NIEHS from 1998 to 2007 and promoted applied science programs focusing on the impact of environmental factors on human health and disease in rural communities. Two research cores focused on the Environment and Reproduction and the Environment and Cancer were supported by centralized core facilities that advanced the scientific discovery process, enhanced the quality of research programs, and attracted young faculty into the field of environmental health sciences. This has been the only Center grant on the TAMU campus and there is a pressing need to recruit new leadership to expand clinical/translational capabilities of the Center to restore funding for this important program.

Environmental Health Science research at this University is now one of the preeminent programs in the United States. In order to maintain this position of preeminence in a highly competitive field, several new faculty positions and new opportunities to enhance interdisciplinary interactions in several key areas will be needed over the next several years for the Toxicology, Oncology and Environmental Health to reach its full potential. In particular, cancer biology and chemical carcinogenesis has emerged as a major research strength of the CERH and IFT and Faculty have received substantial funding from the NIH, Department of Defense, Komen Foundation and private sources for their research activities. At the same time, the Clinical Oncology service at the CVM has established relationships with MD Anderson's Comprehensive Cancer Center in Houston aimed at forming comparative oncology collaborations between the two institutions. The clinical oncology group is also an active member of the Comparative Oncology Trials Consortium funded by the NIH Comparative Oncology group and is actively participating in multi-institutional clinical trials. The NIH together with a private non-profit group is interested in running a series of clinical trials specifically through the clinical oncology group at the CVM over the next 5 years because of the resources, MD Anderson collaborations and potential that this hospital has to offer. The clinical significance of the client owned veterinary patients as models for cancer research is substantial. The NIH estimates that over 1 million pet dogs per year are diagnosed and managed with cancer in the United States alone. Examination of the recently published canine genome has revealed many significant similarities between dogs and humans, especial in association with gene

families involved in tumorigenesis and tumor progression. These similarities are significantly greater than those seen between the human and the mouse. Clinically, the 'One Medicine' approach to cancer research combines the study of naturally occurring disease in companion animal species and the study of human cancer biology, diagnosis, and therapy. Genetic and molecular cancer research has flourished in recent years, however, relevant *in vivo* preclinical models have been lacking thus far.

Assessment/Expectations

The value of Toxicology, Oncology and Environmental Health as a Landmark Area of Excellence can be appreciated in the context of grant funding highlights of the program, which are listed below. The CVM provides substantial leadership for this program, however, faculty have established extensive collaborations with other departments, colleges, and system units. One purpose of this program is to nurture and expand these partnerships to solve complex problems and to create greater funding and independence. The basic and translational accomplishments that have resulted from the interdisciplinary initiatives in this previously identified signature program have been substantial and we expect to create an unprecedented opportunity for faculty and trainees to achieve new breakthroughs.

Therefore, research and graduate training in Toxicology, Oncology, and Environmental Health should be maintained as a Landmark Area of Excellence as a program in the CVM. In order to maintain its standing as a national leader in Environmental Health Science research and training, and to ensure that the prestigious NIH-funded Center, Training and Program Project grants are successfully renewed, new faculty resources to replace faculty who have left the College and to provide expertise in emerging areas are needed to complement the commitment of the IFT to build upon existing strengths. Expectations of the IFT with support from the College of Veterinary Medicine & Biomedical Science follow:

A. The IFT will collaborate with the CVM to restore the Texas A&M CERH. This will involve recruitment of a senior faculty member who will promote interdisciplinary clinical interactions and translational medicine.

B. The IFT will collaborate with the CVM to recruit clinical (MD and DVM) training faculty and target expanded translational research initiatives in preparation to resubmit the NIEHS Toxicology Training Grant.

C. CVM faculty leadership in the SBRP Program Project Grant will ensure that this grant be maintained.

D. The IFT will collaborate with the CVM to promote interactions and recruiting to enhance interdisciplinary interactions in the area of Oncology as part of the Toxicology, Oncology, and Environmental Health Landmark Area of Excellence with the goal of establishing an Institute for Cancer Research with research space in the new Life Sciences Building. This is part of a strategic initiative the enhance competitiveness for funding from the Texas Cancer Initiative which will provide annual competitive funding of $300 million/year for 10 consecutive years.

E. Recruitment

1. CERH director who will provide leadership to promote interdisciplinary clinical interactions and translational medicine and restore the Texas A&M CERH. New CERH research leadership recruitment should be combined with one of Dr. Murano's hiring of up to 20 "research stars."
2. Recruitment of up to 3 new oncology researchers committed to interdisciplinary research and translational medicine.
3. Recruitment of up to 2 new faculty members in the areas of nanotoxicology and nanomedicine.
4. Recruitment of up to 2 new faculty in the areas of toxicogenomics and other "omics" disciplines.
5. Development partnerships with other colleges and System components for recruitment in this Landmark Area of Excellence

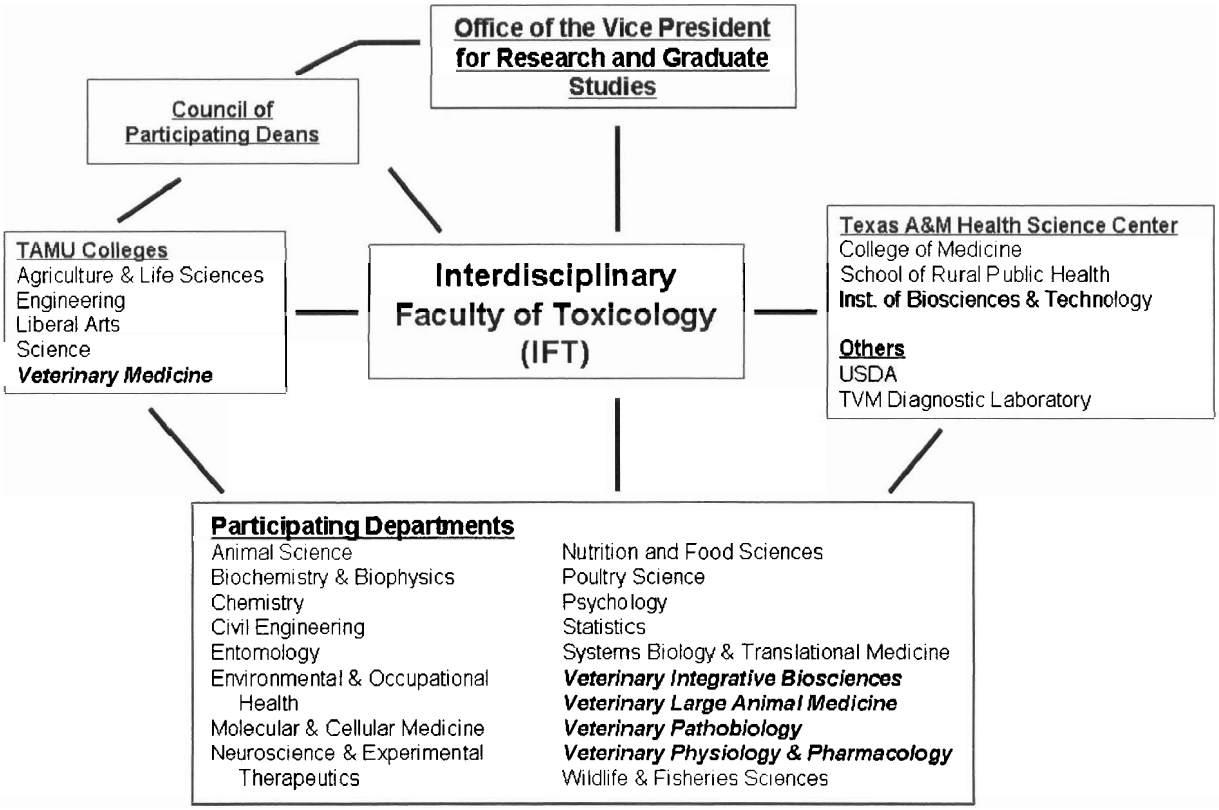
Indices of Excellence

A) The CERH was funded by NIEHS from 1998 to 2007, for approximately $7,500,000. Fifty-one investigators in Environment and Cancer and Environment and Reproduction Research Cores (about 20% from the CVM) were supported by 3 Facility Cores which facilitated interdisciplinary and

multidisciplinary collaborations among collaborations among toxicologists, reproductive biologists, biochemists, engineers, epidemiologists and biostatisticians within the CERH, the Texas A&M System, other state institutions, national and international research agencies. During the period from 2002-2006, CERH investigators published over 740 peer-reviewed research reports and secured over $71.8 million in research funding. The CERH is the only center grant that has been funded at Texas A&M University.
B) The SBRP Program Project has been funded by NIEHS from 1989-present, for approximately $12,000,000. Thirteen investigators (7 from the CVM) are responsible for seven projects and four research support cores involving interdisciplinary collaborations among toxicologists, engineers, epidemiologists and biostatisticians as well as collaborators in the State of Texas and interactions with international collaborators in Azerbaijan, China and the Czech Republic. From 2004-2008 these investigators published 94 research reports.
C) The Toxicology Training Grant was funded by NIEHS from 1992-2007, for approximately $3,000,000. This grant provided funding for six graduate and two postdoctoral stipends annually, and has supported a total of 28 graduate students and 13 postdoctoral fellows during the duration of the program. All trainees in the program participate in annual research symposia, a weekly Toxicology Seminar series, regional and national Society of Toxicology meetings and other local, regional and national scientific conferences. In addition to development of a modern curriculum involving coursework housed primarily in CVM departments, this program also developed a Scientific Ethics course (VMID 686, formerly VAPH/VIBS 689) which is a requirement for all Toxicology trainees, and has become a valued course for other majors throughout the System as well.
D) Outreach/Engagement Activities are core components of the CERH and SBRP grants that provide environmental health information to the public and health care professionals, and facilitate interactions with communities in which the research studies are conducted. These grants facilitated other outreach grants including an NIEHS funded the TAMU Partnership for Environmental Education and Rural Health (PEER) which focused on integrating environmental health science into grades 6 through 8 in rural schools in Texas. This program has been greatly expanded in recent years with science and math emphasis in rural middle schools with funding from NIH and NSF.
E) Cancer biology and chemical carcinogenesis has emerged as a major research strength of the CERH; IFT members have received substantial funding from the NIH, Department of Defense, Komen Foundation and private sources for their research activities. At the same time, the CVM Clinical Oncology group has emerged as a major force in the area of clinical translational research. CERH/IFT members are leading the TAMUS response to the Texas Cancer Initiative and have organized Cancer Workshops to facilitate interchange and collaboration among faculty. In addition, there are plans for establishing a focused cancer research groups in the new Life Sciences building and it is anticipated that newly recruited CVM basic science faculty in cancer biology and carcinogenesis and clinical oncologists will serve as "anchor" research investigators in this unit.
F) The building of a new Cancer Therapy and Advanced Imaging Center at the CVM will upgrade the MRI and radiation therapy unit to cutting-edge tomotherapy. This will provide unparalleled targeting ability and normal tissue sparing to permit treatment of brain and spinal tumors, perform whole body radiation, and treat multiple lesions at once. TAMU would be only the second veterinary school in the world to possess such technology.
G) The Texas A&M Institute for Preclinical Studies (TIPS) was formally established by the Board of Regents as a TAMU institute to serve the preclinical needs of academic researchers and industry. TIPS will develop research activities and provide core services in the areas of device development and combination products, preclinical studies under Good Laboratory Practices (GLP) and biomedical imaging. This is an important step in developing leadership in translational research. The new 112,000 square-foot TIPS facility will open in Summer 2009 and will include long-term large animal housing for approximately 240 animals, state-of-the-art surgical and imaging suites, a clinical diagnostic lab, incubator space for startup companies, and a large auditorium for meetings/training. TIPS imaging center is slated to have the latest in advanced imaging technology. Phase I will include a 3T MRI with XMR, 3-D Echo, and a fixed Cardiac Catheterization Lab; phase 2 plans include a 7T MRI and a 64 slice PET/CT.

APPENDIX I: SUMMARY OF DEPARTMENTS, COLLEGES AND PROGRAMS INVOLVED IN THE IFT

- **VTPP is the Administrative Home Department**
  - **CVM Dean is the Lead Dean for the IFT on the Council of Participating Deans**



APPENDIX II: IFT Faculty Members

Faculty

Name	Dept.	College	Role in IFT
Abbott, Louise C.	VIBS	CVM	Member
Allred, Clinton D.	NUTR	Agrilife	Member
Autenrieth, Robin l.	CVEN	Engineering	Member
Ball, Judith M.	VTPB	CVM	Member
Banu, Sakhila K.	VIBS	CVM	Member
Barr, A. Catherine	TVMDL	CVM	Adjunct Member
Bernstein, Lori R.	MCM	Medicine	Member
Bratton, Gerald R.	VIBS	CVM	Member
Burghardt, Robert C.	VIBS	CVM	Member, Chair, EC
Busbee, David L.	VIBS	CVM	Member
Calvin, James A.	AVPR/STAT	Admin. / Science	Member
Carroll, Raymond J.	STAT	Science	Member
Chapkin, Robert S.	ANSC	COALS	Member
Chu, Kung-Hui "Bella"	CVEN	Engineering	Member
Dees, W. Les	VIBS	CVM	Member
Donnelly, K.C.	EOHS	SRPH	Member
Fackler, John P.	CHEM	Science	Member
Finnell, Richard H.	IBT / VIBS	IBT / CVM	Member
Harvey, Roger B.	USDA/VIBS	CVM	Associate Member
Jayaraman, Arul	CHEN	Engineering	Member
Johnson, Larry	VIBS	CVM	Member
Kier, Ann B.	VTPB	CVM	Member
Ko, Gladys Y.-P.	VIBS	CVM	Member
Miranda, Rajesh C.	NEXT	Medicine	Member
Mirkes, Philip E.	VTPP	CVM	Member
Mora, Miguel	WFSC	COALS	Member
Nation, Jack R.	PSYC	Liberal Arts	Member
Parrish, Alan R.	SBTM	Medicine	Member
Phillips, Timothy D.	VIBS	CVM	Member, Vice Chair, EC
Pietrantonio, Patricia V.	ENTO	COALS	Member
Pillai, Suresh	POSC	COALS	Member
Pine, Michelle D.	VIBS	CVM	Member
Porter, Weston W.	VIBS	CVM	Member, EC
Ramaiah, Shashi K.	VTPB	CVM	Member, EC
Raushel, Frank M.	CHEM	Science	Member
Reagor, John C.	TVMDL	CVM	Member
Russell, Leon H.	VIBS	CVM	Member
Safe, Stephen H.	VTPP/IBT	CVM / IBT	Member, Past Chair, EC
Sayes, Christie M.	VTPP	CVM	Member
Schroeder, Friedhelm	VTPP	CVM	Member
Senseman, Scott A.	SCSC	COALS	Member
Sherman, Michael	STAT	Science	Member
Simanek, Eric	CHEM	Science	Member
Spencer, Thomas E.	ANSC	COALS	Member
Spiegelman, Cliff	STAT	Science	Member
Stallone, John N.	VTPP	CVM	Member

Stoica, Gheorghe	VTPB	CVM	Member
Talcott, Susanne M.	NUTR/VTPP	Agrilife/CVM	Member
Thompson, James A.	VLAM	CVM	Member
Tian, Yanan	VTPP	CVM	Member, EC
Tiffany-Castiglioni, Evelyn	VIBS	CVM	Member
Turner, Nancy D.	ANSC	COALS	Member
Villalobos, Alice R.A.	NUTR	Agrilife	Member
Walker, Cheryl L.	VTPP-Adjunct	CVM	Adjunct Member
Wang, Naisyin	STAT	Science	Member
Wild, James R.	BCBP	COALS	Member
Wilson, Cody L.	EOHS-Adjunct	SRPH	Adjunct Member
Wilson, Emily	SBTM	Medicine	Member
Wood, Thomas K.	CHEM	Engineering	Member

EC = Executive Committee