INSTITUTE OF ENVIRONMENTAL HEALTH

ACHIEVEMENT OF OUTCOMES

A. Basic and Applied Science

- **Establishment of UW-Milwaukee as an International Leader in the Use of Zebrafish as a Fundamental Model in Toxicology and Environmental Health.**

  The zebrafish has enormous potential to revolutionize the science of toxicology because it is the only biomedically accepted vertebrate model in which scientists can study biochemical processes using the powerful genetic techniques previously applicable only in bacteria and lower organisms. A combination of initiatives has moved the Institute into a position to bring this goal to a reality. During the current reporting period, these include:

  - Formation of a powerful partnership between the UWM and the Medical College of Wisconsin. The partners are the NIEHS Marine and Freshwater Biomedical Sciences (MFBS) Center and the Medical College of Wisconsin’s Human and Molecular Genetics Center (H. Jacob, Director) and the Bioinformatics Center (P. Tonellato, Director). This group, in conjunction with members of the University of Oregon, is carrying out a major bioinformatics initiative that link together the human, rat, and zebrafish genomes. It is also in the process of creating the first zebrafish micro array for the detection of changes in gene expression in zebrafish exposed to toxic chemicals.

  - Construction of one of the largest zebrafish animal facilities in the U.S., which will hold 15,000 fish (joint funding from the Graduate School).

  - Purchase of confocal microscope attachment for high-throughput confocal microscopy in the NIEHS Center’s Molecular Biology and Microscopic Imaging Laboratory ($40,000 supplement from NIEHS, matched by Graduate School).

  - NIEHS funding of the proposal “Comparative Genomics Database in Toxicology,” submitted by the four NIEHS Marine and Freshwater Biomedical Sciences Centers, in which the UWM Center will focus on zebrafish genes related to toxicological responses ($225,000 over 3 years from 9/2002 to 8/2005).

  - Attraction of two new investigators to the zebrafish initiative: Fred Williams (University of Toledo) and Daniel Sam (Marquette University).

  - Submission of NIEHS Center competitive renewal grant with central focus on the zebrafish initiative and consortium with the Medical College of Wisconsin and the UW-Madison, including a UWM match to hire three zebrafish researchers. The Center’s proposal and Site Visit focused attention on the core linkage between the MFBS Center and the Institute of Environmental Health.

  - Creation of a cluster of zebrafish faculty positions for hiring in 2002-2003 (2 developmental biologists and an analytical biochemist in proteomics): One-senior and one junior level position (equal funding from the Milwaukee Idea, L&S, and the Graduate School-Freshwater Initiative) and a third position in the biennial budget for the Institute of Environmental Health.

  - Loss and regain of zebrafish faculty positions: the first two positions were lost in the reorganized budget. The result was to redirect the third position from proteomics to developmental biology. Working with L&S administration, a second, senior level position was restored to the original cluster. One of the positions, for proteomics, is gone.
Grant Proposal Awards

The following grant proposals were submitted and funded or are expected to be funded:

- Endocrine Disruptor International Center of Excellence, R. Peterson, UW-Madison, principal investigator. This grant, supported by the WBS Center, has been awarded but funding depends on fund raising by the chemical industry.
- Methyl mercury and zebrafish development (J. Dellinger, M. Carvan), NIH, GMS/ATSDR, $250,000.
- Reproductive Outcomes in Native American Women (J. Hewitt, K. Bender), NIH, GMS/ATSDR, $48,000.
- Marine and Freshwater Biomedical Sciences Center five-year renewal (D. Petering), NIEHS, anticipate funding at $1,800,000.
- Zebrafish Toxicology (M. Carvan), Milwaukee Foundation, Shaw Scholar, $250,000.
- Comparative Genomics Database in Toxicology (D. Petering, NIEHS Center), NIEHS, subcontract for $225,000.
- Dioxin and Estrogen action (R. Hutz), NIEHS, $141,000.

Pilot Project Competition

In response to two calls for proposals, fifteen projects have been submitted from the Colleges of L&S, Engineering, Allied Health, Nursing, and the WATER Institute. They have undergone expert external review. Nine are currently funded ($15,000 each) or are waiting funding, pending issuance of this year’s budget. The projects range from basic research to research directly related to urban environmental health problems and are listed below.

- J. Aldstadt (Chemistry): Organ arsenicals in Green Bay.
- R. Hutz (Biological Sciences): Modulation of Reproductive Function by Dioxin in Zebrafish.
- S. McLellan (WATER Institute): Genetic Structure of E. coli Population in Humans and DNA Fingerprinting to Detect Human Sources in Freshwater.
- D. Weber (MFBS Center): Cyanobacterial Compounds and Behavioral Development in zebrafish.
- L. Sabatini (Health Sciences): Molecular Markers for Breast Cancer.
- D. Heathcote (Biological Sciences): Endocrine disruption and neurocord development in the frog.
- M. Carvan/P. Tonellato (WATER Institute, Medical College of Wisconsin): A Zebrafish Microarray and Comparative Analysis for Developmental Toxicology (pending funding).

B. Community Engagement and Education

- NIH funding of “Science Education Partnership Award, Phase I” through the National Center for Research Resources (10/2000 to 9/2004), 4750,000 in direct cost, D. Petering, principal investigator, Randall Ryder, co-principal investigator.

This phase I award supports the creation of innovative experiment modules for the middle school level life science course. It is based on a partnership between members of the Departments of Biological Sciences (UWM and Carroll College), Chemistry, Film Curriculum and Instruction, and the WATER Institute. Working with this team are a set of 20 teachers from the Milwaukee Public School System who are engaged within the School of Education in a program to enhance their
knowledge and leadership skills in middle school science. The modules combine a focus on living organisms, standards based science content, and environmental health.

During the current academic year, the following experiment modules have been created and are about to be taken into NWS classrooms by about 20 WS teachers and their efficacy fully evaluated:

- **Genetic Basis of Inheritance I (C. Wimpee):** conferral of inheritable properties by a plasmid in a bacterial system; linkage to antibiotic resistance; use of molecular models made at the Milwaukee School of Engineering.

- **Genetic Basis of Inheritance II (M. Carvan, H. Tomasiewicz):** mating of mutant zebrafish and examination of offspring for distribution of traits; linkage to mutagenic chemicals

- **Chromosomes and Cell Division (L. Zettergren, R. Danielson):** frog tail regeneration and cell division, including CD-ROM of chromosomes during cell division and the location of genes on chromosomes (R. Phillips).

- **Frog Embryonic Development (D. Heathcote, L. Zettergren, R. Danielson):** includes a CD-ROM of time-lapse of development; relates to alcohol, nicotine and pesticide exposure.

- **Zebrafish Organ System Development (M. Carvan, H. Tomasiewicz, R. Danielson):** includes a CD-ROM of time-lapse of embryonic development with a focus on the nervous system connected to alcohol, nicotine, and pesticide exposure.

- **Properties of Nerve Impulse Transmission (D. Heathcote, R. Danielson):** neurobehavior of the giant earthworm in relation to the activity of its giant neuron; includes CD-ROM of nerve action potential as affected by environmental chemicals.

- **Respiratory and Circulatory Systems (D. Petering, S. Krezoski, F. Binkowski, R. Danielson):** involves mathematical modeling of lung and circulatory system in relation to oxygen transport, properties of hemoglobin in the lab, an system properties in yellow perch; focus on chemicals such as nitrite (lab), and air pollutants that affect oxygen transport; includes CD-ROM of the behavior and underlying cause of brown-blood disease in fish.

- **NIH funding of “Fish Consumption Risk Communication in Ethnic Milwaukee” through the National Institute of Environmental Health Sciences (9/2001 to 8/2005), $800,000 in directs costs, D. Petering, principal investigator.**

This Environmental Justice grant from the NIEHS aims to communicate the risks of fish consumption from local and regional waters due to their contamination with toxic chemicals. A tripartite partnership between UWM (Departments of Chemistry, Allied Health Sciences, and Mass Communication, and the Center for Urban Initiative and Research), the Sixteenth Street Community Health Center, and Hmong American Friendship Association has begun the process of producing a professional video about fish consumption that effectively communicates concerns to the Hmong population.

During the present year, the process of video production has moved through the following process. The steering committee comprised of UWM (D. Petering, K. Riggs, J. Dellinger), the Sixteenth Street Community Health Center (P. McAvoy), the Hmong American Friendship Association (Lo Neng Kiatoukaysy), and the filmmakers (A. Rostenkowski, T. Gallum) met multiple times. These meetings were interspersed with meetings with a focus group of Hmong leaders from various clans. The goal was to determine the content of the video about the health effects of eating fish, both the problems due to contaminants and the nutritional value of consuming fish and how to present this content that attuned to the Hmong culture. Filming is nearly complete and will soon be ready for focus group evaluation prior to release to the Hmong public.
Grant Proposal Awards

- Science Education Partnership Award, Phase I (D. Petering), NIEHS, $270,000 for current year.
- Fish Consumption Risk Communication in Ethnic Milwaukee (D. Petering), NIEHS, $210,000 for current year.
- Environmental Health Capacity Building (State Bureau of Environmental Health), funding of $750,000; IEH is a partner and will receive some funding.

Other Activities

- The MFBS Center and Institute of Environmental Health have made the infusion of environmental health knowledge into graduate nursing education. During this year J. Hewitt was invited to attend a planning meeting at the National Institute of Environmental Health Sciences to develop a strategy to bolster environmental health understanding among nurses.
- J. Hewitt attended a meeting in Seattle, WA sponsored by the NIH National Center for Minority Health and Health Disparities in order to become familiar with grant programs and opportunities that this organizations sponsors.
- Petering and Jeanne Hewitt met with State partners to discuss possible contributions the Institute could make to environmental health capacity building. They invited V. Klump to provide an overview of the new Water Security program at the WATER Institute in order to alert State officials about our capacity in the area of bioterrorism. The State has just received a $19,000,000 award from the Federal Government to enhance our expertise in this area.
- J. Hewitt spoke to a meeting of the Waukesha Community Health Partnerships organization about the Institute of Environmental Health.
- J. Hewitt has been appointed to a panel of the National Institute of Occupational Health and Safety that will make recommendations on the safe production and handling of hazardous drugs.