Governing Iowa's public universities and special schools

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January 14, 2008

Dennis C. Prouty, Director
Legislative Services Agency
State Capitol

Re: CHEEC Annual Report

Dear Mr. Prouty:

The Center for Health Effects of Environmental Contamination was established at the University of Iowa with the passage of House File 631 by the 72nd General Assembly.

In accordance with Iowa Code §263.17 (4b), this annual report for the Center for Health Effects of Environmental Contamination is hereby submitted to the Legislative Council of the General Assembly.

If there are any questions concerning this report, please don't hesitate to contact this office.

Sincerely,

Andrew J. Baumert

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Attachment
cc: Legislative Liaisons
Legislative Log

CHEEC Report to the Iowa Legislature: 2007

Background The Center for Health Effects of Environmental Contamination (CHEEC) at The University of Iowa (UI) is submitting this progress report for 2007 to the Iowa General Assembly in accordance with requirements outlined in the 1987 Iowa Groundwater Protection Act. Mandated within the Act was the establishment of CHEEC, whose mission is "to determine the levels of environmental contamination which can be specifically associated with human health effects." Center activities include 1) developing and maintaining environmental databases to be used in conducting health effects research, 2) managing a seed grant program to support health effects research, 3) providing education and service programs to the citizens of the state and the region, and 4) serving on state and local committees whose needs require environmental health expertise.

CHEEC is comprised of faculty from the UI Departments of Civil and Environmental Engineering, Epidemiology, Occupational and Environmental Health, Chemistry, and the University of Iowa Hygienic Laboratory (UHL). Participating areas include the Environmental Engineering Laboratory, the Institute for Rural and Environmental Health, the State Health Registry of Iowa and Iowa Registry for Congenital and Inherited Disorders. CHEEC works cooperatively with the Iowa Departments of Natural Resources (IDNR), Public Health, and Agriculture and Land Stewardship (IDALS), plus the United States Geological Survey and Leopold Center for Sustainable Agriculture at Iowa State University.

Advisory Committee The CHEEC Advisory Committee met on November 7, 2007. Bernie Hoyer from IDNR is the current committee chair. The FY 2007 budget was discussed and FY 2008 budget was presented to the committee and approved unanimously. Two new advisory committee members were introduced – Jim Ellerhoff, representing Iowa Department of Agriculture and Land Stewardship, and Ken Sharp, representing Iowa Department of Public Health. Jim Jacobus, a Ph.D. student in the Interdisciplinary Graduate Program in Human Toxicology gave a presentation titled *Polychlorinated Biphenyls are an "Old" Issue: Telomere Toxicity Accelerates Senescence and Promotes Carcinogenesis.* CHEEC provided seed grant funding to Jacobus to research this topic.

Budget for Fiscal Year 2007 CHEEC receives 9% of the annual receipts in the Agricultural Management Account of the Iowa Groundwater Protection Fund. A total of $390,091 was allocated to CHEEC from this account during FY 2007. (Due to an accounting error between state agencies, approximately $60,000 of that total was appropriated after the close of the fiscal year). CHEEC generates additional revenue through federal grants and contracts that support the Center activities and mission.

The personnel budget is presented in the categories of administration, data management, education programs, research programs, and service activities, in order to reflect effort in these areas. General operating costs for administration, CDMC, education programs, and research programs are also presented separately.

The CHEEC FY 2007 operating budget:

Expenditures

Personnel
(Salary + Fringe) (2.8 FTE + Faculty director support)

Administration	$	96,077
Data Management	$	38,069
Education	$	8,194
Research	$	83,215
Service	$	16,683
Total	**$**	**242,238**

Administration

Travel	$	1,844
General Supplies/misc	$	2,180
Telecommunications/postage	$	669
Total		**$4,693**

Data Management Center

Hardware, Software, lic, maintenance	$	9,188
Staff Travel/education	$	-
Total	**$**	**9,188**

Education Programs

Publications	$	6,560
Seminars/Conference Exp.	$	-
Education grants	$	1,000
Total		**$7,560**

Research Programs

Seed Grants	$	148,125
USGS/SWRL match	$	5,000
Total		**$153,125**

Total Expenditures	**$416,804**
Balance general account FY2007	**$16,886**

CHEEC Data Management Center During 2007, CHEEC Data Management Center (CDMC) staff provided full system support for programming, local area network administration, database design and administration, and applications development for in-house and state and federal funded environmental health research projects. Environmental databases are designed and managed on the Oracle database management system.

CDMC created and maintains computerized databases on Iowa water quality, including the *Iowa Historical Municipal Water Treatment and Supply Database*, the *Municipal Analytical Water Quality Database*, and the *Statewide Rural Well Water Survey (SWRL).*

In 2007, CDMC research efforts utilizing CHEEC's environment health and computer database expertise are: 1) Research and data management support for *Muscular Dystrophy Surveillance Tracking and Research Network (MDSTARNet)* in cooperation with the Iowa Registry for Congenital and Inherited Disorders; funding proved by the Centers for Disease Control and Prevention (CDC), 2) Research and database management on the *Comprehensive Assessment of Rural Health in Iowa (CARHI)* in collaboration with the UI Departments of Geography, Occupational and Environmental Health, and Family Medicine. Funding is provided by the CDC, and 3) Full database and applications development for *SWRL Phase II*, a collaborative research effort sampling private rural drinking water wells. Two new projects began in the last half of 2007. They are 1). *Comprehensive Assessment of Rural Health in Iowa: the Carroll County Well Water Study* funded by the CDC and 2). *Nitrates, Nitrites and Nitrosatable Drugs and the Risk for Selected Birth Defects* in collaboration with Texas A & M University. The National Institute for Environmental Health Sciences is funding this multi-year research.

Service/Education Activities CHEEC staff participate in environmental health service and education activities through committee membership, organizing and funding educational programs, and answering environmental health questions from the public through the CHEEC website or referrals from public and environmental health entities.

In 2007 CHEEC staff served on the steering committee for *The Governor's Iowa High School Water Summit and Scholarship Program*. This scholarship competition targeted high school students who have an interest in water resources. The competition seeks to expand awareness of challenges protecting Iowa's water resources today and in the future.

In 2007, CHEEC staff gave professional presentations at state and regional conferences highlighting CHEEC research projects. Center staff serves on the advisory boards of the statewide Ambient Water Quality Monitoring and the Lake Nutrients Standards Technical Advisory Committee. Center staff provided external reviews for numerous academic journal articles submissions.

CHEEC sponsors seminars of interest to interdisciplinary audiences on environmental health issues. The following seminars were held on the UI campus in 2007.

Pyrethroids: A Potential Peril?
Kathy Kuivila United States Geological Survey
co-Sponsors: U.S. Geological Survey

Environmental Exposure to Estrogenic and Other Myco and Phytotoxins
Corinne Hoerger
Swiss Federal Research Station for Agroecology and Agriculture
co-Sponsors: U.S. Geological Survey

Nutrient Transport and Retention in Wetland and Aquatic Ecosystems
Greg Noe, USGS
co-sponsors: IIHR- Hydroscience & Engineering and U.S. Geological Survey

CHEEC awarded one education grant in 2007. The $1,000 grant provided partial support for *Efficacy Assessment of Distributing Radon Education Materials to Parents of Newborns in the State of Iowa: A Pilot Project.* The project teamed with UI Environmental Health Science Research Center and the Iowa Air Coalition to develop and distribute a brochure to parents of newborns in Iowa, and to deliver free follow-up radon test kits.

During 2007, CHEEC responded to information requests from state and county health departments, the National Cancer Institute, engineering consulting firms, state and county public health personnel, university researchers and students, high school students, water and waste water treatment plant operators, agriculture extension personnel, the media, environmental activist groups, and the public.

In the November 2007, CHEEC hosted a one day symposium celebrating the Iowa Ground Water Protection Act. Speakers from the Leopold Center for Sustainable Agriculture (ISU), Iowa Waste Reduction Center (UNI), and environmental health professions revisited the mission of the Ground Water Protection Act and laid out challenges and opportunities for the Regents' groundwater centers to address in the future.

Research Funding With money received from the Agricultural Management Account, CHEEC administers a seed program. It supports pilot level research across a range of environmental health research topics. "Pilot" research refers to small-scale projects designed to test new and unusual hypotheses, develop innovative methodologies in both laboratory and field settings, or perform initial statistical analyses to support efforts to acquire federal or private grants for larger studies. The funding supports the University of Iowa strategic goals by providing graduate level research opportunities and strengthening graduate level programs, creates distinguished innovative research, and fosters interdisciplinary development of research and service opportunities.

CHEEC awards approximately one-third of its annual allocation in seed funding. In return it generates over eight dollars in external funding for every dollar invested. In the past 5 years, seed grants have attracted an additional $6.4 million in external funding for researchers at the University of Iowa and Iowa State University. Seed funding provides hands-on learning opportunities for undergraduate and graduate level students enhancing their education experience and preparing them for their professional life.

In fiscal year 2007, CHEEC awarded the following grants:

Paraquat-Mediated Generation of Endogenous Neurotoxins Resulting from Dopamine Oxidation

Investigator: J. Doorn, Ph.D., Division of Medicinal and Natural Products Chemistry, College of Pharmacy, University of Iowa

Exposure to environmental chemicals is a known risk factor for Parkinson's Disease (PD). Specifically, chemicals used in agriculture, (e.g. paraquat), are associated with PD. However, the exact relationship between exposure and disease is not known, and the underlying mechanism remains to be elucidated. Recent evidence suggests oxidative stress, but it is not known how these agents (e.g. paraquat) produce specific death of DA neurons as observed in PD. A potential mechanism may involve DA-derived endogenous neurotoxins, which would be found in DA regions of the brain. In this proposal, it is hypothesized that exposure of brain mitochondria to the herbicide paraquat results in accumulation of oxidized DA, specifically, DOPAL and/or the DA-quinone, yielding protein modification by these reactive compounds. This study seeks to establish a mechanistic link between exposure to paraquat and aberrant levels of neurotoxic DA oxidation products proposed to participate in PD pathogenesis.

Exploratory Studies of a Novel Pathway for the Formation of halo-organic "Disinfection By-Products"

Investigator: R. Valentine, Ph.D., Department of Civil and Environmental Engineering, University of Iowa

It is hypothesized that metal oxides may exist in some drinking water distribution systems capable of oxidizing iodide and possibly bromide producing species that can react with natural organic to form halo-organic compounds of possible health concerns. This hypothesis is based on recently obtained experimental evidence indicating that lead oxide (PbO2), an oxide that can accumulate in distribution systems and on household plumbing fixtures, has the capacity to oxidize iodide. The primary objectives of this research are to demonstrate proof-of-concept of this novel reaction pathway, and to investigate factors that influence the extent and rates of the reactions. Studies will initially focus on the lead oxide-iodide-NOM system and measurement of selected iodo-organic compounds. Additional studies will be conducted using several other oxides. If iodide is found reactive, then oxidation of bromide will also be evaluated to determine if formation of bromo-organic compounds is also possible at environmentally relevant conditions.

Arsenic speciation in Iowa's groundwater and surface water

Investigator: D. Simmons, Ph.D., University Hygienic Laboratory, University of Iowa

Arsenic (As) is a highly regulated trace element due to its adverse health effects. The University Hygienic Laboratory has closely monitored total arsenic concentrations in Iowa's surface (lakes, rivers, streams, etc.) and groundwater; elevated levels of arsenic have been detected in the past. Different As species, including inorganic and organoarsenic species, have different toxicities and bioavailabilities. This pilot study will assess As speciation in both groundwater and surface water from a variety of Iowa sites. A hyphenated technique, coupling Inductively SCoupled Plasma - Mass Spectrometry (ICP-MS) with a liquid chromatographic (LC) separation, will facilitate the analytical tasks. Some water chemistry parameters and their influence on arsenic speciation will also be investigated. Joining with the Iowa Statewide Rural Well Water Survey Phase II (SWRL

2), it is expected that this study will lead to a more comprehensive arsenic environmental chemistry study in the rural environment.

Determining the Mechanistic Effects of the Physical Properties of Nanocrystalline Zeolites on Cell Toxicity

Investigator:: A. Salem, Ph.D. Department of Pharmaceutics, S. Larsen, Ph.D. Department of Chemistry, The University of Iowa

The rapid growth and development in the synthesis of nanomaterials with carefully controlled properties, such as size and shape, surface area and composition has led to a burgeoning of potential applications for these nanomaterials. However, the toxicological effects of these materials such as nanocrystalline zeolites have not yet been systematically investigated and assessed with respect to their properties. In this proposal, the impact of size, surface chemistry, composition and porosity of nanocrystalline zeolites on the mechanism of death in lung epithelial cells will be investigated.

Mechanisms of Perfluorooctanesulfonamide- Induced Oxidative Stress in Female Rats

Investigator: W. Xie Ph.D., H. Lehmler, Ph.D, Department of Occupational and Environmental Health, D. Spitz, Department of Radiation Oncology, The University of Iowa

Perfluorinated compounds such as perfluorooctanesulfonamides (PFOSAs) are emerging as an important class of environmentally persistent chemicals. Our knowledge of their mechanisms of toxicity is very limited. Exposure to these chemicals has been associated with developmental toxicity in several animal models. Based on the observation that PFOSAs are peroxisome proliferators and cause mitochondrial dysfunction the study hypothesizes that oral exposure to a typical PFOSA such as N-EtFOSE (N-ethyl perfluorooctanesulfonamidoethanol) may cause oxidative stress in vivo. The hypothesis will be tested by measuring markers of oxidative stress and the activity of enzyme in selected organs. This pilot study will answer important questions regarding the toxicity of PFOSAs and allow design of further investigations of the mechanisms of their toxicity.