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January 8, 2007

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,

Gary W. Steinke

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Attachment
cc: Legislative Liaisons
Legislative Log

CHEEC Report to the Iowa Legislature: 2006

Background The Center for Health Effects of Environmental Contamination (CHEEC) at The University of Iowa (UI) is submitting this progress report for 2006 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 October 20, 2006. Bernie Hoyer from IDNR is the current committee chair. The FY 2006 budget was discussed and FY 2007 budget was presented to the committee and approved unanimously. Sarah Larsen, Professor of Chemistry, gave a presentation on nanotechnology and nanoscience activities at the University of Iowa. CHEEC has provided seed grant funding to Larsen on nanocrystalline zeolites and their applications for environmental remediation technologies.

Budget for Fiscal Year 2006 CHEEC receives 9% of the annual receipts in the Agricultural Management Account of the Iowa Groundwater Protection Fund. A total of \$385,000 was allocated to CHEEC from this account during FY 2006. CHEEC also generates income 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 2006 operating budget:

Expenditures

Personnel
(Salary + Fringe) (2.53 FTE + Faculty director support)

Administration	\$	77,233
Data Management	\$	35,750
Education	\$	14,954
Research	\$	63,970
Service	\$	14,954
Total		\$206,861

Administration

Travel	\$	422
General Supplies/misc	\$	3,263
Telecommunications/postage	\$	702
Total		\$4,387

Data Management Center

Hardware, Software, lic, maintenance	\$	11,366
Staff Travel/education	\$	-
Total		\$11,366

Education Programs

Publications	\$	4,279
Seminars/Conference Exp.	\$	1,591
Education grants	\$	2,500
Total		\$8,370

Research Programs

Seed Grants	\$	135,473
USGS/SWRL match	\$	5,000
Total		\$140,473

Total Expenditures **\$371,457**

Balance general account FY2006 **\$43,599**

CHEEC Data Management Center During 2006, 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 2006, 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.

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 2006 CHEEC staff served on the steering committee and was a partial financial sponsor 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 and who have an awareness of the broad array of challenges facing communities in protecting Iowa's water resources today and in the future.

In 2006, CHEEC staff gave professional presentations at state and regional conferences highlighting CHEEC research projects. Center staff serve 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 and National Academy of Sciences publications.

CHEEC sponsors seminars of interest to interdisciplinary audiences on environmental health issues. The following seminar was held on the UI campus in 2006.

Sources, Fate, and Nature of E. coli in Streams and Lakes

Richard Whitman, Ph.D., and Meredith Nevers, U.S. Geological Survey
co-sponsored by the U.S. Geological Survey and Iowa Department of Natural Resources

CHEEC awarded one education grant in 2006. It provided partial support for *The Governor's Iowa High School Water Summit and Scholarship Program*, sponsored by the Governors office, the Iowa Association of Municipal Utilities, and CHEEC.

During 2006, 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.

Research Funding With money received from the Agricultural Management Account, CHEEC administers a seed and cooperative research grant program. Both support 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. This research 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 to these research efforts. In return, the research program generates over nine dollars in external funding for every dollar invested. In the past 5 years, seed grants have attracted an additional \$6.1 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 2006, CHEEC awarded the following grants:

Demonstration Project for Source-Receptor Modeling of Vehicular Toxic Gases and Particles

Investigator: Charles Stanier Ph.D., Department of Chemical and Biochemical Engineering, University of Iowa

This proposal describes the development of a personal exposure screening tool for prediction of gas- and aerosol-phase vehicular air toxics. The tool will marry existing approaches for gaseous pollutants together with emerging techniques and data for size-resolved fine, ultrafine, and nanoscale particulate matter (mainly from diesel exhaust). Including size-resolved particulate matter in a screening model is a significant challenge, made necessary because of the recent focus on the relationships between traffic, health effects, and ultrafine/nanoparticle toxicity. Further rationale for including size resolution comes from upcoming EPA-mandated changes to diesel sources. Emphasis will be placed on creating an efficient model for general and screening use, rather than a highly detailed model for application to a specific location or exposure setting. It is anticipated that the work product will be well received by funding agencies, public health researchers, and transportation planners.

Mouse Model of Experimental Asthma Using (1->3)-B-D- Glucan Derivatives

Investigators: Nervana Metwali, Ph.D., Peter Thorne, Ph.D., Department of Occupational and Environmental Health, University of Iowa

Animal models that mimic the pulmonary features observed in human asthma are important tools to study the mechanism(s) of allergen-induced asthma. (1->3)-B-D-Glucans are fungal cell wall polysaccharides that stimulate innate immune responses and are responsible for bioaerosol-induced respiratory symptoms in both indoor and occupational environments. This research will examine the interaction between different types of glucan (branched and linear) in C3HeB/FeJ mice. The research proposes to expose groups of mice to curdlan as a linear (1->3) glucan, pustulan as a linear (1->6) glucan and scleroglucan and laminarin as (1->3)(1->6) branched glucans. This study will bring new understanding to the role of glucans with differing tertiary structure in the induction of inflammation and specific immunity.

Development of a Single Particle Analysis Technique for Real-Time Monitoring and Characterization of Bioaerosols

Investigator: Mark Young, Ph.D., Department of Chemistry, University of Iowa

This research will develop an advanced instrument capable of determining the aerodynamic size, approximate shape, and detailed chemical composition of single bioaerosol particles sampled directly from the ambient atmosphere. The correlated data will be used to classify individual particles and provide a detailed characterization of diverse aerosol populations. Sample preparation will be minimal and the analysis sufficiently rapid that identification can be achieved in near real-time. The experimental methodology will integrate advanced solid-state laser sources and mass spectrometric techniques to fashion a powerful and unique instrument. The resultant device will be used in future projects to characterize bioaerosols present in the environment, such as in agricultural workplaces, provide a sensitive detection capability for possible biohazards, and monitor bioaerosol transformations induced by chemical processing in the atmosphere. The capabilities of the proposed instrumentation would greatly facilitate epidemiological studies which seek to correlate bioaerosol exposure with deleterious health effects.

Polychlorinated Biphenyls are an "Old" Issue: Telomere Toxicity Accelerates Senescence and Promotes Carcinogenesis

Investigators: James Jacobus, Interdisciplinary Degree in Toxicology, Gabriele Ludewig Ph.D., Department of Occupational and Environmental Health, Aloysius Klingelhutz, Ph.D., Department of Microbiology, University of Iowa

Polychlorinated Biphenyls (PCBs) are persistent organic pollutants classified as "probable human carcinogens" by the US Environmental Protection Agency. The exact mechanism of PCB carcinogenesis continues to be elusive. This pilot study proposes techniques for the investigation of a novel target of PCB toxicity, the telomere. Telomeres are rapidly being recognized by scientists as key cellular factors in carcinogenesis, cell-signaling, and senescence. Oxidative stress has been shown to shorten telomeres and therefore reduce the protective buffer they provide to the chromosome. Researchers have implicated oxidative stress as the ultimate carcinogen resultant from PCB exposure. However, no study has examined a telomeric toxicity arising from PCB metabolism. Positive findings in this study could open up an entirely new line of innovative interdisciplinary research, while providing a unifying explanation to the often contradictory findings in PCB carcinogenesis.

The Prevalence and Control of Fragrance Compounds in Iowa Drinking Water

Investigators: Keri Hornbuckle, Ph.D., William Wombacher, Department of Civil and Environmental Engineering, University of Iowa

The purpose of this pilot project is to evaluate the effectiveness of water treatment in removing fragrance compounds from drinking water. Synthetic musk fragrances are common additives to many household products. They have been found in wastewater effluent discharge and are considered to be common contaminants in surface waters. The effectiveness of conventional water treatment at removing synthetic fragrances is not well known. Some evidence suggests that removal efficiencies are very poor. This is of concern because many synthetic musk fragrances are endocrine disruptors and may present a health risk to humans.

In 2006, CHEEC initiated work on the following project:

SWRL II

Collaborators: CHEEC, Iowa Department of Natural Resources, United States Geological Survey, University Of Iowa Hygienic Laboratory, UI College of Public Health, and County environmental health specialists.

This is the first year of a collaborative research project sampling the water quality of Iowa's private rural wells. The original SWRL (State-wide Rural Well Water Survey), completed in 1988-89, was a comprehensive statistically valid assessment of rural well water quality. Since that time, no other study has looked extensively at the quality of water rural residents are drinking. The first phase of the SWRL II study identified, located and sampled more than 120 of the original SWRL wells. These will be used to assess water quality trends. Subsequent years will randomly select wells across the entire state and look at a variety of biological, inorganic and organic contaminants including commonly used pesticides and their degradates.