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Robert Donley, *Executive Director*

January 6, 2012

Glen Dickinson
Legislative Services Agency
State Capitol

Re: CHEEC Annual Report

Dear Mr. Dickinson:

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,



Robert Donley

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Attachment
cc: Legislative Liaisons
Legislative Log

Annual Report to the Iowa Legislature

For 2011

Submitted by:

The Center for Health Effects of Environmental Contamination

At

The University of Iowa

January, 2012

Background The Center for Health Effects of Environmental Contamination (CHEEC) at The University of Iowa (UI) is submitting this progress report for 2011 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) cooperating and collaborating on environmental health research programs and projects, 3) managing a seed grant program to support environmental health research, 4) providing education and service programs to the citizens of the state and the region, and 5) serving on state and local committees to provide 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 State Hygienic Laboratory. Participating areas include the Environmental Engineering Laboratory, the Institute for Rural and Environmental Health, the Iowa Cancer Registry and the Iowa Registry for Congenital and Inherited Disorders. CHEEC works cooperatively with the Iowa Departments of Natural Resources (IDNR), Public Health (IDPH), and Agriculture and Land Stewardship (IDALS).

Advisory Committee The CHEEC Advisory Committee met on November 16, 2011. Dr. Lois Dusdieker (UI Pediatrics) and Dr. David Bennett (UI Geography) left the Committee in 2011 and were replaced by Prof. Jon Carlson (UI College of Law) and Dr. Margaret Carrel (UI Geography). The final FY 2011 budget was discussed and the proposed FY 2012 budget presented to the committee and approved unanimously. Dr. Lucy Desjardins and Nancy Hall of the State Hygienic Laboratory presented results of their CHEEC-funded project titled *Evaluation of enterococci and bacteroides real time PCR assays for measuring recreational water quality in Iowa with a source tracking perspective.*

Budget for Fiscal Year 2011 CHEEC receives 9% of the annual receipts in the Agricultural Management Account of the Iowa Groundwater Protection Fund. CHEEC's allocation from this Account totaled \$407,490 in FY 2011. Additionally, CHEEC generates revenue through federal grants and contracts, and private contracts that support CHEEC research activities. The personnel budget is presented in the categories of administration, data management, education programs, research programs, and service activities, to reflect effort in these areas. General operating costs within each area are presented separately for expenses charged to the General Account (Agricultural Management Account funds). Remaining expenses (1.3 FTE and other data management costs) are covered by federal grants and contracts.

The balance from FY 2010 (\$41,168) was carried forward into FY 2011 and earmarked for cooperative research grants; one was approved (for \$25,000) by the CHEEC Executive Committee, another will be funded in FY 2012 (for \$25,000). The \$13,344 general expense line includes new office furniture for CHEEC's relocation to the UI BioVentures Center.

The CHEEC FY 2011 operating budget:

Expenditures

Personnel
(Salary + Fringe)
(1.70 FTE + Faculty director support + student hourly support)

Administration	\$ 60,254
Data Management	\$ 48,203
Education	\$ 36,153
Research	\$ 84,356
Service	\$ 12,051
Total	<u>\$ 241,017</u>

Administration

Travel	\$ 2,700
General Supplies/misc	\$13,344
Telecommunications/postage	56
Total	<u>\$ 16,100</u>

Data Management Center

Hardware, Software, lic, maintenance	\$ 8,569
Staff Travel/education	\$ 1,081
Total	<u>\$ 9,650</u>

Education Programs

Publications	\$ 3,402
Seminars/Conference Exp.	0
Education grants	0
Total	<u>\$ 3,402</u>

Research Programs

Seed Grants	\$ 119,586
	\$ 25,000
Cooperative Grant	-
Total	<u>\$144,586</u>

Total Expenditures \$414,755

Balance general account FY 2011 \$39,903

CHEEC Data Management Center During 2011, CHEEC staff provided full system support for programming, local area network administration, database design and administration, and applications development for in-house, state, and federally-funded environmental health research projects. Environmental databases are designed and managed on the Oracle database management system.

CHEEC 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)*. The *Iowa Historical Municipal Water Treatment and Supply Database* is current through 2009. Federal Safe Drinking Water Act data through 2010 were added for all municipal supplies to the *Municipal Analytical Water Quality Database*.

In 2011, research efforts utilizing CHEEC's environmental health and computer database expertise, or other research staff expertise, included:

- **Exposure Assessment Method for Disinfection Byproducts in Drinking Water in the National Birth Defects Prevention Study**

Collaborators: National Birth Defects Prevention Study centers, U.S. EPA, CHEEC
Funding Agency: National Center on Birth Defects and Developmental Disabilities, Centers for Disease Control and Prevention (CDC)

This project calculated disinfection byproducts (DBP) exposures in public drinking water systems for participants in the National Birth Defects Prevention Study. The exposure assessment includes linking geocoded maternal addresses to appropriate drinking water utilities, linking relevant DBP water quality data to those residences, and modeling the DBP data to account for possible spatial and temporal variability.

- **Nitrates, Nitrites and Nitrosatable Drugs and the Risk for Selected Birth Defects**

Collaborators: Texas A&M University, the UI Registry for Congenital and Inherited Disorders, National Birth Defects Prevention Study centers, CHEEC
Funding Agency: National Institute for Environmental Health Sciences

This study is examining the separate and joint effects of prenatal exposures to nitrates, nitrites and nitrosatable drugs on the risk for selected congenital malformations in children, using data collected by the National Birth Defects Prevention Study. Texas and Iowa are conducting an exposure assessment for nitrate in public drinking water and in bottled water; Texas is also modeling nitrate exposures in private well water.

- **Muscular Dystrophy Surveillance, Tracking & Research Network (MDSTARnet)**

Collaborators: Centers for Disease Control and Prevention (CDC), Iowa Registry for Congenital and Inherited Disorders, Iowa Department of Public Health, researchers from Arizona, Colorado, Georgia, and New York.

Funding Agency: Centers for Disease Control and Prevention

CDC is working with researchers to set up surveillance/tracking systems for Duchenne/ Becker muscular dystrophy (DBMD), the most common muscular dystrophy in children. The goal is to find all DBMD patients in these states by using information

from clinic medical records and hospital records. Information about each child's treatments and medical status will be reviewed to try and answer questions re: DBMD.

- **National Children's Study**

Collaborators: UI (Pediatrics, Epidemiology, Iowa Registry for Congenital and Inherited Disorders, CHEEC), Polk County hospitals and Public Health agencies, Des Moines University

Funding Agency: National Institute of Child Health and Human Development

The National Children's Study is examining the effects of the environment, which includes factors such as air, water, diet, sound, family dynamics, community and cultural influences, and genetics on the growth, development, and health of children across the United States, following them from before birth until age 21 years. In Iowa, 1,000 children in Polk County will be enrolled in the Study.

- **Water Quality Data for Private Wells for the Agricultural Health Study**

Collaborators: CHEEC, State Hygienic Laboratory

Funding Agency: National Cancer Institute

This project is providing nitrate, pesticide and other water quality data for private wells and public water utilities across Iowa to use in modeling drinking water exposures for participants in the Agricultural Health Study (~ 89,000 persons enrolled in Iowa and North Carolina); the goal is to investigate the effects of environmental, occupational, dietary, and genetic factors on the health of the agricultural population.

CHEEC Conference Recent Iowa studies have documented the widespread occurrence of arsenic in private drinking water wells. A 2006-08 statewide survey of 475 wells conducted by CHEEC and the State Hygienic Laboratory showed that almost half of the water samples contained arsenic; about 8% of those had arsenic concentrations at or above 10 parts per billion, EPA's drinking water standard for public water supplies. High arsenic levels were documented in 31 Iowa counties, in both shallow and deep wells.

A one-day conference titled ***Arsenic in Iowa's Water Sources: Surveillance, Research, Education and Policy*** was held on November 9, 2011, at the Iowa State Historical Building in Des Moines. The conference was co-sponsored by CHEEC, the State Hygienic Laboratory, IDPH and the Iowa Geological & Water Survey (IDNR). One hundred people attended the meeting, which presented overviews of the possible health effects from exposure to arsenic in drinking water, Iowa surveillance efforts on arsenic, current Iowa-based research on the fate and transport of arsenic in the environment, treatment options for arsenic removal/reduction in small systems, and current water quality education programs in Iowa. Researchers from Minnesota and Wisconsin discussed efforts to address arsenic concerns in those states, and a panel of experts responded to audience questions on what approaches might be taken in Iowa to develop public education programs on arsenic and policies to prevent or limit arsenic contamination of drinking water supplies. Conference attendees included private well owners, well drillers, local and state public health professionals, environmental health researchers, environmental engineers, geologists, local and state policy makers, and the general public.

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 agencies. In 2011, CHEEC staff gave professional presentations at local and state meetings on CHEEC research projects. CHEEC staff also served on the IDPH Advisory Committee for the Environmental Public Health Tracking Program.

During 2011, 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, water and waste water treatment plant operators, agriculture extension personnel, the media, environmental activist groups, and the public. A biennial report (2009-2010) presenting CHEEC research and other activities was published and released in April 2011.

Research Funding With Agricultural Management Account funds, CHEEC administers a seed grant program that supports pilot level research across a range of environmental research topics. Seed grant projects are small-scale studies designed to test new and unusual hypotheses, develop innovative methodologies in laboratory and field settings, or perform initial statistical analyses to support efforts to acquire federal or private grants for larger studies. The funding provides graduate level research opportunities, which strengthens graduate level programs, creates innovative research, and fosters interdisciplinary development of research opportunities.

CHEEC awards about one-third of its annual Agricultural Management Account allocation in seed funding. Since 1989, this investment has generated over ten dollars in external funding for every dollar invested by the program; seed grants projects have attracted over twenty million dollars in external funding for additional research. Seed grant funding provides hands-on learning opportunities for undergraduate and graduate students, enhancing their educational experience and preparing them for their professional lives.

In fiscal year 2011, CHEEC awarded the following seed grants:

Pesticide Exposure and Risk of Endometriosis

Investigators: E. Smith, L. Rubenstein, Department of Epidemiology ; B. Stegmann, Department of Obstetrics and Gynecology; L. Fuortes, Department of Occupational and Environmental Health, The University of Iowa

Executive summary: Endometriosis is a chronic disease affecting ~15% of US reproductive-aged women, and is a significant cause of infertility. One suggested risk factor is exposure to organochlorines (OC). Diagnosed cases of endometriosis have been detected with longer exposure or higher serum concentrations than controls for OCs (PCDD, PCDF, and PCB/dioxin); however, study results have been inconsistent due partly to small numbers of cases/controls and limited exposure history. Analyses using the Agricultural Health Study will provide a significantly larger sample size for a case-control study and detailed measures of pesticide and environmental exposure to common agricultural pesticides and to these OCs. Study results will be used as pilot data for a National Institute of Child Health & Human Development (NICHD) proposal of clinic-based case-control study. In 2010, an NICHD

Fertility Preservation Research Program, sought grants to characterize occupational and environmental exposures that may be associated with risks of infertility. This exposure and infertility issue continues to be of interest to NICHD.

Using Human Enteric Viruses to Track Groundwater Contaminants to a Municipal Drinking Water Supply in an Alluvial Aquifer

Investigator: W. Simpkins, Department of Geological and Atmospheric Sciences, Iowa State University

Executive summary: Alluvial aquifers are the most productive and widely used groundwater source for drinking water in Iowa. They are also the most vulnerable to contamination due to their shallow water table, hydraulic interchange with streams, and the potential for flooding. The Ames aquifer in Ames, Iowa is such an aquifer that is potentially vulnerable to contamination. The hypothesis that *human enteric viruses enter the Ames aquifer from the South Skunk River and are transported to the municipal well field that supplies the Ames drinking water* will be tested by analyzing river water and groundwater in piezometers and wells for viruses and stable isotopes along a groundwater flow path. The results will provide unique information about the extent and temporal variability of human enteric viruses in drinking water and demonstrate an innovative method (i.e., presence of viruses) to assess Groundwater under the Direct Influence of Surface Water (GWUDISW) in alluvial aquifers.

Enantiospecific Disposition of Chlordane in a Mouse Model Lacking NADPH-Dependent Cytochrome 450 Reductase

Investigators: E.D. Oldham, I. Kania-Korwel, H.J. Lehmler, Department of Occupational and Environmental Health, University of Iowa

Executive Summary: The pesticide chlordane is a mixture of structurally related, highly chlorinated hydrocarbons and is a persistent environmental contaminant linked to a range of adverse health effects in animals. Most of the isomers are chiral, and may be metabolized in an enantiospecific manner. This type of metabolism has been shown for other chiral pollutants. We hypothesize that chiral chlordane isomers are metabolized enantioselectively by cytochrome P450 enzymes. To test this hypothesis we will take advantage of a knockout mouse model lacking the NADPH-dependent cytochrome P450 reductase, a critical enzyme in the catalytic cycle of P450 oxidation, and measure levels and enantiomeric fractions of chlordane and its metabolites in tissue from wild-type and knockout mice. This research will provide key mechanistic information about enantiospecific metabolism of chlordane, and can be extended to other pesticides commonly found in Iowa.

Establishing a Methodology for the Detection of Silica Particles in Lung Cancer Tissue Using Computer-Controlled Scanning Electron Microscopy

Investigators: K. Coleman, R.W. Field, Department of Occupational and Environmental Health, University of Iowa

Executive summary: Crystalline silica has long been recognized as an occupational hazard of the dusty trades with exposures resulting in silicosis. As recently as 1997, IARC categorized the respirable portion of crystalline silica as a Grade 1 human carcinogen indicating that silica may be implicated in the development of lung cancer. Evidence in the literature indicates that silica may be not only an occupational hazard, but an environmental hazard as well, with patients with no known exposure showing measurable quantities of silica within cancerous tissue samples. The primary goal of this study is to establish a methodology using Computer-

Controlled Scanning Electron Microscopy to examine silica content in lung cancer tissue. Demonstrating that silica is not evenly distributed within the tissue will establish the need to use automated full scanning techniques, such as CCSEM, to guarantee that the analysis is not subject to random sampling error or researcher error, which may be rendering the traditional random sampling of zones for analysis under-representative of silica concentration in the tissue.

Cooperative Research Grant

CHEEC initiated a cooperative research program in 1999, which seeks to leverage research monies from university, state, and federal entities to conduct research in areas of mutual interest with collaborators. The collaboration requires matching funds from participating entities. A member of CHEEC's executive committee must serve as a co-investigator. Like the Seed grant Program, it seeks to establish innovative lines of environmental health research leading to preliminary results that may be used in seeking further larger grant funding from federal and private sources.

In fiscal year 2011, CHEEC awarded the following Cooperative Research Grant:

Influx of Redox Fluctuations on Arsenic Dynamics in Iowa Aquifer Materials

Investigators: M. Scherer, G. Parkin, D. Schnoebelen, Department of Civil and Environmental Engineering; P. Weyer, CHEEC, University of Iowa

Executive summary: This project will help address the issue of arsenic in groundwater by conducting laboratory experiments to better understand the geochemical processes controlling the release of arsenic to groundwater. This work will build on a concurrent project (which will provide matching funds) to develop analytic methods for measuring arsenic and investigating the reduction of arsenic by common soil minerals. This cooperative research effort proposes to 1) determine the extent of arsenic incorporation and release from iron minerals commonly found in Iowa aquifers, and 2) measure the release of iron and arsenic from Iowa aquifer materials where arsenic has been identified in the groundwater.