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Robert Donley, Executive Director

March 31, 2016

Glen Dickinson, Director  
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 2015**

**Submitted by:**

**The Center for Health Effects of Environmental Contamination**

**At**

**The University of Iowa**

**January, 2016**

**Background** The Center for Health Effects of Environmental Contamination (CHEEC) at The University of Iowa (UI) is submitting this progress report for 2015 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 State Hygienic Laboratory, the UI 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 will meet on January 26, 2016. The Committee did not meet in 2015 due to the Center undergoing a reorganization following the retirement of the faculty Director (Dr. Gene Parkin) and the Senior Systems Analyst (Ms. Jiji Kantamneni). Dr. Peter Weyer was appointed Interim Director effective July 1, 2015. The Committee will be apprised of the status of the reorganization at the January 2016 meeting.

**Budget for Fiscal Year 2015** 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 \$479,688 in FY 2015. 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 (portion of staff salaries) are covered by federal grants and contracts.

**FY 2015 operating budget:**

**Revenue**

Agricultural Management Account	\$479,688
Carry over from FY 2014	<u>\$ 83,462</u>
<b>Total revenue</b>	<b>\$563,150</b>

**Expenditures**

Personnel (Salary + Fringe) (1.70 FTE + Faculty director support + HR support – central Admin)		
Administration	\$ 53,675	
Data Management	\$ 40,256	
Education	\$ 80,512	
Research	\$ 80,511	
Service	<u>\$ 13,419</u>	
<b>Total</b>	<b>\$ 268,373</b>	

Administration

Travel	\$ 662
General Supplies/misc	\$ 836
Telecommunications/postage	<u>\$ 38</u>
<b>Total</b>	<b>\$ 1,536</b>

Data Management Center

Hardware, Software, licenses, maintenance	<b>\$ 16,584</b>
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Education Programs

Seminars/Conference Exp.	\$2,527
Education grants	<u>\$1,000</u>
<b>Total</b>	<b>\$3,527</b>

Research Programs

Seed Grants	\$90,000
Cooperative Grant (encumbered)	<u>\$ 80,000</u>
<b>Total</b>	<b>\$170,000</b>

**Total Expenditures \$460,020**

**Balance general account FY 2015 \$103,130**

Carryover to FY 2015 will be used to fund additional seed grants and education grants.

**CHEEC Data Management Center** During 2015, CHEEC staff provided support for 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)*. Federal Safe Drinking Water Act data through 2014 were added for all municipal supplies to the *Municipal Analytical Water Quality Database*. In 2015, research efforts utilizing CHEEC's environmental health and computer database and research staff expertise included:

### **Obtaining Water Quality Data for Public Water Supplies and 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. The data generated in this project will also be linked to the Iowa Women's Health Study (IWHS) cohort (~28,000 Iowa women enrolled in 1986), so that estimated exposures to pesticides and other contaminants in public water supplies, and nitrate and pesticides in private drinking water well users in the IWHS can be evaluated for cancer risk, and other adverse health outcomes.

### **Exposure Assessment for Drinking Water Contaminants and Cancer Risk in the Iowa Women's Health Study**

*Collaborators:* University of Minnesota, National Cancer Institute, CHEEC

*Funding Agency:* National Cancer Institute

This project will determine associations between environmental exposures and cancer incidence and mortality among older Iowa women by linking drinking water contaminant data including nitrate, DBPs, and pesticides to the women's drinking water source to evaluate risk of brain, bladder, kidney, ovarian, thyroid and gastrointestinal cancers. This is a follow-up investigation to work which began in 1996 on the IWHS cohort, specifically looking at nitrate. Preliminary work will also begin on assessing arsenic drinking water concentrations in communities where IWHS participants resided.

**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 2015, CHEEC was involved in the UI Mobile Museum exhibit "*Water Underground: The Science of Iowa's Most Essential Resource*" and staff participated in a number of conferences and workshops across the state in 2015. CHEEC staff served on the State Hygienic Laboratory Board of External Advisors. During 2015, CHEEC responded to information requests from state and county

health departments, the National Cancer Institute, university researchers and students, water treatment plant operators, the media, environmental activist groups, and the public.

***Research Funding*** 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 nine 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. To date, over forty graduate degrees have resulted from seed grant projects, and over ninety articles describing seed grant projects have been published in peer-reviewed journals.

In fiscal year 2015, CHEEC awarded the following seed grants:

**Metabolomics characterization of early biomarkers of microcystin exposure in blood**

*Investigators:* W. Rumberha, P. Imerman, Department of Veterinary Diagnostic and Production Animal Medicine, Iowa State University; A. Perera, WM Keck Metabolomics Research Laboratory, Iowa State University

*Executive Summary:* Fresh water cyanobacteria harmful algal blooms (HABs) are increasing in frequency and severity in the U.S. and globally. Blooms produce potent and lethal cyanotoxins which poison people and animals. This is a serious emerging “One Health” problem. Among the many cyanotoxins produced by HABs are hepatotoxic and carcinogenic microcystins. Currently, the state-of-the-art diagnostic approach for microcystin intoxications in people is measuring elevated blood serum liver enzymes as biomarkers of effect. Unfortunately, elevated liver enzymes are late biomarkers of microcystin effects. The objective of this study is to identify and characterize early biomarkers of microcystin exposure and effects in humans using the mouse model. These early biomarkers will be used for diagnosis in populations exposed to contaminated water in order to mount early intervention procedures to protect individual and public health.

**A low-cost aerosol sensing estimator for assessing aerosol exposure**

*Investigators:* Sousan, T. Peters, Department of Occupational and Environmental Health, The University of Iowa; G. Thomas, Department of Mechanical and Industrial Engineering, The University of Iowa

*Executive Summary:* The association of air pollution with adverse cardiopulmonary health outcomes may be underestimated because of misclassification errors introduced by uncertainty in the exposure assessment of aerosols. Until recently, the excessive cost of high-end aerosol measurement devices (>\$10,000) has prevented the regular collection of aerosol data with high spatial and temporal resolution with exposure measurements often being limited to a single site

to represent large populations. In some cases, new, low-cost (<\$500) aerosol devices have been found to correlate favorably to high-cost devices. However, these low-cost devices suffer from some limitations, such as an inability to distinguish between fine and coarse particles. The proposed study aims to overcome these limitations by designing and evaluating a customized, aerosol sensor based on low-cost, high-resolution cameras. The low-cost sensor will enable routine aerosol assessment among the general population, providing estimates of aerosol concentrations resolved by size (fine and coarse aerosol) and time (<5 min logging).

### **Metagenomic analysis and modeling of environmental resistance to agricultural antibiotics**

*Investigators:* M. Soupir, A. Howe, Department of Agricultural and Biosystems Engineering, Iowa State University

*Executive Summary:* Increasing levels of antibiotic resistance in clinical settings has led many to believe that animal agriculture antibiotic use is contributing to the global resistance problem; however, that connection is unclear given the limited understanding of antibiotic resistant bacteria (ARB) and resistant genes (ARG) in the soil and water environment. Our previous work has documented differences in ARG concentrations in drainage when compared to measured concentrations of U.S. EPA recommended indicator bacteria. Here, we propose laboratory experiments in a controlled column environment, representative of an agroecosystem, to (1) identify the diversity and quantify the abundance of ARGs and their hosts in manure, soils with varying management histories, and simulated subsurface drainage; and (2) identify the diversity and quantify the abundance of mobile genetic elements and their linkages to ARGs. Results will provide valuable insight into i) the microbial community harboring ARGs and ii) horizontal gene transfer processes occurring in agricultural systems.