

**Governing Iowa's public
universities and special schools**

University of Iowa
Iowa State University
University of Northern Iowa
Iowa School for the Deaf
Iowa Braille and Sight Saving School
Lakeside Laboratory Regents Resource Center
Northwest Iowa Regents Resource Center
Quad-Cities Graduate Center
Southwest Iowa Regents Resource Center



Bruce Rastetter, President, *Alden*
Katie Mulholland, President Pro Tem, *Marion*
Mary Andringa, *Pella*
Sherry Bates, *Scranton*
Patricia Cownie, *Des Moines*
Milt Dakovich, *Waterloo*
Rachael Johnson, *Cedar Falls*
Larry McKibben, *Marshalltown*
Subhash Sahai, *Webster City*

Robert Donley, Executive Director

January 9, 2017

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

<https://iastate.box.com/s/qvnnqn7rov93gi58de384ekto56ogb8>

Attachment

cc: Legislative Liaisons
Legislative Log

Annual Report to the Iowa Legislature
For 2016

Submitted by:

The Center for Health Effects of Environmental Contamination

At

The University of Iowa

January, 2017

Background The Center for Health Effects of Environmental Contamination (CHEEC) at The University of Iowa (UI) is submitting this progress report for 2016 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 environmental health education 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 Iowa Cancer Registry and the Iowa Registry for Congenital and Inherited Disorders., and various Centers and Institutes at the University of Iowa. 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 January 26, 2016. The Committee discussed the status of the reorganization of CHEEC following the retirement of the faculty Director (Dr. Gene Parkin) and the Senior Systems Analyst (Ms. Jiji Kantamneni) in July, 2015. A number of research and educational outreach opportunities related to drinking water and health effects were discussed, and the Committee was apprised of CHEEC's involvement in the TIER activities of the UI with respect to shared services, IT support, and business office and HR functions. The Committee presented a number of ideas on how CHEEC could become involved in the discussion on water quality at the state level, working in conjunction with the Iowa Department of Natural Resources and the Iowa Department of Public Health.

Budget for Fiscal Year 2016 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 \$388,640 in Fiscal Year (FY) 2016. As 2016 was a reorganization year for CHEEC, personnel expenses were down compared to FY 2015. Dr. Peter Weyer has served as Interim Director since July 2015; the CHEEC Executive Committee will be appointing a new Director by June, 2017. Ms. Kantamneni has been on a part-time appointment since July 2015 to cover IT needs on an emergency basis.

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 other grants and contracts.

**FY 2016 operating budget:
Revenue**

Agricultural Management Account	\$388,640
Carry over from FY 2015	<u>\$103,130</u>
Total revenue	\$491,770

Expenditures

Personnel (Salary + Fringe)

Administration	\$ 34,623
Data Management	\$ 8,656
Education	\$ 51,934
Research	\$ 34,623
Service	<u>\$ 43,278</u>
Total	\$ 173,114

Administration

Travel	
General Supplies/misc	\$1,606
Telecommunications/postage	<u>\$ 11</u>
Total	\$ 1,617

Data Management Center

Hardware, Software, licenses, maintenance	<u>\$3,101</u>
--	-----------------------

Education Programs
(\$6,615 in conferences/seminars,
and education grants were covered
on another CHEEC account)

Seminars/Conference Exp.	\$161
Total	<u>\$161</u>

Research Programs

Seed Grants	\$158,519
Cooperative Grants	<u>\$ 80,000</u>
Total	\$238,519

Total Expenditures **\$416,512**

Free Balance FY 2016 **\$75,258**

Carryover to FY 2017 will be used to fund additional research grants and education grants.

CHEEC Data Management Center and related research

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)*. Safe Drinking Water Act data through 2015 were added for all Iowa public water systems to the *Municipal Analytical Water Quality Database*. The Oracle water quality database maintained by CHEEC was migrated to a MS SQL database as part of the reorganization of CHEEC's IT functions. In 2016, research efforts utilizing CHEEC support included:

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 is studying 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.

Pesticides in Tap Water and Congenital Heart Defects

Collaborators: University of Texas Health Science Center at Houston; National Birth Defects Prevention Study Centers, CHEEC

Funding Agency: National Institute for Environmental Health Sciences

This project is investigating the possible risk for heart defects in offspring of women who are exposed to atrazine in their drinking water during pregnancy. Atrazine exposure data was collected from EPA for several NBDPS states and added to an exposure assessment approach that was developed by Iowa and Texas for the previous NBDPS study looking at nitrate in drinking water and risk for neural tube defects and other birth defects.

Implementation of a Novel Bioassay as a Global Indicator of Endocrine Disruption in Public Drinking Water Supplies for Epidemiologic Studies of Cancer

Collaborators: National Cancer Institute, State Hygienic Laboratory at UI, CHEEC

Funding Agency: National Cancer Institute

Epidemiologic literature suggests that endocrine disrupting compounds (EDCs) play a role in human health. It is unknown whether drinking water is a source of human exposure to EDCs. This project uses a new assay to characterize global EDC activity in samples from ten Iowa public water systems. The project will evaluate the feasibility for developing an exposure model that relates measured EDC activity in water samples to characteristics of the water systems, including levels of regulated contaminants, water source and treatment methods.

Education Activities

CHEEC participates in environmental health education activities through organizing and funding educational programs, and giving presentations at conferences, workshops and public meetings across the state. In 2016, CHEEC participated in the *Governor's Conference on Public Health*, the Iowa Association of Water Agencies annual meeting, provided grant support for an outreach effort on water quality produced by the UI Department of Dance,

participated in webinars and podcasts on Iowa's water quality, gave talks at a number of water quality forums around the state, and participated in drafting two white papers on water quality issues in Iowa. In collaboration with the UI Public Policy Center, CHEEC hosted a one-day conference in June 2016 on *Drinking Water Quality Issues in Iowa*, which was held in Des Moines. CHEEC staff also served on the State Hygienic Laboratory at the University of Iowa Board of External Advisors.

Research Grant 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 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 almost ten dollars in external funding for every dollar invested by the program; seed grants projects have attracted over twenty-two 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 sixty graduate degrees have resulted from seed grant projects, and over one hundred articles describing seed grant projects have been published in peer-reviewed journals. In FY 2016, CHEEC awarded the following seed grants:

Exposure to environmental obesogen tributyltin during early pregnancy in association with maternal obesity and gestational weight gain

Investigators: W. Bao, UI Department of Epidemiology; H.J. Lehmler, UI Department of Occupational and Environmental Health; D.A. Santillan, M.K. Santillan, UI Department of Obstetrics and Gynecology; K. Wang, UI Department of Biostatistics

Executive Summary: Emerging evidence from animal studies has established tributyltin (TBT) as a novel environmental obesogen in the development of obesity and impaired metabolic function. However, data on health effects of TBT exposure in humans are lacking, indicating a critical and urgent need to translate the findings from animal studies to humans. This project is innovative in being the first to investigate the associations of prenatal TBT exposure during early pregnancy with maternal obesity and gestational weight gain. The Investigators will measure TBT concentrations in maternal plasma samples collected from 100 pregnant women at the first prenatal visit (<10 weeks of gestation). These samples have been already collected and archived in the UI Maternal Fetal Tissue Bank, an ongoing prospective cohort study. Maternal anthropometric measures, along with demographic and clinical data, will be extracted from confidential electronic health records.

Fate of neonicotinoid insecticides in water and wastewater treatment systems

Investigators: D.M. Cwiertny, G.H. LeFevre, UI Department of Civil and Environmental Engineering; D.W. Kolpin, U.S. Geological Survey

Executive Summary: Neonicotinoids represent one of the most heavily used pesticide classes, particularly for corn and soy production. Despite their ubiquity in Midwestern water resources,

little is known about their fate in the environment, particularly engineered treatment systems intended to mitigate risks of their exposure. The study hypothesis is that chemical and biological processes used in conventional treatment alter the structure of neonicotinoids so as to remove their specificity to invertebrates, thereby exposing non-target organisms, including humans, to unanticipated risks arising from their bioactive transformation products in finished water and effluent. This project's research plan integrates laboratory studies simulating conventional water and wastewater treatment processes with monitoring of neonicotinoid removal and transformation at the UI Water Treatment Plant. Outcomes will provide the first insights into best practices for neonicotinoid removal during treatment and better understanding of the risks associated with their formation of unintended transformation byproducts.

Environmentally active surface films

Investigators: S.K. Shaw, J.S. Grant, UI Department of Chemistry

Executive Summary: This research will address an emerging avenue for pollutant fate and transport in active surface film. Surface films are composed of organic (waxy) and inorganic (salty) species which combine in dynamic, heterogeneous matrixes on nearly all impervious surfaces. The films work as 'environmental sponges' by mediating fate and transport of volatile and semi-volatile organic pollutants (OP), ultimately affecting human and environmental health. The study goal is to assign culpability of surface films' physical morphology (roughness) and chemical maturity (oxidation state) to their participation in OP absorption and release. The Investigators will develop and expose proxy films to metered doses of known environmental maturation agents (i.e. UV radiation and ozone) and quantify the films' morphology and interaction with OP as a function of film maturity. Investigators predict the films' heterogeneous character and dynamic behavior will significantly impact OP adsorption (and absorption), and that this behavior will trend with film hydrophobicity.

Discovering links between environmental contaminant clusters and environmental, geographic and social drivers using network-based data processing

Investigator: A. Sen Gupta, UI Department of Electrical and Computer Engineering

Executive Summary: This project spans two interdisciplinary collaborations across the College of Engineering and College of Public Health that harness the power of information science and signal processing towards better understanding of contaminant fingerprints in the environment. In particular, the Investigator will study data-driven associations linking contaminant clusters to environmental, geographic and social drivers. This project will develop a data-driven infrastructure towards robust interpretation of raw signal and processed field data, along with prediction models for success of intervention methods. While the focus of the work is chemical contaminants, the methods here apply equally to biological contaminants, e.g. water-borne fecal pathogens in soil and water.

Cooperative Research Program grants

The CHEEC Cooperative Research Program seeks to leverage research funds from university, state, and federal entities to conduct research in areas of mutual interest; the collaboration requires matching funds from participating entities. 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. The following projects were funded in FY 2016:

Naturally-occurring radioactivity in private drinking water in Iowa: Understanding the potential for increased cancer risks to Iowans

Investigators: M. Schultz, UI Department of Radiology; M. Wichman, D. May, State Hygienic Laboratory

Cooperators: UI Department of Radiology, State Hygienic Laboratory

Executive Summary: Naturally-occurring radioactive material can be a substantial source of radiation exposure to the public, especially in groundwater-derived drinking water. Two radionuclides from the uranium decay series lead-210 (Pb-210) and polonium-210 (Po-210) are of particular concern because their characteristic properties combine to present potential carcinogenic risks to human. These radionuclides are present in subsurface geological deposits from which a great deal of Iowa's drinking water is derived. While potential carcinogenicities are known, concentrations of Pb-210 and Po-210 are not well characterized in Iowa aquifers. This study will determine the concentrations of Pb-210 and Po-210 in 50 privately-owned wells across the state to develop an understanding of the potential contribution to increased lifetime cancer risk to Iowans. It is expected that these studies will result in a more detailed understanding of the biogeochemical relationship of increased levels of Po-210 and Pb-210 to other natural radionuclides found in Iowa's well water, and will provide preliminary data for understanding potential risk of natural radioactivity in Iowa's well water.

Effect of co-exposure to air pollution and house dust endotoxins on asthma and wheeze

Investigators: P. Thorne, A. Mendy, UI Department of Occupational and Environmental Health; P. Romitti, UI Department of Epidemiology; D. Zeldin, P. Salo, National Institute for Environmental Health Sciences; C. Weir, US HHS Office of Emergency Management

Cooperators: UI Department of Occupational and Environmental Health, UI Department of Epidemiology, National Institute for Environmental Health Sciences, US HHS Office of Emergency Management

Executive Summary: Air pollutants and house dust endotoxin are ubiquitous in our environment. Air pollutants exacerbate pre-existing asthma and evidence is mounting that they may cause the disease through oxidative stress and destruction of the airway mucosa. Endotoxin is also well known to cause bronchial asthma, although research suggests it might be protective against the atopic phenotype, especially with early-life exposure. Animal studies suggest that co-exposure to both air pollutants and endotoxin may have worse consequences on respiratory health than individual exposures. The proposed study aims to investigate the effect of the co-exposure to environmental pollutants on asthma and wheeze in humans in a U.S. representative sample. The research will lead to an increased understanding of environmental risk factors for asthma and wheeze to enhance prevention of these respiratory conditions.