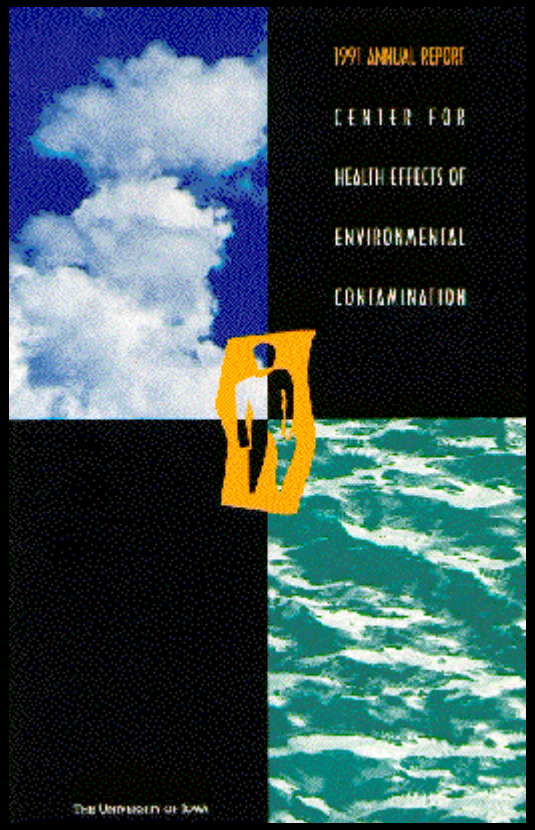
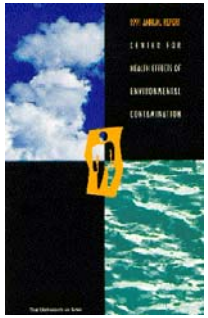
Center for Health Effects of Environmental Contamination | CHEEC

1991 Annual Report

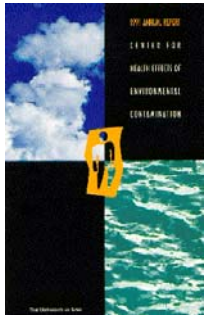




The Center for Health Effects of Environmental Contamination (CHEEC) at The University of Iowa conducts and supports research to determine the levels of environmental contamination which can be specifically associated with human health effects. This annual report for 1991 presents summaries of pilot research studies funded by the Center and gives an overview of CHEEC environmental data management activities and educational programs.

A special section features Rathbun Lake, which is located in Appanoose County in south central Iowa. Through the cooperative efforts of the Rathbun Regional Water Association, the U.S. Army Corps of Engineers, the Iowa Department of Natural Resources, the University Hygienic Laboratory, CHEEC and others, the Rathbun Lake region has become a unique study site to conduct surface water quality research in Iowa.

CHEEC gratefully acknowledges the cooperation of these groups, particularly the Rathbun Regional Water Association. This cooperative spirit has fostered working relationships between academia, government and the private sector, focusing concerns about water quality issues. All Iowans stand to benefit from this alliance.



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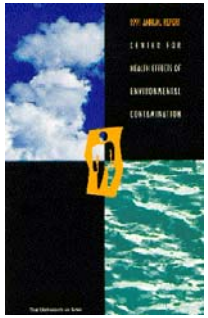
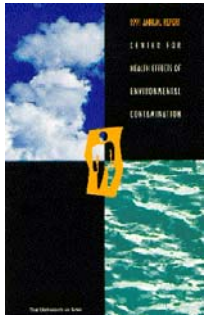


Environmental Data Management Core

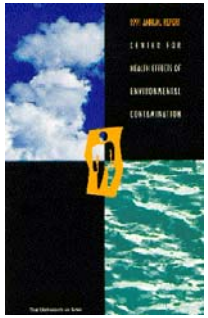
The CHEEC Environmental Data Management Core (EDMC) continues to work on assembling a computerized data base of water supply sample analyses, sources, and treatment characteristics for municipal and private drinking water in Iowa. The goal is to establish an environmental data base that can address potential associations between statewide Iowa Health Registry data on cancer and birth defects and various environmental exposures.

The EDMC manages the following data bases on PC-based systems: water supply data for Iowa municipalities above 400 population; a statewide municipal drinking water survey of pesticides and synthetic organic chemicals (1986-87); a statewide rural well water survey (SWRL: 1988-89); and the Iowa rural radon gas survey (1989). During 1991, the EDMC continued updating historical municipal drinking water survey data for municipalities over 1,000 population, incorporating Iowa Geological Survey Bureau (IGSB) aquifer data into the EDMC data base, collecting historical water supply and treatment data for municipalities under 750 population, and developing systems for accessing environmental data for use by the Iowa Department of Natural Resources (IDNR), the IGSB, the University Hygienic Laboratory (UHL) and CHEEC. The EDMC also linked historical water supply sample analysis data obtained from a variety of sources to the Historical Community Water Supply and Treatment data base. Included were raw and finished water quality data retrieved by the IGSB from the United States Geological Survey (USGS) QWDATA System and the USGS WATSTORE water quality file, raw and finished water quality data from the UHL and finished water quality data from a 1979 National Survey of Environment and Health Water Supply.

In addition to providing support to CHEEC researchers for ongoing environmental studies, the EDMC staff responded to requests for data from state and federal agencies, academic institutions and the private sector.



In April, 1991, the EDMC published a monograph titled "Historical Community Well and Aquifer Data for the State of Iowa." A demonstration of the EDMC data bases was presented at professional meetings and conferences in Iowa.

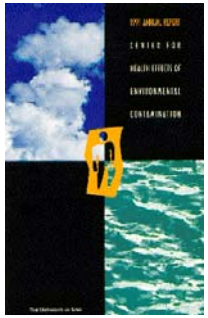


Educational Activities

The Conference on Water Quality, Agriculture and Public Health

On May 14 & 15, 1991, CHEEC hosted the Conference on Water Quality, Agriculture and Public Health in the Iowa Memorial Union on the campus of The University of Iowa. Conference attendees included county public health officials, representatives of the Iowa Department of Public Health (IDPH), IDNR, the Iowa Department of Agriculture and Land Stewardship (IDALS), the Iowa Environmental Protection Commission, scientists involved in water quality and pesticide research from The University of Iowa and Iowa State University, representatives of the agricultural chemical industry, members of environmental interest groups and interested citizens.

The conference provided an opportunity for academic and industry researchers to discuss the environmental and health effects of agricultural chemicals in water supplies, and also served as a forum for discussion of state water quality policies and programs. In the months following the conference, cooperative efforts on addressing water quality problems have been initiated, including proposed collaborative studies and educational programs, discussions on the immediate public health importance of water quality research, and discussion of concerns regarding the public's access to information on water quality issues and research results. Conference proceedings are available upon request.



Seminar Series

The following seminars were sponsored by CHEEC on the campus of The University of Iowa during 1991:

Environmental liabilities in Iowa - and waste reduction solutions
John Konefes, Director, Iowa Waste Reduction Center, University of Northern Iowa

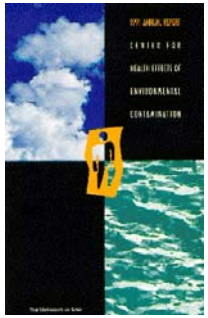
The 1990 Clean Air Act amendments: A panel discussion
Allan Stokes, Environmental Protection Division, IDNR; Dr. Peter Thorne, Department of Preventive Medicine & Environmental Health, The University of Iowa; Dr. Jerald Schnoor, Department of Civil & Environmental Engineering, The University of Iowa; Robert Patrick, Air & Toxics Branch, Office of Regional Counsel, U.S. EPA Region VII, Kansas City

Natural cleansing and bioremediation of oiled shoreline in Prince William Sound
Dr. Hans O. Jahns, Research Manager, EXXON Production Research Company, Houston

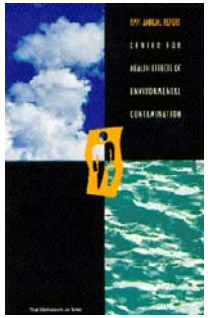
Great Lakes Initiative to protect streams from toxics: Too early or too late?
Dr. William Beranek, Jr., Indiana Environmental Institute, Inc., Indianapolis

The New Jersey case-control radon study: Policy implications
Dr. Judith Klotz, Environmental Health Service, New Jersey State Department of Health

Other CHEEC educational activities during 1991 included:



- co-sponsoring a lecture by consumer advocate Ralph Nader titled "Our environment - our responsibility"
- providing a satellite downlink at The University of Iowa for a teleconference on "Pollution Prevention in Business", presented by the Hazardous Substance Research Center for EPA Regions VII and VIII, Kansas State University
- presenting poster displays of CHEEC-supported laboratory research on pesticides at the 2nd Annual Conference of the Leopold Center for Sustainable Agriculture
- co-sponsoring the National Environmental Health Association 1991 Fall Conference in Des Moines on "Health Risk Analysis: Assessment, Management, Communication"



Seed Grants

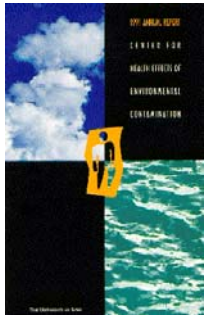
The following research projects were awarded grants by the CHEEC Seed Grant Program during 1991.

Investigation of pesticides and synthetic organic compounds with adverse reproductive outcomes

Investigators: M. Kramer, C. Lynch, Preventive Medicine & Environmental Health, The University of Iowa
Summary: This project will continue the study of possible associations between drinking water contaminants and development of adverse reproductive outcomes. Recent research suggests an important role of atrazine in intrauterine growth retardation (IUGR: low weight for gestational age) while chloroform is also being studied to determine its contribution. The highest concentrations of both chemicals have been found in surface water. Analyses will be conducted using Iowa communities deriving their drinking water from specific surface sources; possible interrelationships between atrazine, chloroform and IUGR will be examined. The study will also look at possible associations between water-borne pesticides and synthetic organic compounds with prematurity, low birth weight and other birth defects.

Radon and radium release into drinking water from distribution system deposits

Investigators: R. Valentine, Civil & Environmental Engineering, The University of Iowa
Summary: Data have recently been obtained indicating that radium containing deposits likely exist in water distribution systems exposed to radium containing water. These deposits could represent a large reservoir of radium and more importantly, a significant source of radon gas. Release of radon and radium could result in water "at the tap" in violation of the proposed EPA Maximum Contaminant Levels (MCLs). This study is evaluating the potential significance of these deposits as a source of radon and radium at several cities in Iowa with raw water supplies having a significant radium content. This is being done by 1) determining the radium



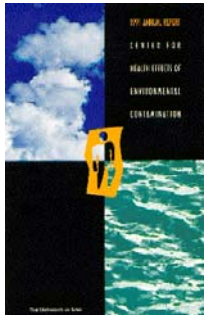
content and radon/radium release potential of collected distribution system deposits, and by 2) conducting radon and radium mass balances in the distribution systems.

Development of a data base of environmental exposures among infertile couples

Investigators: K. Clark, College of nursing; E. Smith, L. Fuortes, Preventive Medicine & Environmental Health, The University of Iowa
Summary: Few epidemiological studies have identified potential causes of infertility, despite an estimated prevalence in the U.S. of between 14% and 33%. Several exposures found in farming, truck driving and welding, and chemical exposures such as DBCP, carbon dioxide, lead and solvents have been suggested as contributing to infertility, but have not been studied in a population of couples seeking treatment for infertility. This study will develop a large data base of environmental exposures among infertile couples by identifying potential risk factors including occupational and chemical exposures as well as medical, sociodemographic and lifestyle factors. Data will be obtained through questionnaires given to couples seeking treatment for infertility at University of Iowa Hospitals Reproductive Endrocrinology Clinic.

Pilot studies of the possible relationship between intrauterine growth retardation, birth defects, fish kills, and the genotoxic properties of herbicides following plant activation

Investigators: P.Isacson, Preventive Medicine & Environmental Health, The University of Iowa; M. Plewa, Institute for Environmental Studies, University of Illinois at Urbana-Champaign; W. Hausler, Jr., University Hygienic Laboratory, T. Jennings, M. Mason, Fisheries Bureau, Iowa Department of Natural Resources
Summary: Plant activation refers to the process by which a non-mutagenic agent is transformed by the biological action of a plant into a mutagen. This process may help in explaining separate but possibly related health outcomes which have been associated with a surface water source in southern Iowa, in which elevated levels of the herbicides atrazine and cyanazine have been found over time. Health associations being studied include the increased incidence of some birth defects in infants born to women whose drinking



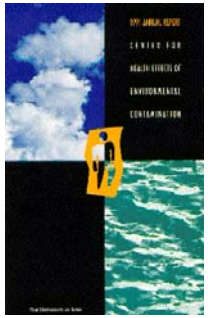
water is derived from that source, and persistent fish kills experienced at the hatchery supplied by the same source. These fish kills have not occurred in other regional hatcheries using the same fish stocks but a different source of water. This study will attempt to determine whether plant activated mutagens can be identified and possibly quantitated from the water source.

The impact of ozone depletion on the flux of ultraviolet radiation in Iowa

Investigator: G. Carmichael, Chemical & Biochemical Engineering, The University of Iowa
Summary: Ozone depletion over Iowa is proceeding at a rate of 3% to 8% per decade. This depletion poses concern due to the fact that each 1% drop in ozone allows 2% more ultraviolet radiation to reach the earth's surface; and ultraviolet radiation is associated with a wide variety of health effects, including skin cancer, cataracts, and immune system suppression. This project will conduct a detailed calculation of the solar radiation reaching Iowa's surface as a function of present trends in ozone depletion. Results will be analyzed in terms of changes in radiation fluxes weighted by action spectrums for DNA damage, plant damage, sunburning, and material damage. Calculations of the present condition, and 50 years from present, will provide the critical basis for detailed health impact assessments.

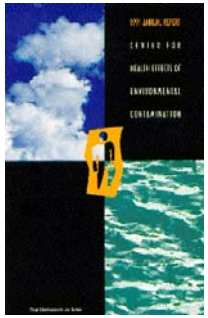
Validation of family history information obtained through parental interview

*Investigators:*T. Burns, P. Romitti, Preventive Medicine & Environmental Health, The University of Iowa
Summary: Family history information obtained by parental interview is important for research on the genetic epidemiology of birth defects and chronic diseases. The ability to make clinical diagnoses and provide accurate recurrence risk estimates depends upon the validity of such information. To date, only limited evaluation of information provided through maternal interviews has been done. This study will examine the degree of agreement between maternal and paternal interviews, evaluate parental and infant factors which may influence recall and assess the accuracy of recall using medical record information. Study findings may suggest future investigations of family histories of individuals with specific birth defects, and may be relevant to studies of an individual's response to environmental contaminants.



Improving and expanding computerized municipal water-supply and water-quality data in the state of Iowa

Investigators: P. Vandorpe, R. Talcott, Iowa Department of Natural Resources-Geological Survey Bureau
Summary: The Municipal Water-Supply Inventory (MWSI), a data base maintained by the IGSB, combines municipal well and water supply information from the Environmental Protection Division of the IDNR with geological and aquifer data from the IGSB and raw water quality data obtained primarily from the UHL and the USGS. This interactive data base allows for the electronic maintenance of current information on the status of municipal supplies, number of active wells, their locations, depths, construction records, yield capacity, geology, sources of ground water, and water quality This project will continue efforts directed at these data management activities and will specifically develop a definitive inventory of municipal water supply sites with cross references to commonly used identifiers.



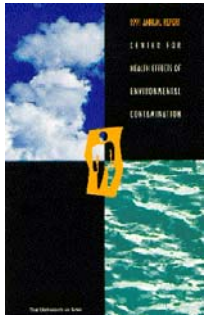
Rathbun Lake and the Rathbun Regional Water Association

Rathbun Lake, located in Appanoose County in south central Iowa, was formed in 1969 by the Corps of Engineers earthen dam impoundment of the Chariton River. The Lake covers almost 11,000 acres, has 155 miles of shoreline and 21,000 acres of public land which are utilized for swimming, boating, fishing, hunting and other outdoor recreational activities. Public facilities and property are maintained by the Corps in cooperation with the Iowa Department of Natural Resources.

The Lake provides storage for flood control and low flow augmentation and has been a source of potable water for the Rathbun Regional Water Association (RRWA) since 1977. The RRWA supplies drinking water to rural families, farms and communities in 13 Iowa counties and 2 counties in Missouri, serving 42 communities and a total population of about 45,000 persons. Nineteen of these towns are completely served while rural residents and residents of 23 other communities are hooked up on a franchise basis.

The RRWA water treatment plant, located on the Chariton River just south of the dam, operates 16 1/2 hours per day and processes up to 4 million gallons of water in a 24 hour period. The water intake structure is located in the Chariton River; up to 4,000 gallons per minute are taken into the plant from the river. The RRWA distribution system includes 23 water towers, 21 booster stations and has almost 4,500 miles of pipeline. The RRWA employs a total of 34 persons in all phases of its operation.

Water quality - including alkalinity, hardness, turbidity, color and levels of magnesium and calcium - is monitored regularly as water leaves the treatment plant. Bacterial analyses are conducted in accordance with state and federal safe drinking water standards. The water treatment process involves a complex sequence of filtration, stabilization and chlorination prior to storage in holding tanks and distribution throughout the RRWA system.



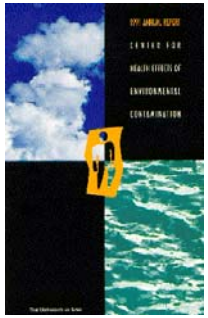
Water Quality Research in the Rathbun Lake Region

The 1986-87 Statewide Municipal Water Supply Survey (HF 2303: "One-time testing of Iowa's regulated drinking water supplies") tested for the presence of several commonly used pesticides as well as synthetic organic compounds (SOCs: by-products of the water chlorination process) in 853 public water systems across Iowa. One hundred and twenty two supplies tested positive for one or more pesticides; 548 tested positive for one or more SOCs. While these chemicals were generally detected in very small quantities, their presence was a cause for concern with respect to potential health effects in persons using that water.

Community drinking water supplies across the state exhibited varying degrees of contamination. Towns supplied by the RRWA provided a unique opportunity to look at samples from one surface water source (Rathbun Lake) taken during each of the four seasons. This was possible because of the wide geographic distribution of the RRWA communities and the fact that the sampling process (a one-time sample per community) was spread out over the year. In this way, seasonal variations in the amounts of contaminants in the water supply could be studied.

CHEEC researchers began looking at the rates of specific health conditions in Iowa residents and how they might relate to urban vs. rural residence, health care factors, socioeconomic status, lifestyle (such as smoking and drinking), educational level and several other variables. Factors they were particularly interested in were the community's source of drinking water and the presence of contaminants in the water supply.

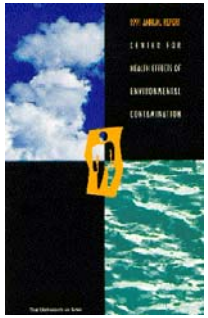
The RRWA was approached by the University Hygienic Laboratory about the possibility of establishing the Rathbun Lake Region as a research site for a wide variety of water quality studies. Dr. William Hausler, Director of the UHL, and Kenneth Owen, Executive Director of the RRWA, had worked together over the years on water testing programs. Through their efforts a cooperative relationship



was developed which has allowed several CHEEC research projects to focus on the region. Participants in this cooperative effort include the RRWA, UHL, CHEEC, the Iowa Departments of Public Health, Natural Resources, and Agriculture and Land Stewardship, and the Army Corps of Engineers.

CHEEC water quality studies focusing on Rathbun include:

- Birth defects in Iowa: effects of surface water pollution
- Development of a water quality database to assess the factors associated with low birth weight rates and intrauterine growth retardation
- Investigation of pesticides and synthetic organic compounds with adverse reproductive outcomes
- Pilot studies of the possible relationship between intrauterine growth retardation, birth defects, fish kills and the genotoxic properties of herbicides following plant activation



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University Hygienic Laboratory

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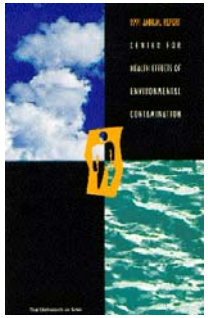

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