

ANNUAL
REPORT

FISCAL YEAR 2017

*From Complexity
to Clarity*



LETTER FROM THE DIRECTOR

From Complexity to Clarity – Bringing Public Health Laboratory Science into Focus



Annual reports are usually modest retrospectives of an organization's year, and, especially for public agencies, they are important as a matter of accountability. Thus, within these pages you will find an overview of the State Hygienic Laboratory and our

work in areas of our scientific focus. However, because we live in an era marked by complexity and uncertainty, I thought my introduction to the report ought to ask you to look beyond the reflections to the challenges ahead.

It has been my great privilege to serve as Director of the Iowa State Hygienic Laboratory for the last 11 years, a period of profound changes in the lab. In 2010 we moved into a state-of-the-art facility in Coralville. Enabled by amazing technological advances, we implemented advanced molecular methods that more quickly produce significantly greater specificity for epidemiologic investigations. In the future, we believe these advancements will require new dimensions of analytical capabilities and strategies for surveillance and intervention. We believe our vision is accurate, but we also know that these are complex concepts that are complicated by uncertain and competitive policy and financial environments. While the possibilities for the laboratory are many, achieving its benefits will require diligence in understanding the best courses of action. It won't be easy.

The first hurdle is achieving a broadly based understanding by policymakers and the people of Iowa of what is necessary to reach this promising future. Unfortunately,

much of what goes on in the lab can be described by the "Black Box" metaphor, i.e., a "device, system or object which can be viewed in terms of its inputs and outputs without any knowledge of its internal workings." (Wikipedia)

The advanced technologies within that box may seem esoteric, but their outcomes in better health are not. Iowa has taken a leadership role in helping students make that connection through its many science, technology, engineering and mathematics (STEM) programs. Growing these disciplines will help us lift the lid off the black box of the public health laboratory to better understand how all advancements can help achieve a better quality of life for all Iowans.

In my opinion, the strategy is pretty straightforward. The state can achieve better public health outcomes if we harness capabilities from scientific advancement, create a coherent public health laboratory system, apply analytical tools to derive strategies from complex information, including the development of a well-informed workforce, and promote prudent policies that enable the best in scientific practices. The State Hygienic Laboratory, as it is or as it could be reconfigured, should be seen as the mechanism that can organize these functions on behalf of all Iowans, bringing laboratory science from complexity to clarity in practice.

A handwritten signature in black ink that reads "Christopher G. Atchison".

Christopher G. Atchison, Director

With great appreciation

For more than 11 years, Christopher Atchison guided and led the SHL in its service to the state of Iowa and to the broader public health community. Through his leadership, SHL increased its national prominence in laboratory science, its collaborations with federal and state partners, and the awareness of SHL's unique and critical role in public health. Many new initiatives were developed that have far exceeded their expectations.

On Jan. 5, 2018, Director Atchison retired from the SHL and the University of Iowa. We are grateful for his vision and for helping us to be all that we can. We will continue to rely on Director Atchison's expertise as we partner with him in the next chapter of his career.

Staff of the State Hygienic Laboratory

TABLE OF CONTENTS

THE 11 CORE FUNCTIONS AND CAPABILITIES OF A STATE PUBLIC HEALTH LABORATORY.....	3
STATE HYGIENIC LABORATORY MISSION	3
OFFICE OF THE DIRECTOR	
Center for the Advancement of Laboratory Science (CALs).....	5
Education, Training and Professional Development.....	6
Emergency Preparedness and Response.....	7
Genomics	8
Human Resources	9
Information Technology.....	10
Organizational Development	11
Public Policy	12
Research and Development	13
Strategic Communications	14
ADMINISTRATION AND FINANCE DIVISION	
Business Development	16
Central Services	17
Client Services.....	18
Financial Management.....	19
Iowa Laboratory Appraisal Program (CLIA).....	20
Quality Systems Management.....	21
DISEASE CONTROL DIVISION	
Blood Lead	23
Environmental Microbiology	24
Maternal Screening	25
Microbiology	26
Molecular Diagnostics and Virology.....	28
Newborn Screening.....	30
Serology	32
ENVIRONMENTAL HEALTH DIVISION	
Ambient Air Quality	34
Industrial Hygiene	35
Inorganic Chemistry.....	36
Laboratory Certification Program	38
Lakeside Laboratory	39
Limnology	40
Organic Chemistry	42
Radiochemistry.....	44
Radiological Emergency Response Team	46
YEAR AT A GLANCE.....	48
TESTING DATA.....	50
REVENUE AND EXPENSES	52

THE 11 CORE FUNCTIONS AND CAPABILITIES OF A STATE PUBLIC HEALTH LABORATORY

Disease Prevention, Control and Surveillance
Integrated Data Management
Reference and Specialized Testing
Environmental Health and Protection
Food Safety
Laboratory Improvement and Regulation
Policy Development
Emergency Response
Public Health-Related Research
Training and Education
Partnerships and Communication

STATE HYGIENIC LABORATORY MISSION

The State Hygienic Laboratory at the University of Iowa protects and improves quality of life by providing reliable environmental and public health information through the collective knowledge and capabilities of our organization.



OFFICE OF THE DIRECTOR

The Office of the Director consists of 10 key functional units that enable the State Hygienic Laboratory to achieve its statutory charge set forth in the Iowa Administrative Code in four areas: scientific, consultative, applied research, and education and training.

CENTER FOR THE ADVANCEMENT OF LABORATORY SCIENCE (CALS)

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CALS is a unique training space located in the lower level of the Coralville SHL facility. It consists of a classroom and fully functional laboratory for hands-on science and learning, and an adjoining conference room with seating for up to 150. The center is a public venue intended for use by environmental and public health professionals, education groups, and community businesses and organizations. It is managed by the SHL Office of Education, Training and Professional Development.



A clinical lab scientist works with inactive specimens of highly infectious diseases as part of SHL training.

HIGHLIGHTS

- Since CALS opened in July 2014, approximately 20,000 people received training at more than 1,000 events.

Courses and events included:

- National CDC Rapid Methods Course
- Packaging and Shipping Workshop
- Biosafety Workshop
- Laboratory Symposium
- Principles of Biomedical Science
- Iowa Academy of Science
- UI Project Lead the Way

Partners who held events in CALS included:

- Iowa Biotechnology Association
- Integrated DNA
- Clinical Laboratory Managers Association (CLMA)
- Iowa Department of Natural Resources
- Iowa Healthcare Collaborative
- Centers for Disease Control and Prevention
- Iowa Nursing Coalition

EDUCATION, TRAINING AND PROFESSIONAL DEVELOPMENT

BETH HOCHSTEDLER: beth-hochstedler@uiowa.edu

The Hygienic Laboratory's educational programs reach every county in Iowa by providing training for laboratorians, first responders, sanitarians and others. Educational topics include emergency preparedness, regulations, food safety, infectious diseases and newborn screening.

The office oversees STEM projects, internships, fellowships, externships for teachers and the Student Mentorship program.

In collaboration with partners, this office develops programs that encourage students to pursue careers in public health laboratory science. It leads the SHL STEM programs and serves as the liaison for the SHL Ambassador Program.



Student Mentorship recipient Lily Fuger works in the Environmental Health Division to measure BPAs in canned foods.

HIGHLIGHTS

- Provided professional development for a state and national audience of more than 6,200 through 109 training events.
- Held 66 STEM events for approximately 7,600 students.
- Hosted four teacher externs and 16 college interns.
- Facilitated the Student Mentorship Program, including the team of GERMinators who researched germs on gloves and mittens.
- Developed and helped present the "Field of Streams" water quality curriculum for middle school students in rural settings across Iowa. This project was awarded a Telligen Community Initiative Grant, with equipment provided by the Roy J. Carver Charitable Trust.

EMERGENCY PREPAREDNESS AND RESPONSE

WANDA REITER KINTZ: wanda-reiterkintz@uiowa.edu

The Hygienic Laboratory responds to credible threat events involving unknown substances; public health and environmental emergencies, including potential biological or chemical threats; pandemic influenza; disease outbreaks such as Ebola; and environmental or natural disasters, including chemical spills and flooding.

Confirmatory, or rule-out, testing is performed on clinical isolates to identify potential agents of bioterrorism. Emergency Preparedness and Response at the State Hygienic Laboratory encompasses the Laboratory Response Network, the Food Emergency Response Network and the Radiological Emergency Response Team.

HIGHLIGHTS

- Tested clinical isolates from sentinel laboratories throughout Iowa for substances of potential public health threat and responded to credible threat events.
- Conducted two Packaging and Shipping Workshops to train laboratorians throughout the state how to package, ship and transport hazardous materials such as infectious substances or biological specimens.
- To help assure the safety of Iowa's clinicians, SHL held its annual Sentinel Lab Rule Out of Potential Agents of Bioterrorism: Wet Workshops.



Emergency preparedness drill

GENOMICS

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Genomics is the analysis of the sequence, structure and function of the genome, and its developing use is seen as creating a significant improvement in personalized health. Its purpose is to explore the implications, challenges and opportunities associated with the use of genomic information, focusing on the newborn period.

The human genome contains a staggering amount of encoded information. Deciphering this code to provide benefits when an infection or inherited disorder occurs requires specialized knowledge and computing power. Genomics is partnering with the UI Interdisciplinary Graduate Program in Informatics. The work is a collaboration with professors and students to develop innovative approaches to public health data analysis.

This office works closely with the Newborn Screening section, which identifies infants at risk for more than 49 inherited diseases by testing a

small blood spot obtained from a simple heel stick shortly after birth. Genomics works similarly with the Maternal Screening program to identify babies at increased risk of developmental delays with the intent of improving delivery and outcomes.

HIGHLIGHTS

- Initiated a collaborative project with the University of Iowa Interdisciplinary Graduate Program in Informatics to analyze data quality in newborn screening.
- Continued to measure and assess timeliness in newborn screening to improve the opportunity for clinical interventions.



HUMAN RESOURCES

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The Office of Human Resources collaborates with laboratory leadership to ensure an engaged, competent and diverse workforce through challenging work activities and belief in the organization's mission.

Human Resources oversees development and administration of policies and programs for recruitment, compensation, training, support and retention. Human Resources works with staff through all phases of employment, from orientation through professional development and retirement.



Quarter Century Club members (from left) Beth Hochstedler, Pam Mollenhauer, Pat Kosier and Mike Schueller pose with fellow club organizers Carol Adamson, Lorelei Kurimski and Amanda Hughes.

HIGHLIGHTS

- Held inaugural "Quarter Century Club" reunion of current and former staff with at least 25 years of service.
- In response to the Working at Iowa Survey, added Conflict Management training for supervisors and staff.
- Provided training for supervisors about changes in state collective bargaining units governed by Iowa Code Chapter 20.
- Developed a salary plan to comply with the Fair Labor Standards Act.
- Participated in APHL's Phase 2 competencies project.
- Updated the SHL Employee Handbook.
- Led transition of staff members to the shared services model.
- Created best practice guidelines for vacation scheduling.



Founded 2016 by Christopher G. Atchison

INFORMATION TECHNOLOGY

FRANK DELIN: franklin-delin@uiowa.edu

The Office of Information and Technology supports a complex set of networks providing comprehensive IT services to the three Hygienic Laboratory locations. The office maintains around-the-clock laboratory operations, including testing in clinical care, environmental and emergency preparedness.

The Hygienic Laboratory is regulated by many national and state agencies, each with their own data security and confidentiality requirements. To be compliant with mandated rules and regulations from such agencies, IT operates a rigorous set of security protocols, including firewalls, encryption, controlled access and monitored surveillance systems.

HIGHLIGHTS

- Transitioned the Maternal Screening section and its associated short-term follow functionality into the OpenELIS laboratory information management system. This was the final clinical section to move to this system, allowing SHL to retire its Public Health Information Management System.



Information Technology members include (front row, from left) Haftom Alemayehu, Anthony Norem and Mike Hayek. Pictured in the second row are Sangathya Pulidindi, Jim Sartain, Matt Bielicke and Alankar Kampooale. In the third row are Nathan Falat, Frank Delin, Bryan Monserud and Steve Masbruch. (Not present is John Schlenker.)

ORGANIZATIONAL DEVELOPMENT

LORELEI KURIMSKI: lorelei-kurimski@uiowa.edu

The Office of Organizational Development oversees strategic planning, organizational change, operation effectiveness, performance measurement and systems design. Areas of focus include workforce performance, customer engagement, financial sustainability, improvement and innovation, and growth of knowledge and expertise.

As part of the office, improvement events focusing on operations are held to increase the efficiency and effectiveness of operations and services. These include applying improvement concepts to redesign processes; collecting and analyzing data; and training, education and leadership.

- Served on the APHL Lab Systems and Standards, and the Knowledge Management committees.
- Co-authored a publication and helped lead the workgroup to develop an innovative return on investment (ROI) tool, including development of a new literature review protocol.

HIGHLIGHTS

- Updated the decision matrix methodology and applied it to the Radiochemistry, GC Analysis, and Molecular Biology/Virology sections as part of a business model. Shared this approach with other public health leaders at the APHL Annual Meeting in Providence, Rhode Island.
- Selected as one of the first recipients of the University of Iowa's new "See It, Solve It" award, which recognizes staff for identifying opportunities and implementing solutions.
- Completed 10 process improvement initiatives.
- Received Lean Six Sigma certification and established a new Community of Practice (a group of individuals with different areas of expertise that come together for a common cause).
- Chosen to host a two-year associate through the CDC Public Health Associate Program. The program's emphasis is on projects within strategic planning, process improvement, training and education, public policy, strategic communications and emergency preparedness.



PUBLIC POLICY

PAM MOLLENHAUER: pamj-mollenhauer@uiowa.edu

The Office of Public Policy strives to provide objective, timely information regarding issues concerning the advancement of the State Hygienic Laboratory's mission. The goal of the office is to foster and maintain relationships with government agencies, elected officials and key stakeholders to promote shared understanding and advancement of public health in Iowa.

The office tracks legislation related to Iowa's public health system; provides educational materials to Iowa policymakers through open forums and Hill Day events; and interfaces with state educational professionals, and environment and public health partners.

HIGHLIGHTS

- Updated policymakers, state leaders and public health partners about the impact of work by Iowa's public health laboratory during several Hill Day events at the state Capitol.
- Led initiatives aimed at developing new and existing policies.
- Planned and organized congressional staff tours.
- Represented SHL in the Iowa Public Health Association.
- Planned cross-sector conferences and educational events for environmental public health.

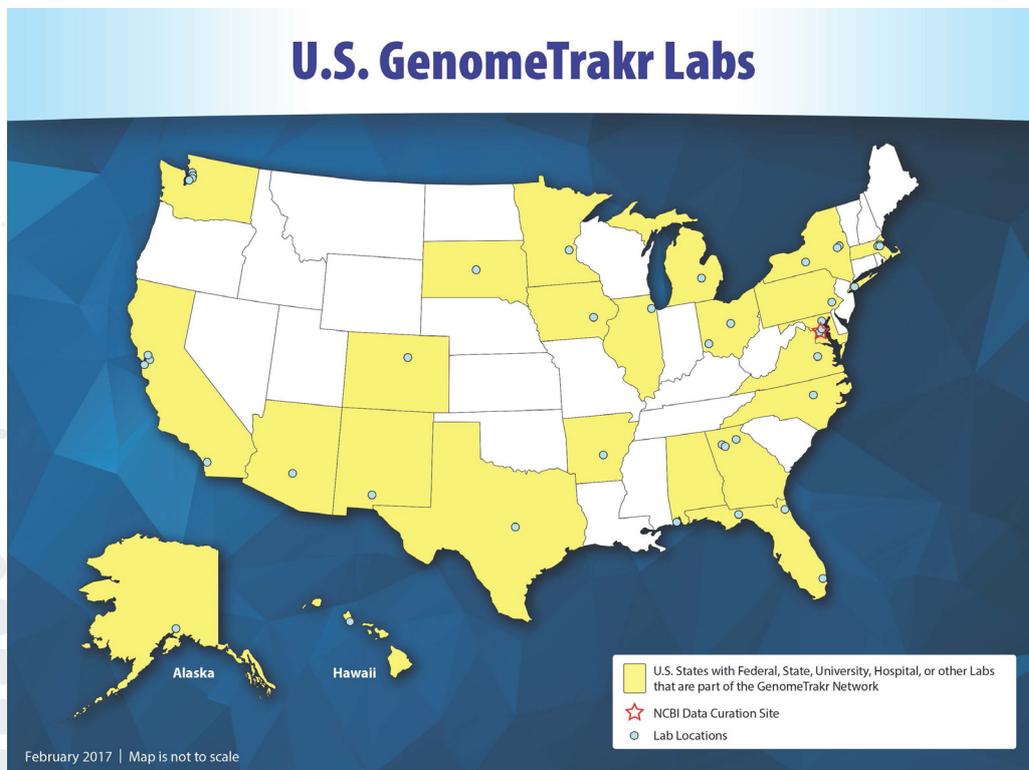


RESEARCH AND DEVELOPMENT

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The Office of Research and Development oversees internal and external efforts to advance laboratory capabilities by engaging in applied research, with an emphasis on state-of-the-art molecular applications. The office evaluates emerging methodologies and activities, including test methods and instrumentation. The office prepares competitive grant applications to support these enhanced activities.

SHL scientists collaborate with federal and state partners such as CDC, APHL, FDA and USDA, and with University researchers and students in projects that include development of test methods and surveillance for pathogens of public health significance.



HIGHLIGHTS

- Advanced next generation sequencing (NGS) projects and collaborations by obtaining funding to support personnel, purchase of a second MiSeq instrument, reagents and supplies.
- Participated in CDC's Advanced Molecular Detection initiative with NGS projects in enteric bacteria and *Mycobacterium tuberculosis*. SHL continued participation in FDA's GenomeTrakr program, and developed a NGS *Legionella* project to better understand the bacteria found in Iowa hospital plumbing systems.
- NGS revealed the need for bioinformatics capabilities at the laboratory. In response, this office initiated a program to develop the capacity to utilize NGS data in public health investigations. SHL partnered with University of Iowa faculty and graduate students for training, attended workshops and networked on a national level.

STRATEGIC COMMUNICATIONS

PAT BLAKE: pat-blake@uiowa.edu

The Office of Strategic Communications serves as the lead communications section for the agency and guides the flow of information from SHL to the public, news media and public health partners. It tells the SHL story through publications, outreach materials, website content and social media.

The office works with state and national media, educators and public health partners to share the news of Iowa's state public health laboratory. It provides consultation and crisis communications during environmental and public health emergencies by managing clear and open communication.

HIGHLIGHTS

- Developed new branding programs for a Private Well program, a water quality initiative (UCMR4) and the employee Quarter Century Club.
- Began development of a biosecurity course for CDC and APHL.
- Launched new Clinical Test Menu and Radiochemistry web pages.
- Produced educational materials as part of an environmental learning kit for teachers and students.



Valerie Reeb demonstrates a lab technique for videographers.

ADMINISTRATION AND FINANCE DIVISION

The Administration and Finance Division is responsible for Financial Management, Business Development (Grants and Contracts, Outreach) and all Hygienic Laboratory facilities. It also includes certification and quality assurance (CLIA and Quality Systems Management) and the pre- and post-analytic processes related to laboratory testing (Client Services, Central Accessioning and Central Services).



SARAH DRICKEN
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BUSINESS DEVELOPMENT

TRISHA KREMAN: trisha-kreman@uiowa.edu (BUSINESS DEVELOPMENT)

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LISA RATHJEN: lisa-rathjen@uiowa.edu (CLIENT OUTREACH)

The Business Development section processed 23 agreements through the UI Division of Sponsored Programs, totaling more than \$5.2 million in external funding.

Business Development coordinates pre- and post-award administrative functions for internal (University of Iowa) and external funding sources. These external sources include state agencies, federal agencies, and various other public and private sources of funding.

State agency partners include the Iowa Department of Natural Resources, the Iowa Department of Public Health, the Iowa Department of Inspections and Appeals, and agencies in other states.

Federal and national partners include the Centers for Disease Control and Prevention, the Food and Drug Administration, the Environmental Protection Agency, the US Department of Agriculture and the Association of Public Health Laboratories.

Client Outreach is part of Business Development. It carries out the Hygienic Laboratory's service, education and research mission by increasing understanding and use of the state's public health and environmental laboratory system. Strategic planning, process improvement, market research and analysis, and customer feedback are key parts of this unit, which is a liaison between the laboratory and its clients.



HIGHLIGHTS

- Assisted principal investigators and project managers with post-award management of restricted funds through periodic budget review meetings.
- Continued monthly management of staff effort on restricted funds to ensure real-time tracking and accurate expenditure of salary and fringe dollars.

CENTRAL SERVICES

KEVIN SINGLEMAN: kevin-singleman@uiowa.edu

Central Services sent an average of 1,940 sample kits to clients each month.

Located in Coralville and Ankeny, this section creates and distributes analytical test collection kits to clients throughout Iowa and other states. Staff also process incoming and outgoing packages and correspondence.

Central Services provides support for the entire laboratory by purchasing, tracking and distributing supplies necessary for laboratory testing. Team members are certified in Hazmat shipping requirements for select packages, and specially trained personnel perform necropsy work to assist with rabies testing.

The section also schedules the University of Iowa Fleet Service leased vehicles used by staff. On average, staff members travel approximately

150,000 miles per year to carry out the Hygienic Laboratory's mission.

HIGHLIGHTS

- Coordinated shipping of indeterminate rabies specimens to the CDC.
- Collaborated with the scientific divisions to ship collection kits for new and expanded projects including Grants to Counties private well testing, asbestos in water testing, IDNR groundwater monitoring and *Cryptosporidium* testing in Missouri.



A tuberculosis specimen collection kit is assembled in Central Services.

CLIENT SERVICES

SHERRI MARINE: sherri-marine@uiowa.edu

Client Services created an average of nearly 26,000 media plates and tubes each month.

The Client Services section consists of support services that relate to customer service. The staff members work in the areas of data entry, customer service contact and, in Ankeny, Central Services.

Also part of Client Services are Central Accessioning (receives and processes clinical and environmental samples); Glassware Wash (cleans and sterilizes glass equipment); and Media Prep (prepares sterile material used to help identify bacteria and viruses). This section also completes data entry for clinical and environmental samples that are delivered by clients.

The section oversees kit orders and results for

Iowa DNR projects that occur from spring to fall to ensure supplies and support are provided.

HIGHLIGHTS

- Organized orders for the IDNR summer beach program for 70 beaches conducted at five different times during the summer.
- Participated in the transition of Maternal Screening from the legacy system to OpenELIS.
- Accessioned an average of 12,000 specimens monthly.



Water from 70 Iowa beaches is tested by SHL, with orders coordinated by Client Services.

FINANCIAL MANAGEMENT

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PAMELA LENZ: pamela-lenz@uiowa.edu

Each year, Financial Management processes more than 18,000 invoices.

The finance section is responsible for the management of the \$24 million State Hygienic Laboratory operation, including overseeing revenues and expenses to accomplish the objectives of the laboratory. This accounting, billing, purchasing, financial analysis, and revenue- and expense-stream management section of the laboratory provides financial transaction support for more than 4,000 clients and distributes more than 18,000 invoices per year.



IOWA LABORATORY APPRAISAL PROGRAM (CLIA)

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Under the federal Clinical Laboratory Improvement Amendments (CLIA) of 1988, any laboratory or facility performing laboratory testing of human specimens to provide information for the diagnosis, prevention or treatment of disease, or the assessment of health, is required to obtain a CLIA certificate and to meet certain requirements.

For more than 45 years, the Hygienic Laboratory, under contract with the Iowa Department of Inspections and Appeals, has provided personnel to conduct laboratory surveys. Since 2002, the Hygienic Lab also has been responsible for administrative oversight of the CLIA laboratory program and is the state agency representative for the Center for Medicare and Medicaid Services CLIA program.

HIGHLIGHTS

- Completed an average of 14 laboratory surveys per month, logging more than 2,000 miles throughout Iowa monthly.
- Performed 24 proficiency testing desk review surveys for laboratories that have not met the proficiency testing performance requirements.
- Developed electronic recordkeeping strategies, allowing easier tracking and accessibility of CLIA survey statistics and a reduction in paper retention.



CLIA team members are (from left) Melinda Bochmann, Kristi Rotzoll and Nancy Grove.

QUALITY SYSTEMS MANAGEMENT

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MARCIA VALBRACHT: marcia-valbracht@uiowa.edu

Quality Systems Management assures regulatory compliance and laboratory best practices using data to drive process improvement and achieve quality management objectives.

The essential focus of Quality Systems Management is to ensure the quality of SHL's scientific, consultative, training and research obligations. The unit plays a key role in meeting the needs of customers by continuously evaluating and improving processes, reducing waste, lowering costs, facilitating and identifying training opportunities, engaging staff and setting organization-wide direction.

The Quality System managers help coordinate and direct activities to meet customer and regulatory requirements, and improve effectiveness and efficiency on a continuous basis with input from the following:

- ISO/IEC 17025:2005 – The SHL Management Principal
- Clinical Laboratory Improvement Amendments (CLIA)
- Health Insurance Portability and Accountability Act (HIPAA)
- Environmental Protection Agency
- National Environmental Laboratory Accreditation Program (NELAP)
- Iowa Department of Natural Resources State Certification: Kansas, Nebraska, New Hampshire, North Carolina and Virginia
- American Industrial Hygiene Association (AIHA)
- Food and Drug Administration
- Food Emergency Response Network (FERN)

HIGHLIGHTS

- Established a Quality Advisory Committee of laboratory executive leadership.
- Completed HIPAA risk assessment/audit and improved HIPAA breach notification policy and process.
- Coordinated equipment certification and calibration lab-wide for pipettes, balances and microscopes.
- Collaborated with FDA and APHL to write training content for laboratories seeking ISO/IEC 17025:2005 accreditation for FDA Food and Feed Testing.
- Coordinated on-site inspections by National Environmental Laboratory Accreditation Program (NELAP).
- Received ISO/IEC 17025:2005 accreditation for food testing at Ankeny and Coralville labs.
- Co-authored (Marcia Valbracht) APHL's Quality Management Training System.
- Oversaw successful CLIA audits at all lab locations and a successful NELAP assessment for Coralville Environmental Health Division.
- Collaborated with IDPH to establish rules for laboratory testing of medical cannabidiol.



DISEASE CONTROL DIVISION

The primary mission of the Disease Control Division is to test human specimens, food and water for diseases of public health significance to protect the citizens of Iowa. The Hygienic Laboratory supports numerous programs to prevent and control communicable disease, participates in epidemiologic investigations of disease outbreaks, and serves as a reference laboratory for clinical testing. These services help prevent the spread of disease in Iowa through the detection of infectious organisms, and help families through newborn screening for genetic disorders and maternal screening.



WADE ALDOUS

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BLOOD LEAD

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More than 6,000 Iowa children were tested for lead exposure this year.

The Hygienic Laboratory is the central testing laboratory for Iowa Department of Public Health's Childhood Lead Poisoning Prevention Program. As such, the Blood Lead section tests for the presence of lead in humans, and is the state's reference laboratory for confirmation of all capillary lead screening results.

The primary instrument used to screen blood specimens is a graphite furnace atomic absorption spectrometer. The Hygienic Laboratory also has the capability of using more sensitive multi-elemental techniques such as inductively coupled plasma mass spectrometry to detect low levels of lead and other potentially toxic metals such as cadmium, arsenic and mercury from the same blood specimen. Results from these instruments are analyzed by laboratory scientists to confirm the level of lead from venous blood specimens.

Recent technological advancements in point-of-care testing allows health care providers to test blood for levels of lead. However, because of the significant public health threat from lead poisoning, the Hygienic Laboratory maintains the capability to provide both screening and confirmatory testing for IDPH.



ENVIRONMENTAL MICROBIOLOGY

NANCY HALL: nancy-hall@uiowa.edu

One of the fastest responses to an Iowa foodborne outbreak identified Salmonella Braenderup in potato salad sold at a local deli as the cause of the illness that sickened 50 people.

The analytic services of the Environmental Microbiology section detect potentially harmful microorganisms in many environmental matrices, including food and water. Such analyses are used in outbreak investigations to pinpoint the source of contamination and to assess the environmental impact from exposure to microbial contaminants. Culture confirmation of microorganisms is critical to perform DNA fingerprinting on food, environmental samples and clinical stool isolates to evaluate the scope of the local or national outbreak as part of remediation efforts.

Laboratory testing also supports statewide water surveillance programs to assess the overall safety of public and private drinking water supplies, surface waters (lakes and ponds), and recreational waters (pools and spas). Pathogen analyses of water, food and environmental surface samples are expanding with emphasis on *Cryptosporidium*, *Legionella*, *Salmonella* and *Listeria*.

HIGHLIGHTS

- IPDP's Center for Acute Disease Epidemiology, the Iowa Department for Inspection and Appeals (IDIA) and SHL worked together on an Iowa County outbreak investigation that was solved in one week; one of Iowa's fastest responses from recognition to causative agent confirmation. Fifty people became ill, all reporting that they had eaten potato salad. Clinical isolates and leftover potato salad grew *Salmonella* Braenderup. Isolates were indistinguishable using PFGE and highly related by whole-genome sequencing, confirming the source of the outbreak. IDIA conducted environmental sampling at the implicated deli in which the same strain of *Salmonella* was found.

- In support of EPA's Long Term 2 Enhanced Surface Water Treatment Rule, more than 600 surface water samples from the Midwest's largest surface water treatment facilities were analyzed for *Cryptosporidium* and *Giardia*, double the number of the previous year.
- Before an IDIA environmental *Listeria* surveillance project began in Iowa retail deli facilities, a pilot project was started to validate the field test that would be used to detect *Listeria* species. SHL demonstrated that this field test had sensitivity and specificity issues. The manufacturer removed it from distribution, and developed a new field test. Because the new device also was unacceptable, the project was modified to have SHL test the samples in the laboratory.
- About 175 surveillance samples of hot dogs, deli meat, ground pork, and ground chicken or turkey from local stores were tested for select agent microbes or toxins through a five-year microbiology cooperative agreement grant with the USDA's Food Safety and Inspection Service. Through this project, USDA and FDA gathered information about lab capacity and capabilities and food safety as part of preparedness planning.

TOP TESTS

- 1 SDWA total coliform
- 2 Private well total coliform and *E.coli*
- 3 Private well nitrate
- 4 Surface water *E.coli*
- 5 Swimming pool total coliform

TOTAL TESTS: 43,042

MATERNAL SCREENING

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Requesting tests and accessing results was streamlined for providers across the state.

Maternal Screening helps identify women at increased risk of having a developing fetus with Down syndrome, Trisomy 18, or an open neural tube defect, as well as provide patients and health care providers with information about their pregnancy. The Iowa Maternal Screening Program consists of lab results generated from SHL as well as follow-up guidance by genetic counselors and OB/GYN nursing staff at the University of Iowa Hospital and Clinics for any patient generating an abnormal risk.

Detection rates vary depending on the screening test chosen by the provider. Integrated screening combines testing results from two samples collected in the first and the second trimester, and has the



Barb Shirazi scans the bar code on a specimen tube to order tests.

highest detection rate for pregnancies at risk if an Nuchal Translucency (NT)-certified sonographer provides a NT measurement. This screening test may be performed without an NT measurement at a slightly lower detection rate. By offering both options, it enables patients without access to an NT-certified sonographer to obtain an integrated screen.

TOP TESTS

- 1 Quad screen
- 2 Integrated serum screen
- 3 AFP only
- 4 First trimester only
- 5 AFP only—amniotic fluid

TOTAL SPECIMENS TESTED: 11,174

Includes first and second trimester samples for integrated screening

TOTAL MATERNAL SCREENING RISKS GENERATED: 8,326

HIGHLIGHTS

- Added an easier, more streamlined approach for health care providers to access screening information by migrating to an electronic lab information system known as OpenELIS.
- Updated and clarified test request forms after surveying providers who send high volume maternal screening test requests.
- Worked with UnityPoint across Iowa to standardize their interface for electronic ordering and reporting of maternal screening tests.

MICROBIOLOGY

RYAN JEPSON: ryan-jepson@uiowa.edu

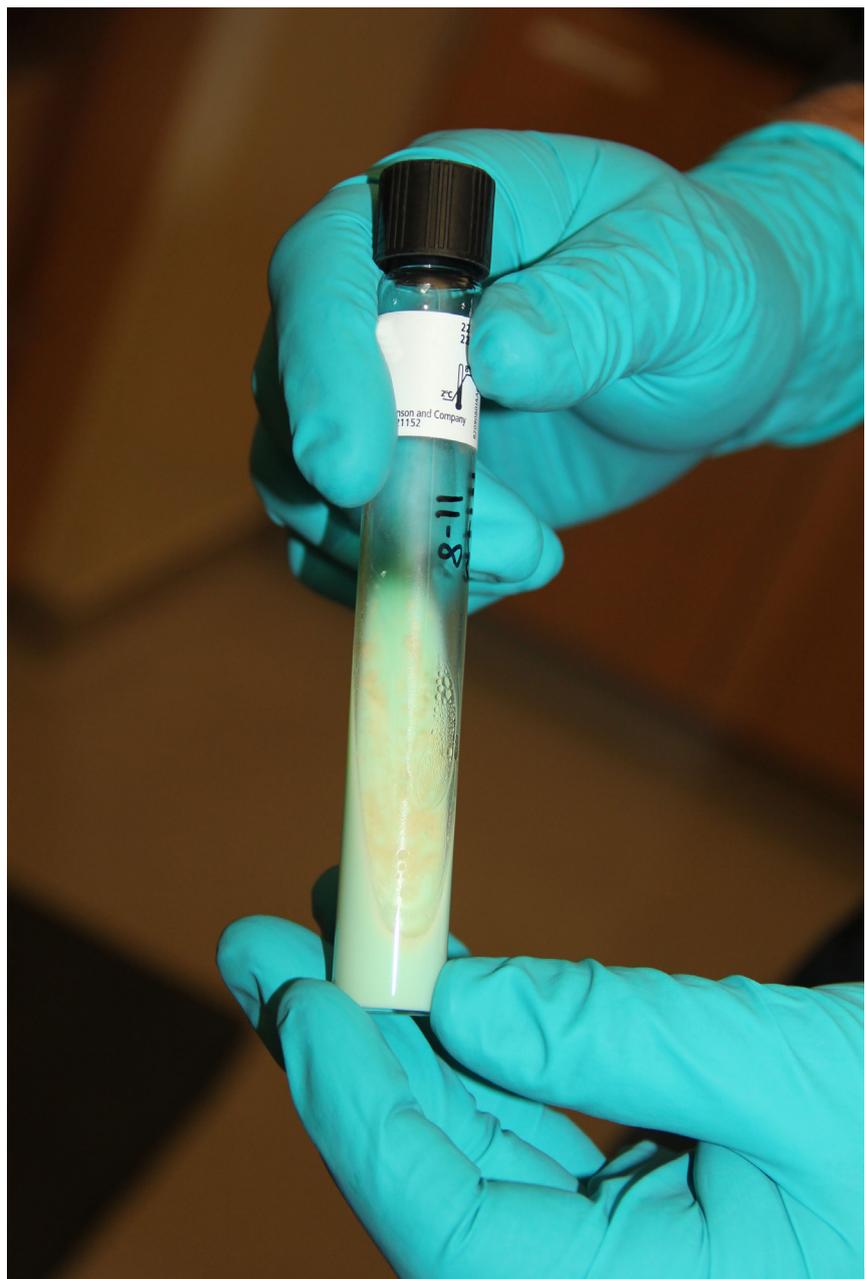
As a member of the CDC's Antibiotic Resistance Laboratory Network, the Microbiology section works to address the emerging threat of antibiotic resistance. The section uses a variety of molecular and phenotypic methods to detect Carbapenemase-resistant Enterobacteriaceae from hospitals throughout the state. In coming years, SHL will share susceptibility data with clinical and public health providers to better understand antibiotic resistance in Iowa.

Microbiology performs whole-genome sequencing and pulsed-field gel electrophoresis on all isolates of *Salmonella*, *Shigella*, *E.coli* and *Listeria*. The section continues to address the challenges of increased specimens as a result of culture-independent diagnostic testing

Microbiology is the study of microorganisms in humans that are, or may be, the cause of illness. Specialized testing is performed in several areas: bacteriology, parasitology, mycobacteriology (tuberculosis) and mycology (fungi).

The Microbiology section supports IDPH, all county health agencies and hospitals throughout the state by isolating, identifying and characterizing pathogens that are of public health significance. The section also performs all rabies testing associated with human exposure and performs enteric pathogen serotyping. It uses pulsed field gel electrophoresis to determine the DNA fingerprint of bacteria and is a member of the CDC's PulseNet, which uses these fingerprints to detect and define local and multi-state foodborne outbreaks.

Selected section staff participate in the CDC Laboratory Response Network, which responds quickly to biological, chemical and radiological threats and other high priority public health



Tuberculosis bacteria

emergencies. They are able to perform confirmatory testing of suspect agents of bioterrorism.

HIGHLIGHTS

POSTERS AND PRESENTATIONS

- “How Next Generation Sequencing is Revolutionizing Public Health,” Travis Henry and Ryan Jepson (Iowa Governor’s Conference on Public Health)
- “Culture-Independent Testing – Benefits and Challenges to Public Health,” Gary Moet (Iowa Governor’s Conference on Public Health)
- “The Effects of Antimicrobial Resistance on Human and Animal Health and the Environment,” Ryan Jepson and Wade Aldous (Iowa Governor’s Conference on Public Health)
- “Is This Heaven?! No, it’s Identification of Mycobacterium sp. from Culture Using PCR!” Ryan Jepson (10th National Conference on Laboratory Aspects of Tuberculosis)
- “The Concentration That Kills: A Case Study Evaluating TB Recovery and the Potential Impact of an Increased Concentration of Sodium Hydroxide,” Ryan Jepson (10th National Conference on Laboratory Aspects of Tuberculosis)
- “State Hygienic Laboratory - What Do We Do?” Jennifer Elwood (Iowa One Health Conference, UI Center for Emerging Infectious Diseases)

TOP TESTS

- 1 Mycobacteriology (tuberculosis)
- 2 Parasitology
- 3 PulseNet and enteric bacteriology
- 4 Reference bacteriology
- 5 Mycology

TOTAL TESTS: 27,914

MOLECULAR DIAGNOSTICS AND VIROLOGY

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A record number of mosquitoes were tested at SHL for West Nile virus in response to enhanced mosquito surveillance to determine if the mosquito types known to transmit Zika virus were present in the state.

Molecular testing techniques – primarily polymerase chain reaction (PCR) and next generation sequencing (NGS) – have significantly increased the overall sensitivity and specificity of detection and characterization of bacteria and viruses that cause disease. The Molecular Diagnostics and Virology section is heavily involved in supporting many molecular research and development projects, including the development of new PCR assays, and rapidly evolving NGS methods and associated bioinformatics.

The section works in close partnership with the Iowa Department of Public Health to target diseases of public health significance – highly communicable diseases that require intervention to reduce or stop their spread. Among these are legionellosis, viral meningitis, mumps, herpes and chicken pox.

The section also tests specimens related to disease outbreaks, such as whooping cough (pertussis) and norovirus, the primary cause of gastroenteritis outbreaks in Iowa. The Hygienic Lab is the only lab in the state that performs confirmatory norovirus tests. Identification of these pathogens allows state outbreak investigators to target remediation and prevention strategies.

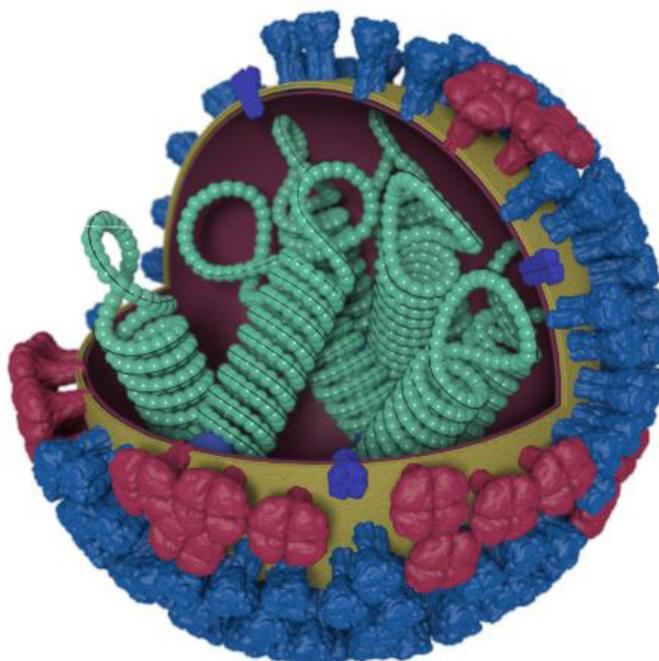
Testing is also performed in support of various surveillance programs in partnership with IDPH, Iowa State University and local public health departments:

- Viral respiratory disease surveillance informs the medical community of when and where influenza is circulating in the state and if strains match the current vaccine.
- Sexually transmitted disease surveillance provides testing for the diagnosis of chlamydia and gonorrhea infections, ensuring patients receive proper treatment to prevent further

spread of infection.

- Arbovirus surveillance tests mosquitoes and humans for West Nile virus and alerts public health officials when mosquito-borne illnesses are circulating, allowing them to implement methods of infection prevention.
- PCR testing for *Cryptosporidium* and *Cyclospora* surveillance in various food items is conducted in cooperation with SHL's Environmental Microbiology section. Additionally, the section supports molecular testing for Food Emergency Response Network (FERN).

AN INFLUENZA VIRUS



HIGHLIGHTS

- Served as a reference laboratory for a clinical trial in a new category of research activity for SHL. This involved performing more than 2,000 shell vial cultures and direct immunofluorescence assays (DFA) for influenza and almost 300 PCR reactions.
- Began the validation and implementation process for a new PCR test that will identify Herpes Simplex Virus (HSV) types 1 & 2, and Varicella Zoster Virus (VZV) from cutaneous and mucocutaneous swabs. Varicella Zoster Virus causes chickenpox and herpes zoster (shingles). Recent reports have shown that VZV is detected in genital swabs at a higher rate than previously thought. The test is a multiplex assay and can detect all three virus types, whereas previous identification of VZV by shell vial culture and direct fluorescent antibody only occurred if specifically requested.
- Began transition from a labor-intensive method of screening for chlamydia and gonorrhea to a fully automated random access platform.
- Validation and implementation began for PCR testing for measles and rubella in-house (rather than sending a sample to a regional Vaccine Preventable Disease Reference Lab).
- Provided testing for Zika, chikungunya and dengue viruses using the Trioplex RT-PCR assay. Also tested a record number of mosquitoes for West Nile virus in response to enhanced mosquito surveillance to determine if the mosquito types known to transmit Zika virus are present in the state.

TOP TESTS

- 1 Zika virus by RT-PCR
- 2 Influenza virus by RT-PCR
- 3 Norovirus by RT-PCR
- 4 Mumps by RT-PCR
- 5 Bordetella pertussis by PCR

TOTAL TESTS: 16,353

NEWBORN SCREENING

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The Iowa Newborn Screening Program turned 50 in 2016.

The Iowa Newborn Screening Program identifies infants at risk for more than 49 inherited diseases by testing drops of blood obtained from a simple heel stick shortly after birth. Most newborns with an inherited condition show no obvious signs of disease. However, with special tests, the Iowa Newborn Screening Program can identify an infant who may be at risk, and alert the doctor and caregivers of the need for immediate, sometimes critical, medical treatment.

A nationally recognized leader in newborn screening, the Iowa program is administered by the Iowa Department of Public Health, which partners with the State Hygienic Laboratory and the University of Iowa Stead Family Children's Hospital.

HIGHLIGHTS

- In September 2016, the Iowa Newborn Screening Program celebrated its 50th anniversary. Iowa Gov. Terry Branstad signed a proclamation recognizing the anniversary and declaring September as Newborn Screening Awareness Month.
- Screening for Severe Combined Immunodeficiency (SCID) was added in July 2016 to the conditions that SHL screens for on behalf of North Dakota. (The rare condition was added to the Iowa screening panel in



2014 and to the screening done on behalf of South Dakota in 2015.) SCID represents a fundamental change in the testing methodology compared to the other conditions on the screening panel. It is the first condition to directly use a DNA target as the marker for the disorder, and the first condition for which a cure is available.

- The Iowa Newborn Screening Program continued its work as a part of the Association of Public Health Laboratory's (APHL) NewSTEPs pilot Collaborative Improvement and Innovation Network (CoIIN) for Timeliness in Newborn Screening. The goal of this ongoing project is to achieve timely reporting of results in 95 percent of newborns that receive dried-blood spot (DBS) newborn screening. The Iowa CoIIN project is working to increase awareness of the newborn screening process and provide education for best practices with the intent of improving response time for babies born in Iowa, and eventually for all babies born in the U.S. In FY2017, the Iowa Newborn Screening Program achieved its goal of receipt of 95 percent of newborn screening specimens within 65 hours of birth.
- New versions of blood spot collection forms were created and distributed in Iowa, North Dakota and South Dakota. Educational webinars on the use of these forms were provided to hospital staff. An educational resource flip chart, "How to Complete the Iowa Newborn Screening Cards," was created for Iowa and North Dakota and distributed to all hospitals and clinics in Iowa.
- The Iowa newborn screening laboratory validated a new cystic fibrosis mutation test method in the span of three months.
- New instrumentation for the punching of dried blood spots from the filter paper specimens went online. The new punching instrumentation will help provide more accurate identification of specimens, help reduce lab errors and enhance traceability through the analytical process.

- A comprehensive site review was conducted by the APHL NewSTEPS (Newborn Screening Technical Assistance and Evaluation Program) team of experts who assessed various components of our newborn screening program, including the laboratory system, birth facilities and follow-up system.
- Continued research collaboration on developing models predictive of gestational age using newborn screening biomarkers with Kelli Ryckman, associate professor in the University of Iowa Department of Epidemiology. SHL involvement in this project involved testing nearly 1,000 research specimens from Africa and India for more than 70 newborn screening biomarkers.
- Awarded a grant by APHL to host a “Deliberative Community Engagement” event with Iowa citizens as part of a review of new conditions for Iowa’s screening panel.

SCREENING VOLUME

- 1 Iowa: 323,628
- 2 North Dakota: 107,610
- 3 South Dakota: 108,371

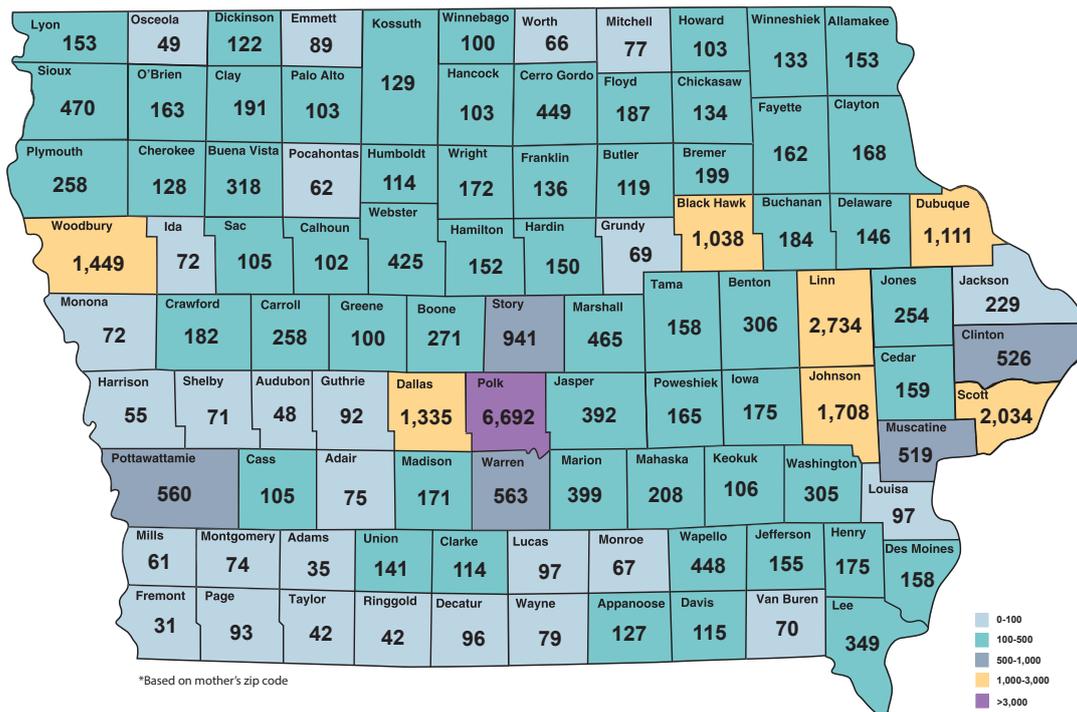
TOTAL: 539,609

SPECIMENS RECEIVED

- 1 Iowa: 40,532
- 2 North Dakota: 13,471
- 3 South Dakota: 13,571

TOTAL: 67,574

Babies Screened in Iowa FY2017 = 35,012*



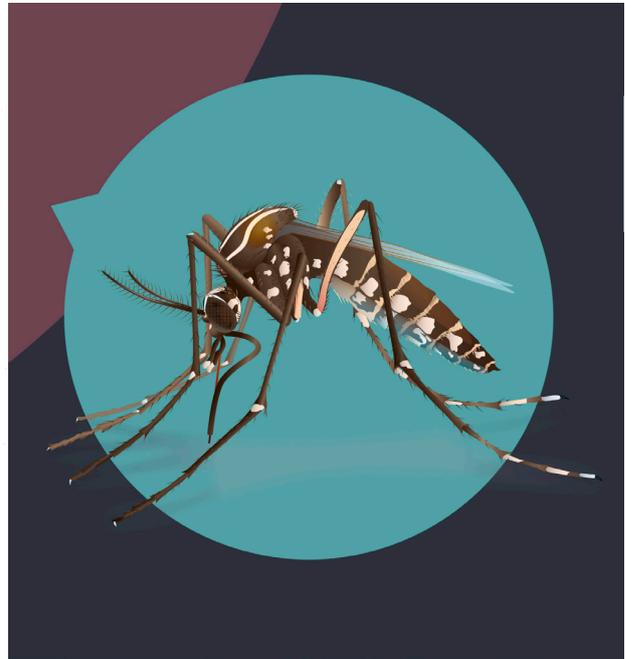
SEROLOGY

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Testing for measles, rubella, Zika and other illnesses was automated with the addition of new equipment.

Serologic testing is used to diagnose certain acute, recent or chronic infectious diseases by detecting antigens or antibodies in the blood. In some cases, when the suspected etiologic agent is impossible, difficult or dangerous to grow in cultures in a routine diagnostic laboratory, serology is the safest, most practical testing method. Monitoring antibody levels that the body produces in response to exposure is important in the medical care of the patient, as well as in stopping the spread of disease from person to person.

Serology's most commonly performed assay helps diagnose latent tuberculosis infection, with more than half being performed on students from high-risk TB areas of the world who are attending Iowa's universities and colleges. Screening for latent TB infection is an admission requirement to prevent the potential spread of the disease that could occur as international students join the campus population. The acquisition of a new instrument, the Dynex DSX, by the serology section will increase the daily capacity for testing TB. This will in turn allow the student testing to occur over a shorter



time period thus decreasing the chance of a student with a positive test from spreading the disease because of a delay in testing.

Measles and mumps exposures, as well as mosquito- and tick-borne diseases, are some of the diseases commonly requested for testing in support of epidemiological investigations performed by the Iowa Department of Public Health.

HIGHLIGHTS

- Began reporting QuantiFeron-TB Gold quantitative result values, including response to the TB antigen and two controls, nil and mitogen. These results along with the qualitative test interpretation may be useful for clinical decision-making in individual cases, in combination with risk factors.
- With the aid of grant monies, purchased two new automated instruments.
 - The Dynex DSX instrument will be used for testing our highest volume test, QuantiFERON-TB Gold, as well as automating our ZIKA IgM test.
 - The acquisition of the BOLT automatic pipetting system, has automated measles, rubella, and HSV testing.

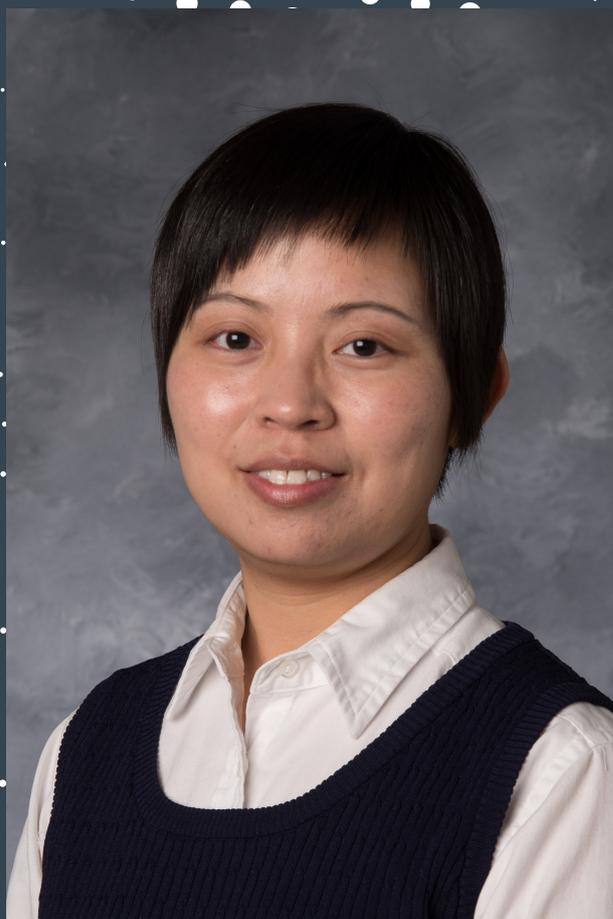
TOP TESTS

- 1 QuantiFeron-TB Gold
- 2 Syphilis VDRL
- 3 Syphilis TPPA
- 4 Mumps IgM Antibody
- 5 Zika Virus IgM Antibody

TOTAL TESTS: 16,353

ENVIRONMENTAL HEALTH DIVISION

The Environmental Health Division routinely monitors private and public drinking water, private wells, streams and lakes, wastewater, air, soil and food for contaminants of potential environmental and public health concern. It also responds to environmental and manmade emergencies – such as compromised water supplies due to chemical spills and flooding – with testing needed to protect public health. Services include testing samples submitted by the general public, local health departments and state agencies.



SUSIE DAI

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AMBIENT AIR QUALITY

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The department grew with the addition of three environmental analysts during FY17. The new staff came eager to learn about Iowa's ambient air and how they would become stewards for the health of Iowans.

The Ambient Air Quality section provides technical expertise, equipment calibration, and maintenance for monitors that sample and analyze Iowa's ambient (outdoor) air quality. These monitors – along with monitors maintained by public health departments in Linn and Polk counties – form a surveillance network covering all major population and industrial centers in Iowa.

The state of Iowa requires ambient air monitoring as part of the Clean Air Act. The Hygienic Lab's Ambient Air section fulfills this requirement through a contract with the Iowa Department of Natural Resources.

Data from more than 100 monitors at 29 sites in 16 Iowa counties is available in the Ambient Air section of the Hygienic Laboratory's website. Real-time data is highlighted and provides concentration information about many pollutants in Iowa's air. Many of these monitors have been active for several decades.

Data that is collected by Air Quality staff is submitted to the Iowa DNR and EPA, and used for research and enforcement. These are keys to Iowa having some of the cleanest air in the country.



Teflon filters are stored in a magazine after collecting particulate matter of 10 microns, 2.5 microns or less from sites around the state.

INDUSTRIAL HYGIENE

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The Industrial Hygiene program performs occupational health testing for the Bureau of Labor to support the Iowa Department of Workforce Development and the Iowa Occupational Safety and Health Administration programs (Iowa OSHA). Testing for these programs is performed in both the Ankeny and Coralville labs, and consists of testing air filters for both inorganic and organic chemicals to assess occupational exposures to chemicals and fumes in the workplace.

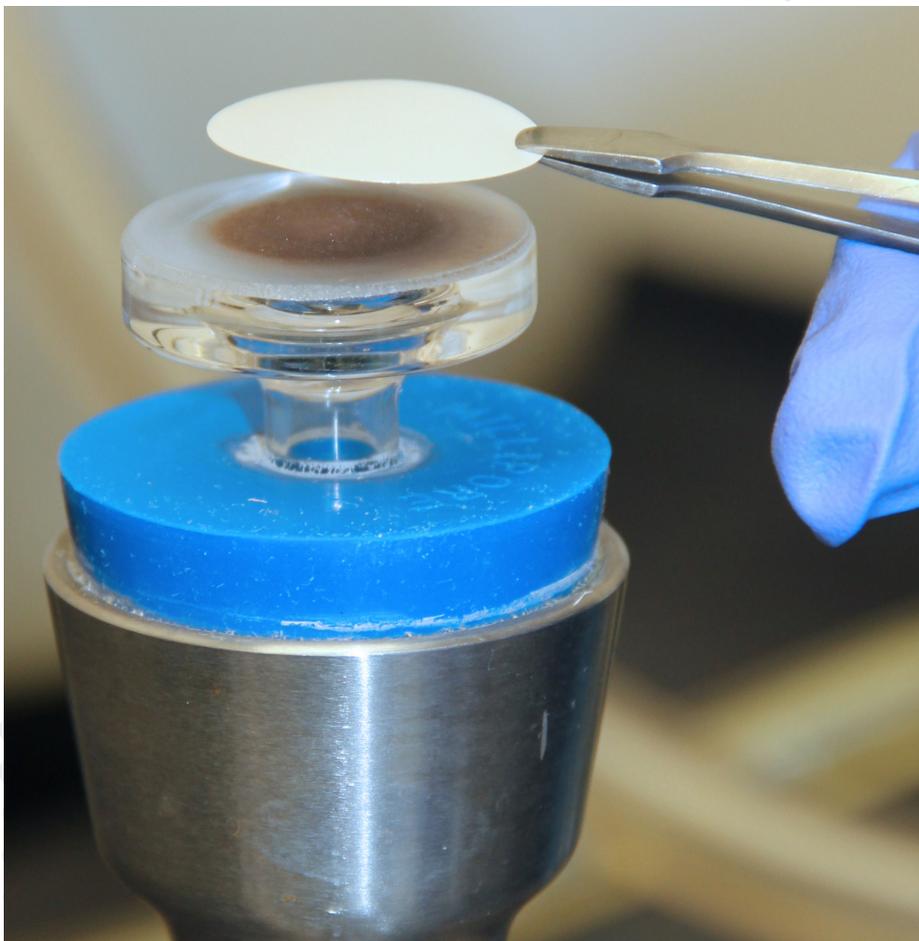
The Hygienic Laboratory also tests for asbestos, a group of similar minerals with separable, long, thin fibers. It is a natural mineral fiber that was used in products primarily because of its fire-retardant capability and strength. Asbestos has long been suspected as a health threat to humans, because the fibers can be inhaled and are difficult to remove from the lungs.

Asbestos testing is performed for businesses, state agencies and individuals. Materials that are frequently tested for asbestos include roofing, flooring and other items used in construction.

TOP TESTS

- 1 Industrial Hygiene Metals, NIOSH 7300
- 2 Various organic solvents in air by gas chromatography
- 3 Particulates (Respirable and Total Dust) in air
- 4 Various organic solvents in air by liquid chromatography

TOTAL TESTS: 547



A silver membrane filter is placed on a vacuum manifold in preparation to analyze an air sample for silica.

INORGANIC CHEMISTRY

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The laboratory has supported several research projects investigating the role of elements (copper, tin, lead and selenium) in the treatment of disease and their occurrence in the population.

Inorganic elements are minerals and metals found in the environment, some of which are harmful to human and animal health, even with minimal exposure. Some inorganic compounds occur naturally in the environment, such as metals found in soil and rock, while others are present due to human activities, such as crop fertilization or the

use of lead in paint prior to 1978. Detection of these elements is important because mitigation techniques can then be implemented to reduce potentially dangerous exposure.

Testing is conducted for state agencies, public water supplies, county public health departments, businesses and private citizens. The Inorganic

Chemistry section can determine the presence of inorganic elements in air, groundwater, drinking water, surface water, wastewater, soil, sludge, vegetation and food. Tests conducted on these matrices can determine the presence of arsenic, cadmium, mercury, lead and many other metals in the environment.

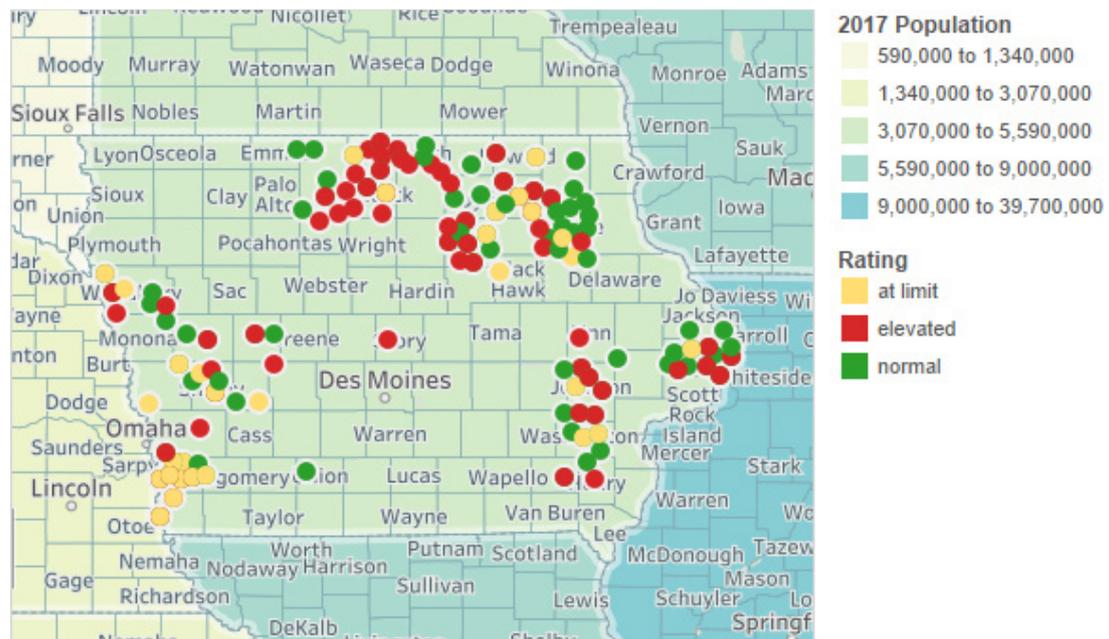
Samples from public and private (well) water supplies are analyzed for levels of nitrate, nitrite, total coliform and *E.coli* bacteria. Testing for lead in dust, paint, soil, pottery and food products is performed to help identify sources of lead exposure.

Inorganic Chemistry samples with short holding times (within 48 hours of collection) are tested to determine the presence and levels of orthophosphate, nitrite and nitrate. Determination of levels of oil and grease in waste streams is performed at the Coralville laboratory.



Mathew Banford makes a series of dilutions on a sample for the biochemical oxygen demand analysis.

Levels of arsenic in well water tested by SHL are indicated by dots in red (elevated), yellow (at EPA's limit for public water supplies) and green (normal).



HIGHLIGHTS

- Tested more than 1,000 beach sand samples from four Iowa beaches to measure *E. coli* per dry weight per gram.

TOP TESTS

- 1 Total suspended solids
- 2 Ammonia
- 3 Metals
- 4 Nitrate/nitrite
- 5 Total Kjeldahl nitrogen

TOTAL TESTS: ~62,000

LABORATORY CERTIFICATION PROGRAM

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The Laboratory Certification program assists in reviewing the 184 laboratories in the Iowa DNR program to ensure that reliable analytical data for the state's wastewater, drinking water and solid waste programs are provided to minimize environmental threats.

Public water providers in the United States are required to monitor their drinking water to determine if consumers are adequately protected from microbiological, chemical and radiochemical contaminants. Similarly, wastewater treatment facilities perform analyses to assure that the wastewater is properly treated to protect the environment from bacteria, pathogens and other pollutants.

The Hygienic Laboratory provides laboratory certification assessments and management for the Iowa Department of Natural Resources. These were developed over the past 30 years to provide a comprehensive list of testing parameters and fields of testing for laboratory certification.

A laboratory is certified to perform a specific method for a specific analyte or analyte group. The program also provides the opportunity for a testing laboratory to become certified for a specific analyte group across multiple environmental programs. For example, a lab may acquire certification for

inorganic chemicals (IOCs) within the wastewater, drinking water and contaminated site programs.

There were 184 laboratories certified in 2017. These include municipal and regional water plants, water treatment facilities and commercial laboratories. Approximately 150 laboratories perform only wastewater testing. The remainder test for drinking water, or a combination of drinking water, wastewater and solid waste. Commercial laboratories include those that are located both in and outside of Iowa that perform work in the state.

Certification in Iowa is on a two-year cycle with most laboratories receiving an onsite inspection once during that two-year period. Some laboratories, especially out-of-state laboratories that are certified in their home state, can be certified for Iowa based on reciprocity with their state's certification or accreditation in the National Environmental Laboratory Accreditation Program. Through reciprocity, a laboratory may not require an onsite inspection.



HIGHLIGHTS

- 50th Annual Lab Symposium
- Presentation at regional IAWEA meetings
- Method Assistance and Guidance for Small Laboratory Programs

A primary clarifier treats wastewater.

LAKESIDE LABORATORY

DENNIS HEIMDAL: dennis-heimdal@uiowa.edu

Volunteers for the Cooperative Lakes Area Monitoring Program (CLAMP) celebrated the 19th consecutive sampling season for Dickinson County lakes. CLAMP is coordinated by the Iowa Lakeside Laboratory in partnership with the State Hygienic Lab at Lakeside, with funding support from the Friends of Lakeside Lab. CLAMP participants cut the cost of monitoring at least in half by volunteering their time and boats to collect field measurements and water samples.

The Water Chemistry Laboratory at the Iowa Lakeside Laboratory – Regents Resource Center is a satellite environmental laboratory located in Milford, Iowa. It conducts analytical testing on both public and private drinking water, groundwater, surface water and wastewater. The lab also assists local water testing facilities.

Lakeside’s newest building is the Waitt Lab, a gift of the Friends of Lakeside Lab. Opened in 1998, it contains the Bovbjerg Water Chemistry Laboratory, two classrooms, several offices and Andrea’s Atrium, which is used for receptions and gatherings.

Staff provides educational and outreach services for local students and citizens, as well as classes and laboratory experiences for college students, interns and teacher externs.



Zebra mussels attach to a shell.

TOP TESTS

- 1 Wastewater and surface water:
E.coli, Total Phosphorus
- 2 Pool and spa: coliform bacteria,
nitrate/nitrite as nitrogen
- 3 Total Kjeldahl nitrogen

TOTAL TESTS: 5,328

HIGHLIGHTS

- Through the Iowa Governor’s STEM Advisory Council Real World Externship, two teachers spent the summer working at the State Hygienic Lab at Lakeside. The teachers spent more than a month learning about water quality testing and data analysis. Both completed several projects, which will be used in the classroom and assist the lab in educating the public regarding lake water quality.
- CLAMP volunteers collected lake water samples that will be analyzed for algal toxins and for the presence/absence of the blue-green algae (microcystis).
- In partnership with a local wastewater treatment plant, a three-month study was conducted to determine the effectiveness of a ultra-violet disinfection unit in killing bacteria prior to discharge.

LIMNOLOGY

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MIKE SCHUELLER: michael-schueller@uiowa.edu

Despite the harsh Iowa winters, limnologists collect samples throughout the year from 61 ambient streams to test for levels of contaminants that may endanger water quality.

Limnologists collect and analyze samples of surface water, wastewater and groundwater throughout Iowa. They examine the chemical and physical characteristics and biological organisms and processes of aquatic ecosystems. The data from this work is used to assess short and long-term trends in water quality throughout the state.

The environmental specialists in the Limnology section are the foremost experts specializing in

benthic macroinvertebrate taxonomy and are among the very best fish taxonomy generalists in Iowa. They have developed a Top Five stream bioassessment program in the United States in partnership with the Iowa Department of Natural Resources. Their efforts have resulted in comprehensive records of the benthic macroinvertebrate and fish communities in Iowa, and the documentation of many species not previously recorded in the state.



Limnologists collect samples of aquatic life from Silver Creek near Davenport.

HIGHLIGHTS

- Performed 103 bioassessments in seven ecoregions across the state, which included collecting and identifying tens of thousands of fish and benthic macroinvertebrates and the measurement of greater than 50 physical habitat parameters along approximately 1,000 stream transects.
- Monitored 61 stream sites across Iowa on a monthly basis for ambient water quality parameters that included nutrients, bacteria, metals, chlorophyll, solids, temperature, pH, dissolved oxygen and stream discharge.
- Performed several special stream characterization studies and imparted subject matter expertise to federal, state and local agencies to assist their water quality analysis in rivers, streams, lakes and impoundments.
- Donated hundreds of hours to educate students in grade schools, high schools, colleges and universities about methods of water quality analysis (chemical, biological, physical) and the importance of being good stewards of the natural resources. This included assisting with the development of a water monitoring curriculum implemented in several elementary schools in Iowa.
- The article "Aquatic Coleoptera (Dryopidae, Dytiscidae, Elmidae, Gyrinidae, Haliplidae, Helophoridae, Hydrochidae, Hydrophilidae, Noteridae, Psephenidae) of Iowa: Distributional Records and Notes" was published in *The Coleopterists Bulletin*.
- Todd Hubbard received the University of Iowa Outstanding Staff Award

TOP TESTS

- 1 Chlorophyll
- 2 Field pH
- 3 Field temperature
- 4 Field dissolved oxygen
- 5 Benthic macroinvertebrate collection and taxonomy

TOTAL TESTS: 7,386

ORGANIC CHEMISTRY

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SARAH MAY: sarah-may@uiowa.edu

The laboratory provided multiple testing services for a new DNR study measuring residual industrial contamination of Cedar Lake in downtown Cedar Rapids with the objective of being able to restore the lake for recreational use.

Human activities often have a significant impact on the environment. Contaminants that infiltrate our natural resources can be detrimental to the health of both humans and animals. The Organic Chemistry section analyzes air, soil, water, vegetation and food to identify and measure potentially toxic organic compounds, such as plasticizers, pesticides, personal care products, pharmaceuticals and industrial chemicals.

Testing is conducted for state agencies, public water supplies, county public health departments, businesses and private citizens. Routine environmental monitoring is conducted to evaluate the ongoing health of Iowa's environment, while responsive testing is conducted to determine the risk of human and animal exposure in the event of environmental catastrophes.

Analysis for organic compounds is conducted using highly specialized methods and instrumentation in order to detect very low levels of organic compounds. New testing methods are implemented as new threats emerge, such as the possible presence of hormones and steroids in drinking water.

Organic Chemistry sections of the lab include Gas Chromatography Analysis and Liquid Chromatography Analysis, so named for the technology used in the analyses of various samples to determine organic contaminants. A gas chromatograph is used to analyze relatively low molecular weight organic compounds that can be vaporized by heating, while a liquid chromatograph can detect extremely low levels of compounds that have a higher molecular weight and are not as easily vaporized.

HIGHLIGHTS

- Partnered with researchers at the National Institutes of Health to conduct a study of drinking water from 10 Iowa cities looking at how endocrine disrupting chemicals have been linked to adverse effects on human reproductive systems and the thyroid. Findings from the study were presented at the Iowa Governor's Conference on Public Health.
- Applied for and became an approved lab for testing drinking water under the EPA's Unregulated Contaminant Monitoring Rule 4, scheduled to begin in 2018.
- Expanded testing of unknown products and materials for problem-solving purposes for clients, including pesticide oversprays, drinking water contamination, train derailments and various investigations.
- Contributed to several *Lab Link* articles, including "State archaeologists and lab confirm time in a bottle," "Meteor from 74 million years ago still affects Iowa water," and "Ethanol from train derailment spurs water assessment."



TOP TESTS — GAS CHROMATOGRAPHY

- 1 Trihalomethanes in water
- 2 Haloacetic acids in water
- 3 Nitrogen containing herbicides in water, vegetation and soil
- 4 Volatile organic compounds in water and soil
- 5 Semivolatile organic compounds in water and soil

TOP TESTS — LIQUID CHROMATOGRAPHY

- 1 Carbonyls in air
- 2 Acid herbicides in vegetation and soil
- 3 Glyphosate in vegetation and soil
- 4 Glyphosate in water
- 5 Miscellaneous pesticides in vegetation and soil

TOTAL TESTS

GAS CHROMATOGRAPHY: 4,584

GAS AND LIQUID CHROMATOGRAPHY-SAMPLE PREP: 4,002

RADIOCHEMISTRY

DUSTIN MAY: dustin-may@uiowa.edu

SHL radiochemistry continues to meet and exceed client expectations despite high sample volume while diversifying its operations into research and food testing.

Radionuclides can be harmful to human health if inhaled or ingested. They are commonly present at low concentrations in geological formations, produced at low levels through interactions between the atmosphere and cosmic radiation, and are produced artificially through human activities, such as power generation, medical therapy and heavy industry.

The Radiochemistry section primarily performs analyses of water and soil to determine radioactivity concentrations, but also is capable of analyzing air, food, milk, urine and foliage. The section maintains preparedness for any radiation emergency response incidents.

TOP TESTS

- 1 Combined radium
- 2 Gross alpha radiation
- 3 Gamma spectrometry
- 4 Tritium
- 5 Gross beta radiation

TOTAL TESTS: 4,036



Alpha-emitting radionuclides are co-precipitated with iron hydroxide using a color indicator, bromocresol purple, and a strong base, ammonium hydroxide.

HIGHLIGHTS

- Turnaround times for highest volume tests either improved or remained the same in FY17 as compared to FY16. Median turnaround time for one of SHL's highest volume tests – gamma spectrometry – decreased from 14 days in FY16 to 5 days in FY17, representing a 64 percent improvement in overall turnaround time.
- Performed extensive surveillance for radionuclides in food products as part of the Food Emergency Response Network (FERN).
- All three full-time radiochemistry staff members received SHL Exceptional Performance awards for dedication and accomplishment.
- In collaboration with researchers at the University of Iowa, Radiochemistry supervisor Dustin May published three peer-reviewed journal articles, focusing on new method development and analysis of the environmental impacts of drilling and mining wastes on the environment.

PUBLISHED

- May, D., Nelson, A.W., Schultz, M.K. (2017). Quantitation of Lead-210 (^{210}Pb) Using Lead-203 (^{203}Pb) as a “Massless” Yield Tracer. *Journal of Environmental Radioactivity*, 171, 93-98. DOI:10.1016/j.jenvrad.2017.02.003
- Nelson A.W., Eitrheim E.S., Knight A.W., May D., Wichman M.W, Forbes T.Z., Schultz M.K. (2017). Polonium-210 Accumulates in a Lake Receiving Coal Mine Discharges—Anthropogenic or Natural? *Journal of Environmental Radioactivity*, 167, 211-221. DOI:10.1016/j.jenvrad.2016.10.023
- Eitrheim, E.S., May, D., Forbes, T.Z., Nelson, A.W. (2016). Disequilibrium of Naturally Occurring Radioactive Materials (NORM) in Drill Cuttings from a Horizontal Drilling Operation. *Environmental Science & Technology Letters*, 3 (12), 425–429. DOI:10.1021/acs.estlett.6b00439

RADIOLOGICAL EMERGENCY RESPONSE TEAM

LEONARD MARINE: leonard-marine@uiowa.edu

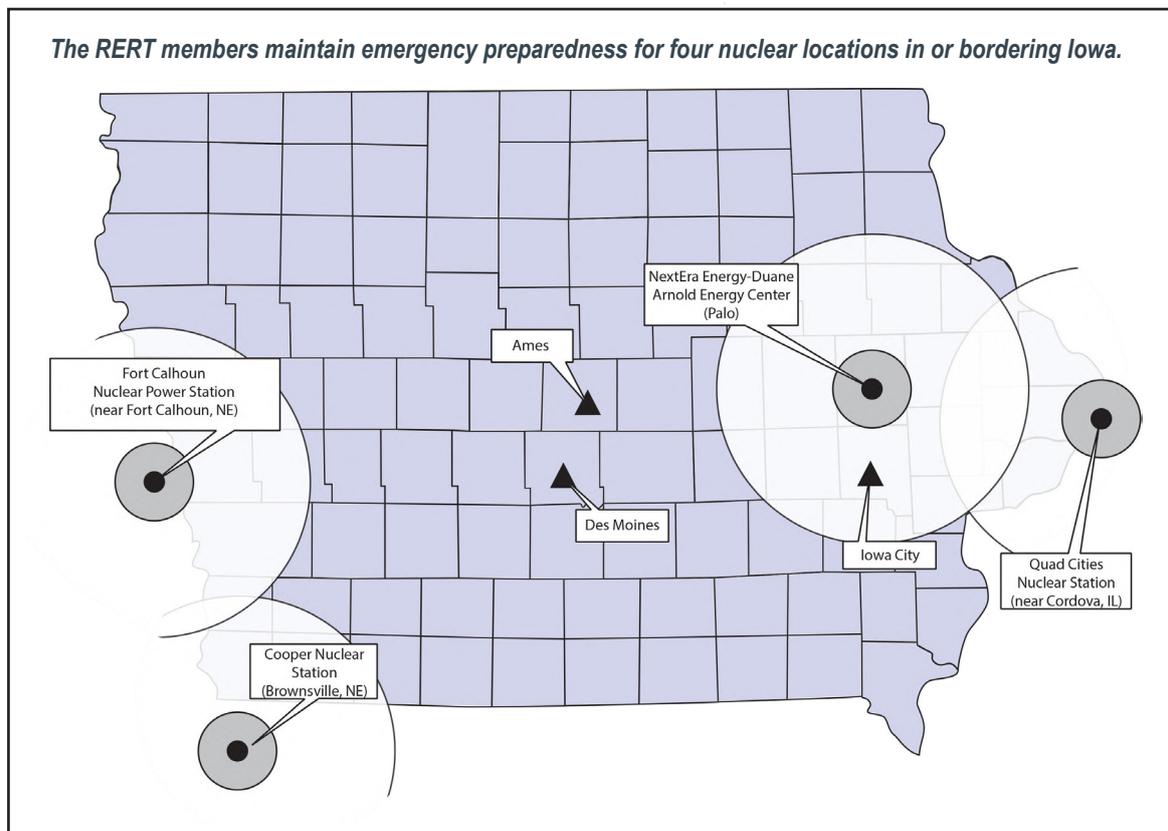
The Radiological Emergency Response Team section maintained the Hygienic Laboratory's preparedness for radiological emergencies. It hosted annual field team training, participated in five drills at nuclear energy sites and a nuclear station, and was evaluated during emergency phase exercises.

The RERT is part of Iowa's Radiological Emergency Response program. This group provides field monitoring, technical consultation and initial accident assessment in coordination with the Iowa Department of Public Health.

The team also works with Iowa Homeland Security and Emergency Management Division to prepare for the unlikely event of an act of terrorism or an accident at one of the four nuclear power plants in or near Iowa. The role of the Hygienic Laboratory's RERT is to evaluate the extent to which radioactive

materials have been released from an incident.

In Iowa, responding organizations to a radiological emergency communicate, share and aggregate data through the RadResponder Network. Chainbridge Technologies maintains this network. Its staff participated in the RERT field team training to share best practices and better understand how Iowa uses the network. This interaction led to improved utilization of RadResponder and provided an opportunity to suggest modifications that address needs unique to Iowa.



Federal guidelines require emergency planning for areas within a 10-mile and a 50-mile radius of a nuclear power station. The laboratory also provides the following services:

- Field surveillance and monitoring of radiation levels, including coordination of environmental sampling with state and federal agencies;
- Dose assessment in support of IDPH programs;
- Laboratory analysis and support of environmental sampling and radiological monitoring activities during an emergency and post emergency;
- Maintenance and communication of data relating to radiation exposure and contamination; and
- Technical expertise for local emergency response personnel for monitoring and decontamination of evacuees.

HIGHLIGHTS

- Hosted annual field team training with 38 participants representing 10 different local, state and federal agencies, and three utilities.
- Participated in five drills: four drills at Duane Arnold Energy Center in Palo, Iowa, and one at Ft. Calhoun Nuclear Station in Nebraska. (Drills are non-federally evaluated practice events, generally held quarterly.)
- Participated in a rehearsal and evaluated emergency phase exercises for the Quad Cities Nuclear Station near Cordova, Ill. (A rehearsal is considered a practice before a federally evaluated exercise.)
- Evaluated by FEMA Region 7 onsite at the Radiochemistry Laboratory.
- Continued to implement the Rad Responder Network. This network assists in rapidly recording, sharing and aggregating large quantities of data during a radiological emergency.

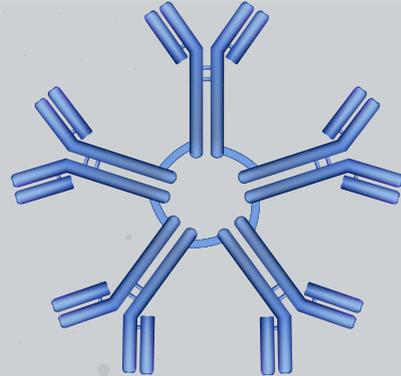
YEAR AT A GLANCE

JULY 2016



Broadleaf herbicide in crop-dusting overspray in and near the city of Marion is confirmed by the lab.

AUGUST 2016



Iowa confirms first cases of West Nile virus for the season.

SEPTEMBER 2016



Todd Hubbard's published work identifies for the first time 40 species of aquatic beetles in Iowa, and records an additional 171 known to be in the state.

OCTOBER 2016



SHL researchers co-author a study of radioactive nuclides, including polonium-210, in wastewater from coal mining.

NOVEMBER 2016



Iowa is among five states included in a Newborn Screening Collaborative Improvement and Innovation Network pilot project, continuing its national leadership in timely screening.

DECEMBER 2016



Press coverage highlights SHL testing of well water contamination.

JANUARY 2017



SHL begins testing for carbapenem-resistant enterobacteriaceae, which can be deadly because of its resistance to available antibiotics.

FEBRUARY 2017



HazMat teams practice handling hazardous materials during laboratory training.

MARCH 2017



Twenty tanker cars are derailed from a bridge in northwestern Iowa, prompting the lab to test water samples for ethanol and biochemical oxygen demand.

APRIL 2017



A case of rabies is confirmed in a cat from northern Iowa.

MAY 2017



In one week, the Iowa Department of Inspections and Appeals and SHL rapidly solve a foodborne outbreak of *Salmonella* Braenderup in potato salad.

JUNE 2017



Teachers were students of lab science during the summer as part of the Iowa STEM Teacher Externships Program.

SUMMARY OF TESTING FY2017

TOTAL TESTING FOR IOWA AND NATIONWIDE COMBINED FY2017

781,551 Analyses Performed 211,111 Samples Submitted

Total Testing for Iowa FY2017

554,551 Analyses Performed
179,030 Samples Submitted

Newborn Screening for Iowa

323,564 Analyses Performed*
40,524 Samples Submitted

Environmental Testing for Iowa

143,532 Analyses Performed
70,716 Samples Submitted

Newborn Screening for South Dakota

108,371 Analyses Performed
13,571 Samples Submitted

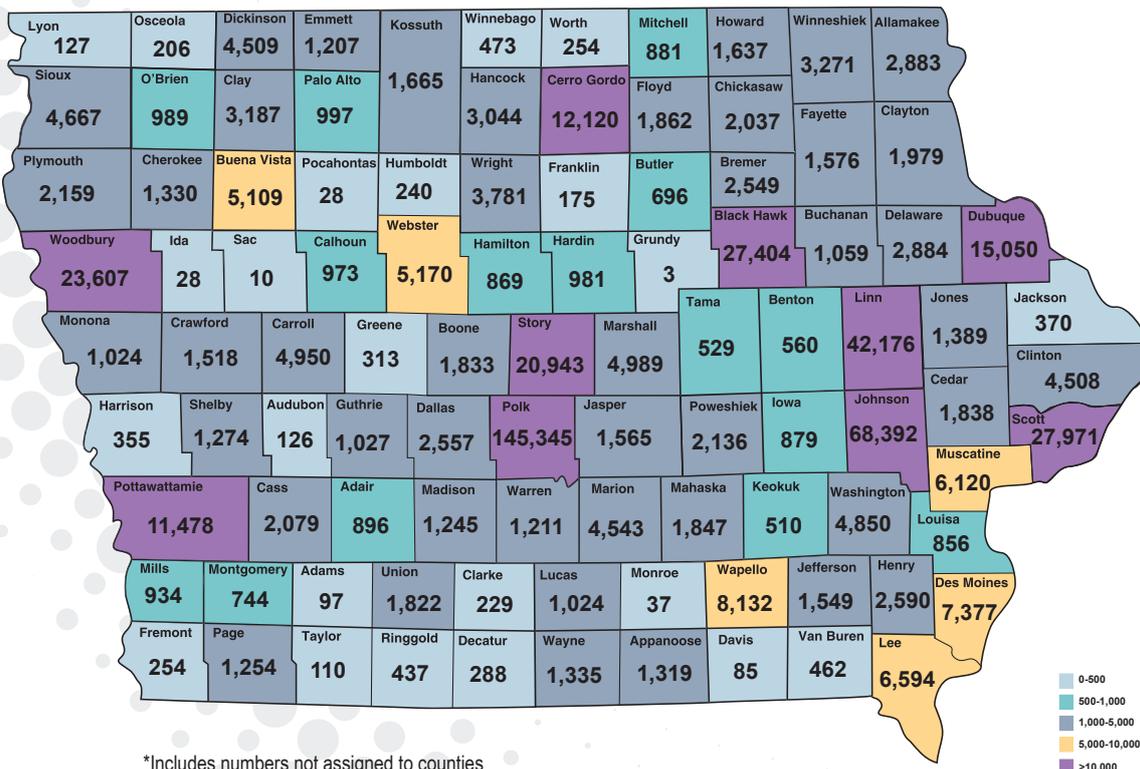
Clinical Testing for Iowa

87,455 Analyses Performed
67,790 Samples Submitted

Newborn Screening for North Dakota

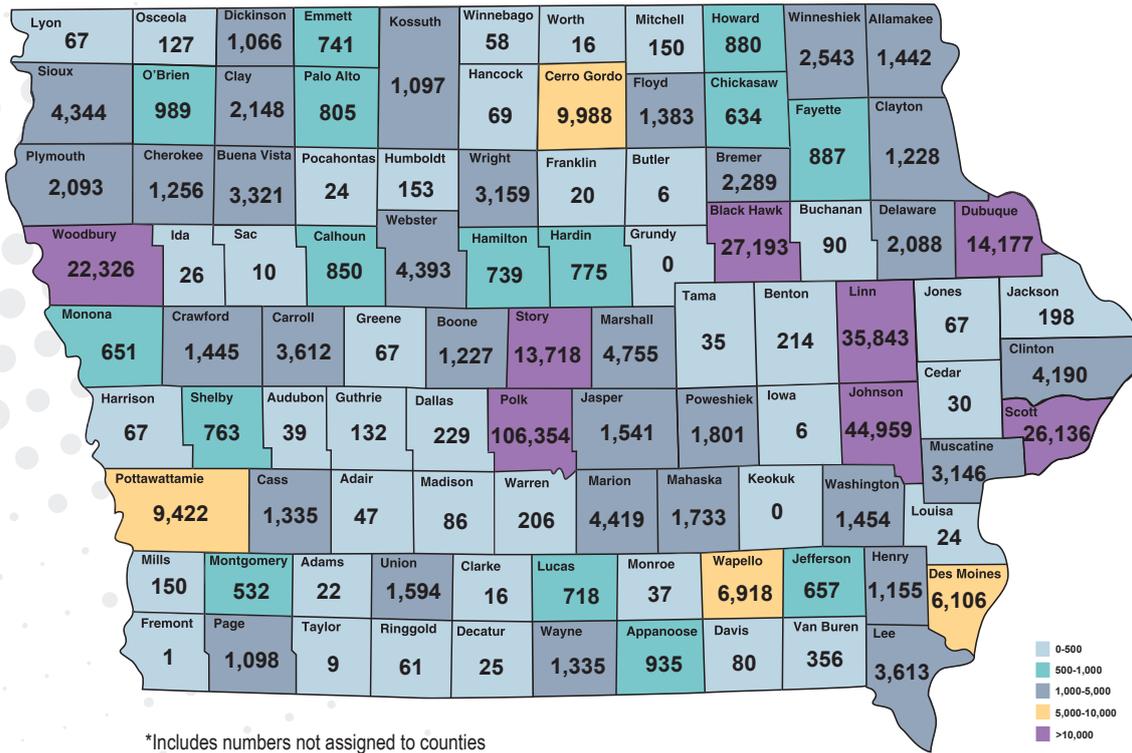
107,610 Analyses Performed
13,471 Samples Submitted

TOTAL TESTING FOR COUNTIES IN IOWA



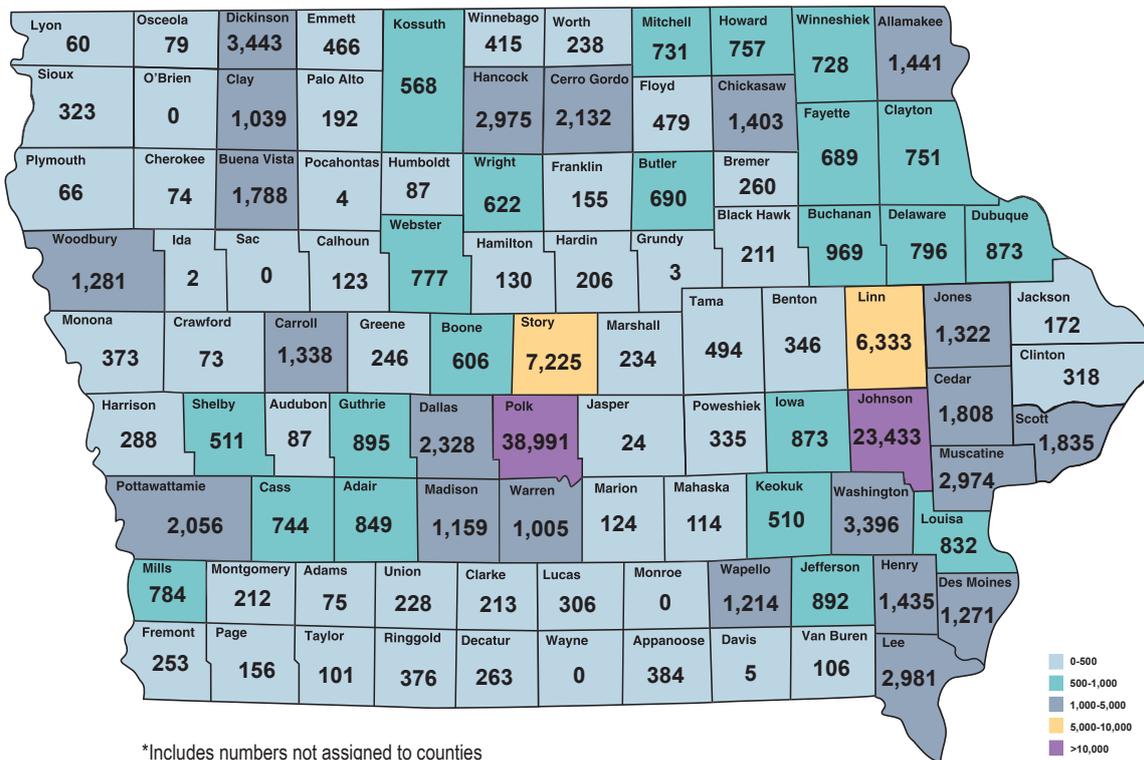
*Includes numbers not assigned to counties

TOTAL CLINICAL TESTING



*Includes numbers not assigned to counties

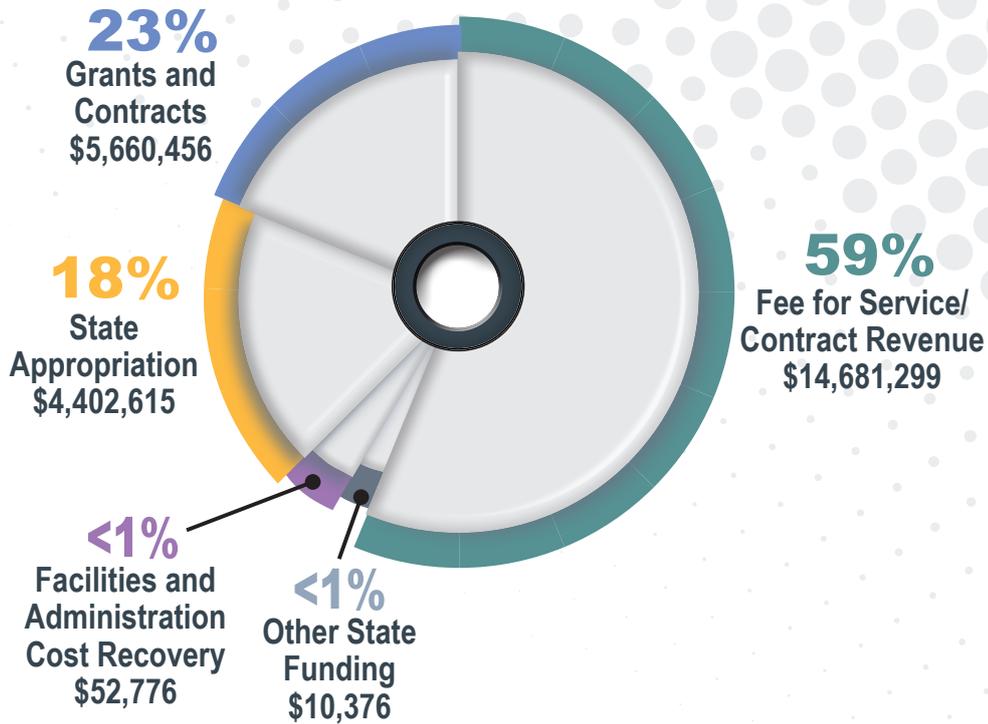
TOTAL ENVIRONMENTAL TESTING



*Includes numbers not assigned to counties

REVENUE

FUNDING SOURCES FOR THE YEAR ENDED JUNE 30, 2017

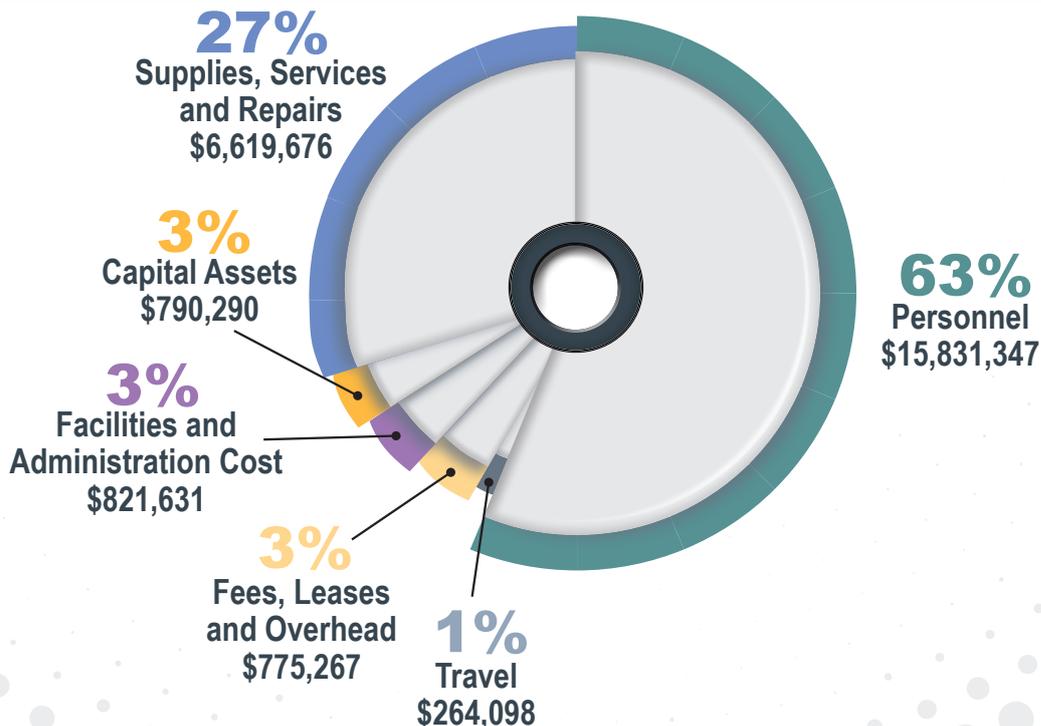


TOTAL OPERATING REVENUE

\$24,807,522

EXPENSES

(CASH BASIS) FOR THE YEAR ENDED JUNE 30, 2017



TOTAL EXPENSES

\$25,102,309



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