

# STATE HEALTH LABORATORIES ANNUAL REPORT 2012



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**April 2013**



## Message from the Director

April 2013



Dear Colleague:

In 2011, the Rhode Island Department of Health launched a comprehensive effort to support, achieve, and maintain a performance improvement culture. We are guided by a firm belief that improving the way we do public health will lead to better health and safety outcomes statewide.

The State Health Laboratories help us monitor health, diagnose and investigate diseases, and enforce laws—three essential services that guide public health work both locally and nationally. During the past year, the laboratories implemented several initiatives to enhance the quality and efficiency of their work in these vital areas.

This report highlights some of these initiatives, which range from enhancing and standardizing food testing programs to providing more efficient testing of forensic evidence and of blood specimens from those arrested for driving under the influence of alcohol. The report also describes the breadth and professionalism of health laboratory work in Rhode Island, which includes tests in the areas of disease detection, food safety, environmental health, forensic science, and emergency response.

I invite you to learn more about the laboratories' important work, which furthers our collective effort to make Rhode Island the healthiest state in the nation.

Sincerely,

Michael Fine, MD  
Director of Health

## Table of Contents

Executive Summary .....	5
State Health Laboratories Organization .....	6
Administration and Support Section .....	7
Laboratory Customer Satisfaction Survey .....	8
Biological Sciences .....	9
Bioterrorism Response and Special Pathogens Laboratory .....	9
Molecular Biology and Enteric Pathogens Laboratory .....	11
Serology Laboratory.....	13
Biomonitoring and Chemical Terrorism Response Laboratory.....	16
Environmental Sciences .....	17
Air Pollution Laboratory .....	17
Food and Water Chemistry Laboratory.....	19
Water Microbiology Laboratory .....	21
Organic Chemistry Laboratory.....	24
Analytical Laboratory Certification Program .....	25
Forensic Sciences .....	26
Combined DNA Index System (CODIS) .....	26
Forensic Biology/DNA Laboratory.....	27
Forensic Toxicology Laboratory .....	28
Forensic Breath Analysis Section .....	29
Forensic Drug Laboratory .....	30
Appendices .....	31
A. Summary of Laboratory Testing Services .....	31
B. Accreditations .....	34

## Executive Summary

State Health Laboratories provide laboratory services and scientific expertise in support of state and federal public health, environmental, and public safety programs. This sixth annual report provides an overview of Rhode Island's state laboratory programs and summarizes the accomplishments and challenges of 2012.

State Health Laboratories serve a unique and changing role in the delivery of the public health system services. Timely and accurate laboratory data help solve outbreak investigations, monitor the spread of disease, and guide treatment. The laboratory programs provide specialized reference testing for hospital laboratories and are the first line of defense in the detection of bioterrorism and chemical terrorism. In cooperation with Rhode Island's Community Health Centers, they also provide selected lab services to the uninsured and indigent populations in the state.

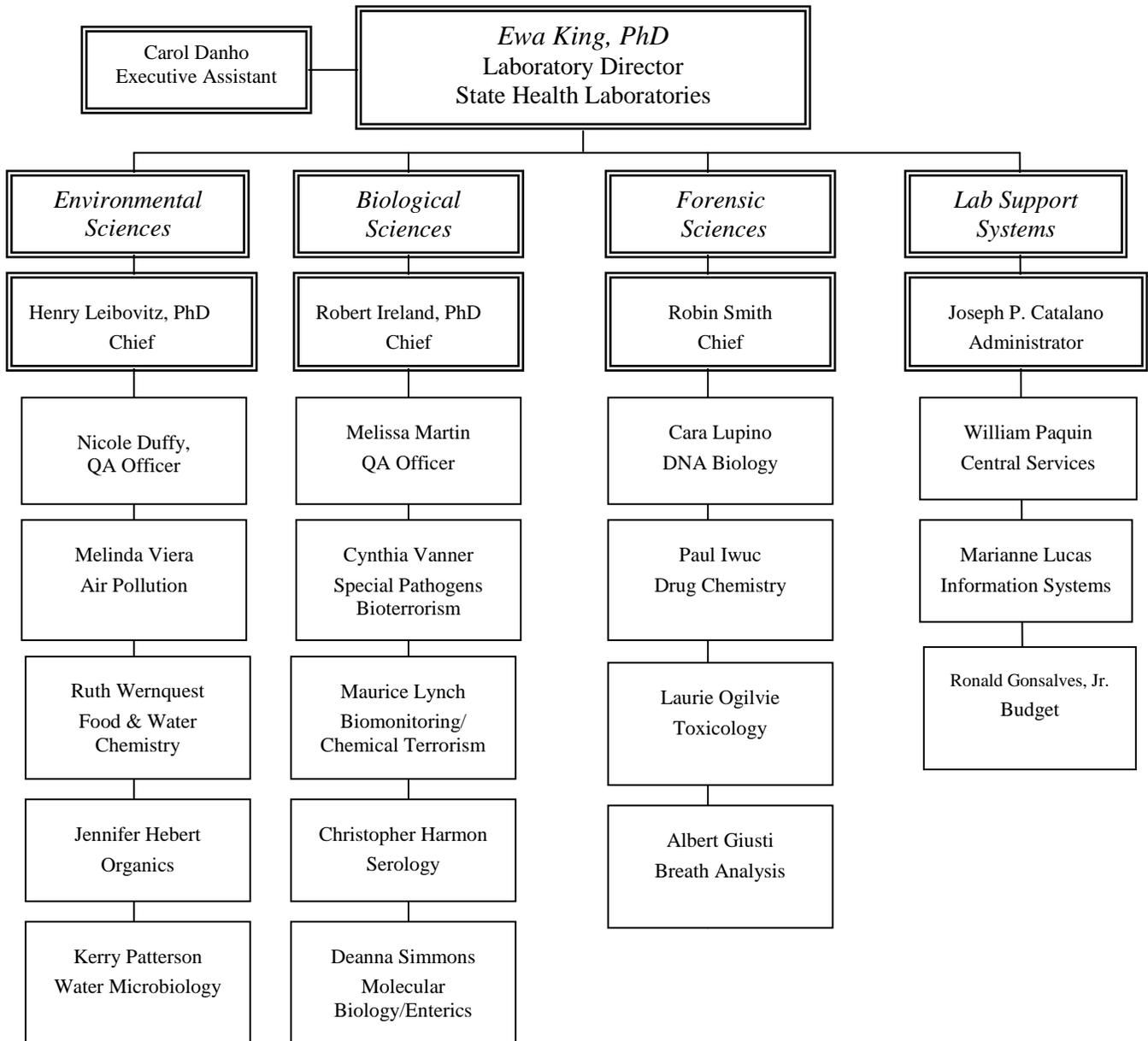
State Health Laboratories help mitigate the effect of environmental pollution on the health of populations and individuals. In cooperation with the Rhode Island Department of Health's Office of Drinking Water Quality, State Health Laboratories help assure safe drinking water by providing test results to the public water systems and private well owners. They partner with the Rhode Island Department of Environmental Management to operate a statewide network of air monitoring stations and perform thousands of water quality tests. They also perform lead screening tests for thousands of Rhode Island children to help lower the burden of childhood lead poisoning.

State Health Laboratories operate sophisticated forensic laboratories supporting the needs of the state and municipal police departments, as well as the Office of State Medical Examiners. Forensic laboratories aid in the cause of death investigations, identify confiscated illegal substances, and test crime scene evidence for the presence of DNA that can be used to identify perpetrators.

In 2012, the state laboratories continued to provide a full array of testing services while emphasizing efficiency of operations. Backlog of tests and turn around times are monitored and reported monthly. The implementation of Six Sigma and LEAN management approaches is expected to significantly improve the efficiency of laboratory operations in the coming year.

# State Health Laboratories Organization

State Health Laboratories are organized into three scientific disciplines or sections: Biological Sciences, Environmental Sciences, and Forensic Sciences. Laboratories in each section, with their own distinct roles, are supported by staff in the common Administration and Support section. Section Chiefs and the Laboratory Administrator report to the Laboratory Director, who is responsible for the overall management and leadership of all Laboratory programs. At the end of 2012, the Laboratories had 69 employees. The number of employees has remained stable over the last few years. The Laboratories employ four scientists at the Doctoral (PhD) level, twenty-five Master's Degrees, twenty-eight Bachelor's Degrees, three Associate's Degrees, and nine support staff.



## Administration and Support Section

The Administration and Support section provides the overall leadership and maintains the budgetary, personnel, purchasing, billing, information technology, and clerical support functions for the State Health Laboratories. Additional support functions, which are specific to laboratory operations, are provided by Laboratory Central Services. These functions include shipping/receiving, hazardous waste storage/disposal, and glassware washing. Security is another important responsibility of the Administrative section.

The Fiscal Year 2013 budget for all laboratory programs is approximately \$9.8 million. About \$6.3 million of the budgeted total is from State General Revenues and \$3.5 million is from various federal funding sources such as the Centers for Disease Control and Prevention, the Environmental Protection Agency, the Food and Drug Administration, and the US Department of Justice. In 2012, the Health Laboratories received a new five year grant in the amount of \$1.5 million to become accredited in the area of food testing. In addition to grants received directly by the laboratories, many public health programs have an important laboratory component and dedicate some of their funding to supporting laboratory personnel or offsetting the cost of laboratory supplies. These partner programs include the Department of Health’s Office of HIV & Viral Hepatitis, Sexually Transmitted Disease (STD) program, the Division of Infectious Disease and Epidemiology, and the Center for Emergency Preparedness and Response. These funds are not included in the laboratory budget request.

As illustrated in the table below, in the past four years, the laboratory’s expenditures of state funds remained relatively constant, despite rising wages and the ever-increasing cost of laboratory supplies. This is attributed mainly to a smaller number of employees and increased funds from federal grants.

Approximately two-thirds of the laboratory budget is dedicated to personnel. The remaining third is apportioned for operating expenditures such as testing supplies and reagents, equipment maintenance and repairs, proficiency testing, and accreditation costs.

### Expenditure Trends for Laboratory Programs (fiscal years 2010-2013)

<i>Funding Source</i>	<i>2010</i>	<i>2011</i>	<i>2012</i>	<i>2013*</i>
State Funds (General Revenue)	\$6,053,681	\$6,596,176	\$6,011,211	\$6,300,363
Federal Funds	\$2,128,895	\$2,881,647	\$2,997,833	\$3,475,428
<b>Totals</b>	<b>\$8,182,576</b>	<b>\$9,477,823</b>	<b>\$9,009,044</b>	<b>\$9,775,791</b>

**Note: Additional federal funds were received from the Epidemiology and Laboratory Systems Capacities for Infectious Diseases grant that are not included in these figures. \* Figures for 2013 were the revised requested FY2013 budget submission.**

# Laboratory Customer Satisfaction Survey

State Health Laboratories are committed to meeting the needs of their partner programs, and they use customer satisfaction indicators as one of their performance measures. In addition to customer satisfaction, the laboratories also measure a variety of specific process measures such as critical test turn around time and proficiency testing results. The customer satisfaction survey consists of several questions assessing customer satisfaction related to various aspects of laboratory services:

- Quality and reliability of results
- Test turn around times
- Scope of services
- Notification of urgent test results
- Response to customer concerns
- Clarity and usefulness of lab reports

The customer satisfaction survey administered in February 2013 solicited responses from external customers as well as internal customers (i.e. Department of Health programs) to assess the quality of laboratory services provided during the calendar year 2012. In addition to programs within the Rhode Island Departments of Health and Environmental Management, community customers such as physicians, hospital and commercial laboratories, community health centers, and state and local police departments responded to the survey. A total of 83 responses were received, a slight decrease compared to the number of respondents to the 2011 survey (90). Overall, 92.7% of respondents rated laboratory services as exceeding or meeting expectations.

State Health Laboratories will continue to administer and analyze the results of the annual satisfaction survey. The survey has become an excellent tool to gauge overall performance and pinpoint areas where improvements are necessary. Individual laboratory results and customer comments are conveyed to managers and supervisors to serve as a quality improvement tool.

## Biological Sciences

The primary mission of the *Biological Sciences Section Laboratories* is to provide essential laboratory support to public health programs concerned with the early detection, surveillance, and containment of infectious diseases in the state. Through the rapid detection of infectious disease outbreaks, excess morbidity and mortality is avoided. The section maintains the capacity to rapidly identify newly emergent infectious diseases such as novel strains of influenza, as well as established infectious diseases such as HIV or tuberculosis. Working closely with the Centers for Disease Control and Prevention, the section has incorporated sophisticated molecular tests to identify microbial agents and toxins of bioterrorism. Microbiological testing is also performed to assess the safety of the food supply. This laboratory section also includes the Biomonitoring Laboratory, which follows procedures established by the Centers for Disease Control and Prevention (CDC) to test human specimens for the presence of environmental toxic substances such as lead or mercury and obtain a more accurate correlation between environmental contaminants and human exposure.

## Programs and 2012 Highlights

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### Bioterrorism Response and Special Pathogens Laboratory

The *Bioterrorism Response and Special Pathogens Laboratory* continues to help prepare clinical microbiology laboratories throughout the state to respond rapidly to a large infectious disease outbreak. The Bioterrorism Response program is prepared to analyze suspicious environmental powders and other evidence for potential agents of bioterrorism.

The laboratory tests clinical specimens and isolates submitted by area hospital laboratories for pathogens of public health significance including tuberculosis. During 2012, the laboratory analyzed 1840 specimens for *M. tuberculosis*, the causative agent of tuberculosis, representing a slight increase in testing volume from 2011 totals.

The Special Pathogens Laboratory also tested 1,669 specimens for *B. pertussis*, the causative agent of pertussis (whooping cough), nearly a 4 fold increase over last year, due to recent outbreaks of this disease. Clinical laboratories throughout the state submitted 124 primary specimens, 107 bacterial isolates, and 26 blood parasite specimens requiring testing, confirmation, or shipment to the Centers for Disease Control and Prevention. These numbers are consistent with past years averages.

## Collaboration with the Wadsworth Center

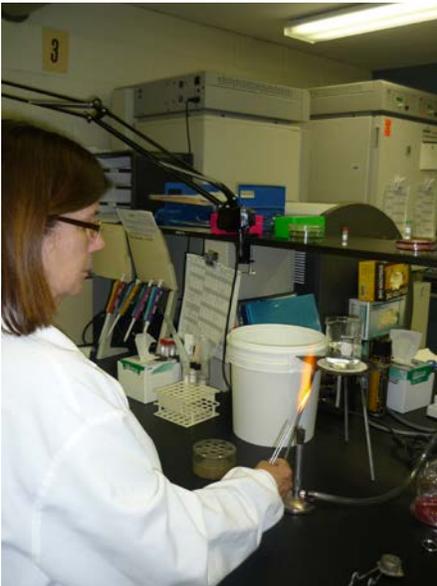
The New York State Wadsworth Center (NYSWC) and the State Health Laboratories have joined in a collaborative effort to determine the feasibility of shared services for the detection and identification of tuberculous and non-tuberculous mycobacterium (NTM). The services provided by the Wadsworth Center include the detection and identification of members of the TB complex, detection of mutations associated with drug resistance, conventional drug susceptibility testing, and the molecular identification of NTMs by DNA sequence analysis. The additional characterization of these Mycobacterial isolates provides the State Health Laboratories with yet another tool for battling tuberculosis infections in the state. Since the inception of this program, 18 specimens have been sent to New York for this additional characterization.



*Toby Bennett, Principal Clinical Laboratory Scientist tests clinical specimens for the presence of tuberculosis in the Special Pathogens Laboratory.*

## Molecular Biology and Enteric Pathogens Laboratory

The *Molecular Biology and Enteric Pathogens Laboratory* provides capability and capacity for rapid testing of clinical specimens for pertussis, norovirus and influenza. The laboratory receives and characterizes microbial isolates potentially associated with foodborne disease outbreaks and continues to participate in national and international surveillance programs. In 2012, the number of norovirus tests remained at very similar levels as last year, with 154 specimens tested. The bulk of these test requests comes from long-term care institutions and schools. Pertussis tests performed (1669 specimens) were at levels nearly 4 fold higher at than in 2011.



*Sharon Mallard, Senior Forensic Scientist confirms the identification of microorganisms causing foodborne diseases.*

In 2012, 354 flu tests were performed, very similar to last year's numbers. The laboratory continued the use of an FDA approved rapid molecular method for identifying Influenza A and B, as well as for identifying the various subtypes of Influenza A.

The Enteric Pathogens section of the laboratory completed enteric pathogen screens on only 13 specimens, mostly associated with outbreak investigations, and received 345 microbial isolates for confirmatory testing during 2012. These isolates are received from hospital and clinical laboratories for definitive identification of these foodborne disease-causing pathogens.

Testing for gonorrhea by microbial culture was discontinued due to dramatically declining numbers of requests for this test. We are in the process of validating a nucleic acid amplification-based replacement test in the Serology Laboratory, and hope to have it available in 2013.

Testing of food samples for microbial contamination in support of foodborne disease outbreak investigations continued in the Molecular Diagnostics Laboratory, with continued support from a grant from the FDA. These tests support food safety investigations conducted by the Division of Infectious Disease and Epidemiology and the Office of Food Protection or federal agencies.

In addition to identifying foodborne pathogens using molecular or culture methods, this laboratory performs further sub-typing (fingerprinting) of bacteria using Pulsed Field Gel Electrophoresis (PFGE).

## Pertussis Outbreak Investigations

The State Health Laboratories worked closely with the Office of Infectious Diseases and Epidemiology to help manage 5 outbreaks of Pertussis (Whooping cough) during the 2012 calendar year, many among elementary school students. As a result of the larger than normal number of outbreaks, our Pertussis testing volume was nearly 4 fold higher than last year. Pertussis is a vaccine-preventable disease, with the vaccine being administered as one of the normal childhood vaccinations. While the larger than normal number of Pertussis outbreaks has not been attributed to any particular cause, it is suspected that they may have resulted from waning immunity in older children or from children not being vaccinated.

### Molecular Biology/Enteric Pathogens Laboratory Testing

Test Performed	Number of Specimens Tested
Enteric Bacterial Isolates	345
Gonorrhea Cultures	1
Norovirus PCR	154
Parasitology	833
PFGE	227
Pertussis PCR	1669
Stool Cultures	13
Influenza	354
TB NAAT	29



*Deanna Simmons,  
Supervisor of the  
Molecular  
Diagnostics  
Laboratory prepares  
specimens for  
Pertussis (Whooping  
Cough) testing by  
PCR.*

## Serology Laboratory

The *Serology Laboratory* conducts testing for the serological diagnosis of infectious diseases. The testing assists epidemiologists in detecting and controlling the spread of communicable diseases. Specific analyses include serological and molecular testing for diseases such as HIV, hepatitis C, and sexually transmitted diseases.

The Serology Laboratory conducts routine testing for sexually transmitted diseases such as chlamydia, gonorrhea, syphilis, and HIV. The number of chlamydia and gonorrhea tests continued to increase in 2012, with the laboratory performing 43,524 tests, while syphilis testing decreased again to 6,447 tests performed. HIV testing volume was stable at 14,142 tests.

In 2010, hepatitis testing was expanded to include hepatitis A and B, in addition to hepatitis C. The number of clinical specimens tested for hepatitis increased from 713 in 2010 to 1157 in 2011, and remained at similar levels in 2012 with 941 total hepatitis tests performed.

The laboratory continued to provide capacity for serological testing on cattle, to assist the Department of Environmental Management in controlling the spread of infectious diseases in livestock.

In addition, in 2012 West Nile virus (WNV) and eastern equine encephalitis (EEE) testing continued as a responsibility of the Serology Laboratory, with 106 WNV IgM tests performed. Federal grant funding supported surveillance testing programs for mosquito-borne diseases such as WNV and EEE, which involves the testing of mosquitoes trapped by staff at the Department of Environmental Management. In 2012, 2234 mosquito pools were tested in the Serology Laboratory; 5 mosquito pools were found to contain WNV, 5 were identified as having Flanders Virus, and 5 were found to have Highlands J Virus. The laboratory also identified 6 mosquito pools from which EEE was isolated. While both Flanders Virus and Highlands J Virus are not of clinical significance, they are thought to be predictors of the presence of WNV (Flanders) and EEE (Highlands J) virus.





*Noyo Shrestha, Clinical Laboratory Scientist of the Serology Laboratory loads samples into the Abbott Architect for HIV and Hepatitis testing.*

### **Implementation of New HIV Confirmatory Tests**

The Serology Laboratory completed implementation of the new Abbott Diagnostics 4th generation test for HIV screening in 2011. This new test detects the HIV-1 p24 antigen in addition to detecting the HIV-1 and HIV-2 antibodies detected by the previous generation test. The ability of the new screening test to detect HIV-1 p24 antigen allows healthcare providers to detect an acute HIV infection sooner than was possible with the older test, resulting in faster time to treatment.

The new generation of screening test has required laboratories to modify their HIV confirmation algorithm. The current Centers for Disease Control and Prevention proposal for new HIV confirmation involves first using a rapid test to differentiate between antibodies to HIV-1 and HIV-2. If that test is negative, then a nucleic acid amplification test (NAAT) for HIV-1 RNA is performed. In Rhode Island, the Serology Laboratory has implemented a modified version of the new HIV confirmation algorithm in 2012. The Serology Laboratory performs the NAAT for HIV-1 RNA first. The test to differentiate between antibodies to HIV-1 and HIV-2 is only performed when the HIV-1 RNA test is negative. This algorithm allows the Rhode Island State Health Lab to detect HIV-1 acute infections earlier, while keeping down the cost of testing.

## State Health Laboratories Continue to Support Community Health Centers

The State Health Laboratories continue to support the Community Health Centers in Rhode Island through testing programs for important communicable diseases such as HIV, other sexually transmitted diseases, and intestinal parasites. Blood lead screening tests for children are also performed by the laboratory for Community Health Center patients. These services provide important coverage for the uninsured and underinsured residents of our state. In 2012, the laboratory performed 32,344 tests in support of the Community Health Centers. These numbers remain typical of the averages over the past five years.

<i>Test Performed For Community Health Centers</i>	<i>Number of Tests Performed In 2012</i>
Chlamydia/Gonorrhea	27,568
Syphilis	5,363
HIV	6,456
Lead	4,659
Ova & Parasites	833



## Biomonitoring and Chemical Terrorism Response Laboratory

The *Biomonitoring and Chemical Terrorism Response Laboratory* tests blood and urine specimens for toxic substances such as lead or mercury. These tests termed “biomonitoring” help assess the type and quantity of chemicals that enter human bodies from the environment.

The Chemical Terrorism Response Laboratory continues to implement new technologies and methods developed by the scientists at the CDC National Center for Environmental Health (NCEH). These methods are designed to test clinical samples collected from exposed individuals to detect chemicals that may have been used as agents of terrorism. The laboratory has demonstrated proficiency in multiple methods for the detection of industrial chemical poisons and chemical warfare agents.



*Jean Barry, Principal Clinical Laboratory Scientist prepares samples for testing for cyanide contamination using headspace gas chromatography/mass spectrometry*

The Biomonitoring laboratory includes a specialized blood lead testing program. In support of the universal screening requirement of the childhood lead poisoning prevention programs, the State Health Laboratory performs blood lead screening tests on children younger than six years of age. Specimens are received from hospitals, private physicians, and Community Health Centers and are tested using atomic absorption spectrophotometry. In 2012, 16,599 blood lead level screening tests were performed. Elevated screening results or symptoms of lead poisoning require retesting, resulting in an additional 544 follow-up diagnostic tests. These numbers are slightly higher than the number of tests performed in 2011.

# Environmental Sciences

The primary mission of the *Environmental Sciences Section Laboratories* is to monitor the safety of resources vital to public health including public drinking water supplies, ambient air, the environment, and food supplies. In support of the state's environmental health and protection programs the Environmental Sciences Laboratories test samples collected by personnel at the Department of Health, the Department of Environmental Management, other state agencies, and private homeowners for a variety of substances that can be harmful to human health and ecosystems. Laboratory tests of ambient and drinking water, air, and food are performed in accordance with strict scientific standards set by the US Environmental Protection Agency (EPA) and Food and Drug Administration (FDA).

## Programs and 2012 Highlights

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### Air Pollution Laboratory

The *Air Pollution Laboratory* maintains a network of eight air monitoring sites in urban, coastal, and rural inland areas across Rhode Island to measure pollutants in outdoor air. Operating with a staff of five scientists, the Air Pollution Monitoring Laboratory performed a total of 448,202 air quality measurements in 2012. The pollutants monitored by this laboratory include carbon monoxide, metals, nitrogen dioxide, ozone, particulate matter, polycyclic aromatic hydrocarbons, sulfur dioxide, volatile organic compounds, and other airborne toxic compounds that have the potential to cause adverse health effects. The air quality measurements undergo a quality control review process and are submitted to the Rhode Island Department of Environmental Management and the EPA to define current air quality conditions that support forecasting and the development of air pollution control measures for the state and the region. Current and forecasted conditions are used to define the Air Quality Index, which is available on the website [www.epa.gov/airnow](http://www.epa.gov/airnow). Testing parameters include 2.5 and 10 micron particulate matter, ozone, carbon monoxide, sulfur dioxide, nitrogen oxide, total reactive nitrogen, ammonia, nitric acid, and surface meteorology.

In 2012 the laboratory continued its required participation in the EPA NCore Program in support of scientific studies across public health, technology, and ecosystem assessment strategies.



*Agnieszka Wieczorek, Environmental Laboratory Scientist and Melinda Viera, Supervising Environmental Laboratory Scientist prepare to analyze filtered air samples collected in Providence for 10 micron particulate matter (PM10).*

## Food and Water Chemistry Laboratory

In 2012, the *Food and Water Chemistry Laboratory* continued testing environmental contaminants in drinking water, ambient waters, and wastewater, as well as shellfish and food products by physical, chemical, and instrumental analysis. This laboratory supports the regulatory efforts of the Offices of Drinking Water Quality and Food Protection, as well as the Department of Environmental Management Water Resources programs.

The State Health Laboratories continued the private well water testing program in 2012 as part of the larger program of protecting the safety of drinking water. Drinking water samples collected from public water systems and private homeowner wells across the state were tested for the presence of chemical substances and contaminants that affect water quality and are detrimental to human health, including nitrates and nitrites and heavy metals, such as lead, copper, and arsenic.

In 2012, this laboratory performed 6764 separate water chemistry tests, including tests for nitrite and nitrate, lead, copper, arsenic, and a host of other metals and minerals. The breakdown of these tests is shown in the table below.

<b>Food and Water Chemistry Laboratory Inorganic Chemistry Tests In 2012</b>	
Cyanide	122
Mercury	122
Iron	91
Minerals	479
Lead & Copper	766
Metals	1690
Other	3494
<b>Total Water Chemistry Tests</b>	<b>6764</b>

*Sylwia Korovae,  
Environmental  
Laboratory  
Scientist measures  
turbidity of drinking  
water samples prior  
to analyzing them  
for metals.*





*Jeffrey Maymon, Environmental Laboratory Scientist  
preparing the ion chromatograph for the trace level  
analysis of hexavalent chromium.*

**Food and Drug Administration (FDA) grants award for food testing laboratories to become accredited to ISO 17025 standards.**

In 2012 the FDA awarded a grant to the State Health Laboratories to assist the state manufactured food regulatory program in achieving conformance with Standard Ten of the Manufactured Food Regulatory Program Standards (MFRPS) as an ISO/IEC 17025:2005 accredited state laboratory. The award will enhance and standardize the laboratories' food testing programs, and prepare the food testing laboratory staff, equipment, and quality assurance systems for accreditation to the ISO/IEC 17025:2005 Laboratory Standards. The accreditation process will increase the food testing laboratories' capacity to provide standardized food testing. The award will enable the State Health Laboratories to continue to perform food analyses in the event of a national food borne illness outbreak or in a response to food emergencies as an ISO 17025-2005 accredited state food testing laboratory. In 2012, the laboratories performed 228 tests of food products submitted by the Office of Food Protection in response to consumer complaints or food borne illness outbreaks.

Laboratories involved in food testing participate in the national environmental response networks including the Food Emergency Response Network (FERN) administered by the FDA/USDA and the Environmental Response Laboratory Network (ERLN) administered by the EPA. These networks strengthen State Health Laboratories' emergency preparedness and readiness to assist in a large-scale national response to an accidental or intentional chemical poisoning of our food or water supplies.

## Water Microbiology Laboratory

The *Water Microbiology Laboratory* conducts microbiological tests that monitor the quality of the environment and protect consumers. Specific tests include microbiological tests on water, dairy and shellfish samples to assess the safety of the potable water supply, local dairy products, shellfishing, and recreational waters. This laboratory conducts tests on shellfish for fecal contamination, on mussels for red tide toxin, and on dairy products for adherence to FDA standards for pasteurization and wholesomeness.

The laboratory also tests a wide variety of water samples to assure the safety of drinking water, to locate and define sources of pollution, and to monitor the spread of pollutants. Shellfish bed waters are periodically tested for evidence of fecal contamination and are re-tested after heavy rains. Shellfish beds showing evidence of contamination are closed until subsequent bacterial tests show the beds are once again safe for harvesting. Similarly, the laboratory tests beach waters for fecal contamination. Rapid state lab testing of beach waters and shellfish beds affords earlier detection of safe swimming and harvesting conditions, allowing quicker re-opening of these facilities.

In 2012, the Water Microbiology Laboratory performed a total of 7,956 drinking water, shellfish, and recreational water monitoring tests and 1,589 dairy sample tests.

### Water Microbiology Laboratory Testing Volume

<i>Test</i>	<i>Number of Tests Performed in 2012</i>
Drinking water samples	1821
Marine and shellfish water samples	2231
Recreational water samples	3904
Dairy samples	1589
Total Tests	9545



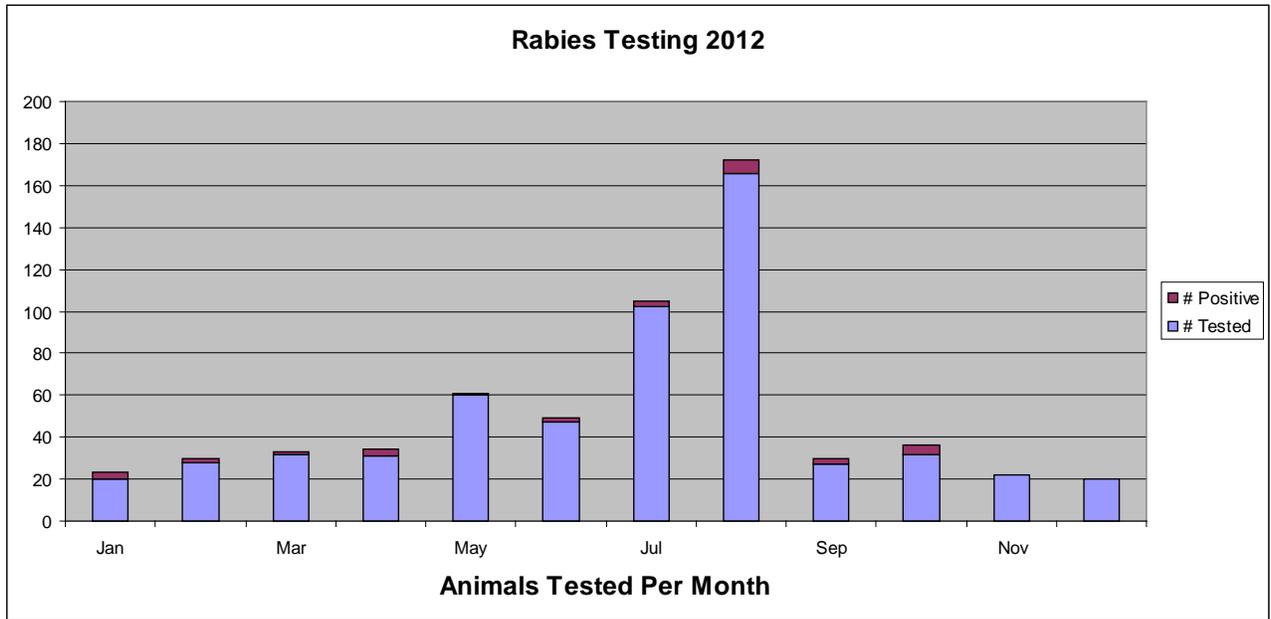
*Kerry Patterson, Supervising Clinical Laboratory Scientist, and Samantha Jalette, Environmental Laboratory Scientist analyzing Narragansett Bay water samples collected from shellfishing areas for fecal coliform. These results are used by the state to determine whether shellfishing areas are safe for harvesting.*

### **Rabies Testing: A Core Public Health Laboratory Program**

The State Health Laboratory conducts rabies testing on animals that have exhibited symptoms of neurological illness and that have either bitten, or come into potential contact with, an individual. The most common animals tested are bats, raccoons, and skunks. However, dogs, cats and large farm animals are also tested. The need for animal rabies testing is often determined by the State Epidemiologist (for human exposures), or the State Veterinarian (for animal exposures).

Rabies is a neurological disease of viral origin which is fatal if not treated. Timely treatment of individuals known or suspected of being exposed to rabies is therefore critical. Such timely treatment is dependent on rapid attainment of testing results. The State Health Laboratory maintains an on-call group of laboratorians trained to conduct and interpret these results and report them rapidly.

The graph on page 23 illustrates the number of rabies tests performed by month in 2012. In 2012, the laboratory tested 587 animals for rabies virus, of which 28 were found to be positive for rabies virus. As expected, the highest number of tests occurred during the late summer months, but the data also show that rabies-positive animals can be found all year long.



*Michael DiMatteo, Principal Clinical Laboratory Scientist analyzing tissue samples collected from an animal suspected of being infected with the rabies virus. Each year hundreds of animals suspected of rabies infection are tested by the State Health Laboratories.*

## Organic Chemistry Laboratory

The *Organic Chemistry Laboratory* tests public drinking water, private well water, ambient waters, and wastewater for pesticides, herbicides, volatile organic and synthetic organic chemical contaminants. In 2012, this laboratory performed 624 test groups for a total of 17,444 chemicals tested. Historically, the organic contaminants entered the environment from industrial and household processes, the use of petroleum and its by-products, and pesticides applications. These chemicals do not readily decompose and remain in the soil or groundwater for years. Once in the groundwater these chemicals can enter drinking water supplies. State and federal regulations such as the Safe Drinking Water Act and the Clean Water Act require these organic chemicals be tested in the effort to protect the state's public water supplies and watersheds from further chemical contamination. Routine monitoring is necessary to ensure drinking water continues to be safe.

The Organic Chemistry Laboratory also works closely with the Rhode Island Department of Environmental Management's Division of Water Resources and Agriculture to monitor Rhode Island's waste water treatment compliance and to monitor ambient rivers and streams and agriculture run off for evidence of improper waste water treatment, disposal, and pesticides applications.

### Organic Chemistry Laboratory: Tests Performed in 2012

Volatile Organic Chemicals	12,329
Synthetic Organic Chemicals	3,528
Pesticides & Herbicides	1,365
Chlorophyll	222
Total Organic Chemistry Tests	17,444

### Organic Disinfection By-Products Testing

The Organic Chemistry Laboratory reestablished the capability and capacity to perform the analysis of organic disinfection by-products in drinking water that are produced during the chlorination process. Public water systems are using this service to analyze samples for both haloacetic acids and trihalomethanes and to report the compliance monitoring results electronically to the State Drinking Water Information System (SDWIS) database.



*Jennifer Hebert, Supervising Environmental Laboratory Scientist removes traces of moisture from semi-volatile organic extracts of drinking water samples prior to analysis using gas chromatography and mass spectrometry.*

## **Analytical Laboratory Certification Program**

The State Health Laboratories are required to follow a systematic approach to Quality Assurance and maintaining the high standards of its laboratory testing services. The Department of Health's ***Analytical Laboratory Certification Program*** certifies commercial, municipal drinking water, and wastewater testing laboratories that provide analytical services for testing the quality of potable and non-portable water as well as for environmental lead hazard mitigation. In 2012, the office certified 76 laboratories including 30 laboratories in Rhode Island and 46 out-of-state laboratories.

The office also responds to customer concerns and answers technical and customer service questions from programs served by the laboratories. The Laboratory Certification program works closely with the DEM Wastewater Treatment Program to provide guidance for the inspection of wastewater treatment facilities that maintain laboratories on site.

A current list of laboratories certified for drinking water and wastewater testing is available at the following website: [www.health.ri.gov/lists/labs/analytical](http://www.health.ri.gov/lists/labs/analytical)

# Forensic Sciences

The primary mission of the **Forensic Sciences Section** laboratories is to support Rhode Island's criminal justice system through the accurate, thorough and timely examination of evidence; to provide the most scientifically advanced and technologically proficient investigative capabilities available; to provide unbiased evaluation of evidence and courtroom testimony.

The Forensic Sciences Section Laboratories apply modern scientific methods to the analysis of crime-scene evidence; assists law enforcement agencies in determining if a crime has been committed and the identity of the perpetrator; provides unbiased expert testimony, training and consultative services to the criminal justice community.

The bedrock of the Forensic Laboratory is the integrity and intellectual capital of its staff. From the crime scene to the laboratory to the courtroom, the criminal justice system relies on the knowledge and objectivity of forensic scientists to establish the facts. Whether their findings may identify a perpetrator or exonerate a suspect, whether their testimony may convict or acquit a defendant, the forensic scientist applies the scientific method to the examination of the evidence with equal vigor.

## Programs and 2012 Highlights

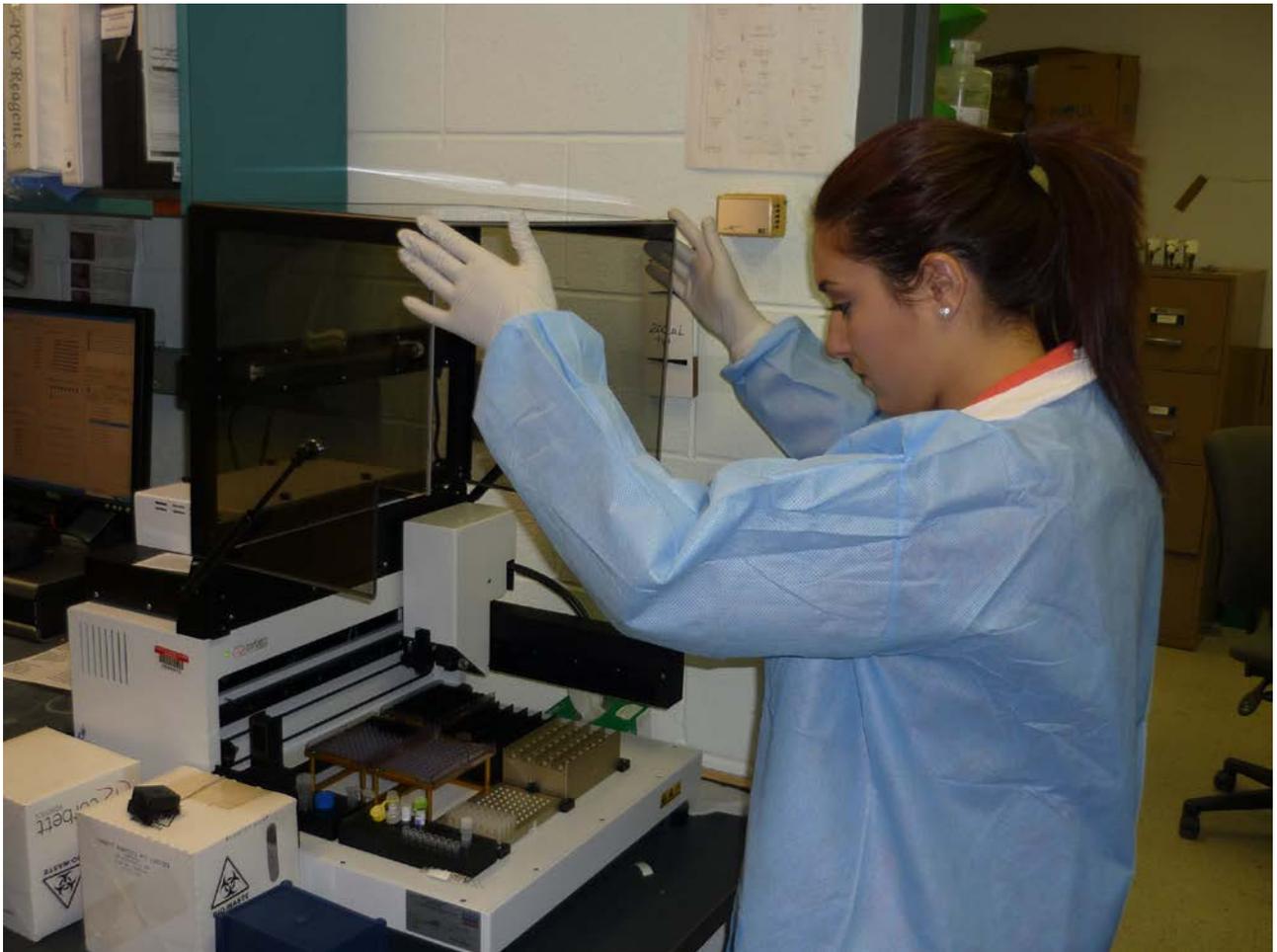
### **Combined DNA Index System (CODIS)**

*CODIS* (Combined DNA Index System) is a national database of DNA profiles collected from convicted offenders, crime scenes, and missing persons. This database has aided the investigation of thousands of unsolved crimes and has exonerated dozens of falsely convicted individuals nationwide. The Forensic Biology Laboratory administers the CODIS database for the State of Rhode Island. Current law requires all convicted felons to provide a DNA sample for inclusion in the database. The laboratory is responsible for the collection and analysis of buccal swabs and the entry of resulting DNA profiles into the database. In 2012, legislation was introduced to collect DNA from all felony arrestees, but it did not pass.

Since the program began in Rhode Island, 15,294 convicted offender profiles and 649 forensic crime scene profiles are included at both the State and National levels. The FBI searches profiles from both convicted offenders and crime scenes nationally once a week, and notifies each CODIS laboratory of any potential matches. These 'hits' could be between an offender and an unsolved crime, or they could link crimes to other crimes throughout Rhode Island and the United States, providing investigators with valuable information; in some instances, the name of the perpetrator. As of December, 2012, Rhode Island had 33 forensic hits, 72 national offender hits, and 128 state offender hits, resulting in 126 law enforcement investigations aided.

## Forensic Biology/DNA Laboratory

The *Forensic Biology/DNA Laboratory* examines evidence in homicides, sexual assaults, burglaries, and other violent crimes – for example, clothing, weapons, tissues, fluids, and debris – for sources of DNA that can be compared to a potential suspect, or for entry into CODIS. In 2012, 189 crime scene profiles were entered into CODIS. Staff works closely with investigators in order to determine which evidence is probative, and evaluate findings. Expert courtroom testimony in the areas of body fluid identification and DNA are provided by scientists, as well as consultations and training, if requested. In 2012, there were 420 cases submitted, with each case often containing multiple items. A new evidence submission policy was introduced early in the year, limiting the amount of evidence initially submitted for examination, depending on the crime. Coupled with the addition of fully trained staff, this policy streamlined the testing process, and greatly reduced turnaround time to customers.



*Alexandra Brodeau, Forensic Scientist loads DNA samples and reagents onto a liquid handler robot as part of the multi-step process in DNA analysis.*

## Forensic Toxicology Laboratory

The *Forensic Toxicology Laboratory* examines autopsy specimens, including tissues, organs, fluids and medications, for the presence and quantity of drugs and/or poisons that may have contributed to the cause of death. This information is used, primarily, by the Office of State Medical Examiners to carry out its mission. The Toxicology Laboratory received a total of 872 Medical Examiner cases in 2012. Each case represents multiple screening and confirmatory tests on numerous specimens.

This laboratory also examines blood specimens obtained from motor vehicle operators arrested for driving under the influence. In 2012, 240 Driving Under the Influence of Alcohol or Drugs (DUI) cases were received and analyzed for the presence of alcohol and drugs. This reflects a steady increase in submissions to the laboratory under this program. Requests for court appearances have continued to increase.



*Rebecca Conway-Novi, Forensic Laboratory Scientist extracts blood samples before tests to determine the presence of alcohol and/or drugs.*

## RI Department of Transportation Funding Helps Speed Up DUI Test Results

Federal funding from the RI Department of Transportation (DOT) Highway Safety Office has continued in 2012. As a result of continuing funding available for additional staff, the laboratory has been able to reduce reliance on outsourcing drug testing and work on new methods in-house. Using federal funds, the laboratory has continued to provide blood collection kits for law enforcement agencies at no cost. This provides both police and medical personnel with standardized, written instructions to follow when collecting blood samples from suspected drunk drivers. Two members of the Forensic Toxicology Laboratory received drug training at Indiana University's Borkenstein Institute.

### Forensic Breath Analysis Section

The *Forensic Breath Analysis* section monitors instruments used by law enforcement agencies to analyze the breath of motor vehicle operators suspected of driving under the influence of alcohol. In 2012, 869 breath instrument inspections currently in operation were completed on-site at 47 facilities, and through a grant program funded by DOT, new instruments were initialized and inspected before being put into use.

This program also trains and certifies the operators of breath testing instruments. In 2012, instructional sessions were conducted for Rhode Island law enforcement agencies to train 1,591 officers. This office also trains the police recruits at the RI Municipal Police Academy, the Providence Police Academy, and the RI State Police Academy.

Staff of the Forensic Breath Analysis program provide expert technical testimony 8-10 times per month throughout the State's Court System, as well as 24/7 on-call support.

This program works very closely with the DOT Highway Safety Office, and has been the recipient of federal funding through this agency. Additionally, this office works closely with the state's National Highway Traffic Safety Administration liaison to screen and instruct officers in Drug Recognition and Field Sobriety Protocols.



*Al Giusti, Forensic Breath Analysis Supervisor, prepares a breath analysis instrument for certification.*

## Forensic Drug Laboratory

The *Forensic Drug Laboratory* examines evidence confiscated in drug-related crimes – for example: pills, powders, plant material, paraphernalia – for the presence of controlled substances. Staff also assists federal and state law enforcement agencies in the investigation of local clandestine drug laboratories.

In 2012, 2,584 separate cases were submitted for examination. Marijuana (cannabis), cocaine, and heroin are the top three most frequently identified substances. The cases submitted often contain more than one type of questioned sample. In 2012, a total of 4,646 separate identifications were made. New substances such as synthetic cannabinoids and bath salts have made their way from the street to the laboratory, and identifications have been made of these substances, even though some are not regulated.

<i>Top Five Submitting Agencies</i>	
<i>RI State Police</i>	<i>20%</i>
<i>Providence Police Department</i>	<i>19%</i>
<i>Woonsocket Police Department</i>	<i>8%</i>
<i>Pawtucket Police Department</i>	<i>7%</i>
<i>Newport Police Department</i>	<i>5%</i>

<i>Top Five Drugs Identified</i>	
<i>Cannabis</i>	<i>25 %</i>
<i>Cocaine</i>	<i>24 %</i>
<i>Heroin</i>	<i>9%</i>
<i>Oxycodone</i>	<i>4 %</i>
<i>Hydrocodone</i>	<i>3 %</i>



*Leslie Nolan, Senior Environmental Laboratory Scientist, and Tamara Wong, Senior Forensic Laboratory Scientist inspect the Gas Chromatography Mass Spectrometer before loading seized drug samples for analysis.*

# Appendices

## A. Summary of Laboratory Testing Services

### Biological Tests

#### *Bioterrorism Response & Special Pathogens Tests*

Tuberculosis	Pertussis (culture)	Identification of bacterial agents of bioterrorism
Reference Isolates: identification of infectious disease pathogens	Medical Examiner: identification of infectious diseases as a cause of death	Blood parasites

#### *Food and Water Microbiology Tests*

Coliform bacteria counts	Rabies	Bacterial quality of marine (beach/shellfish) waters
Total bacteria counts	Enterococcus bacteria	Dairy products testing (antibiotics, fat content, bacterial contamination)

#### *Molecular Biology/Enteric Tests*

Identification of bacteria associated with foodborne disease	Gonorrhea cultures	Norovirus
Parasitology	Influenza (Isolation and subtyping)	Identification of agents of bioterrorism in food
PulseNet (PFGE): genetic typing of bacteria associated with foodborne disease	Pertussis (PCR)	

#### *Serology Tests*

Chlamydia (amplified probe)	Gonorrhea (amplified probe)	HIV (antibody/antigen screen & confirmation)
Syphilis (screen and confirmation)	Hepatitis A, B, C	Animal diseases
West Nile infection in humans	Mosquito pools (West Nile/EEE)	Miscellaneous serology

## Environmental Tests

### Overview of Ambient Air Pollution Measurements

Carbon Monoxide (CO)	Nitrogen Monoxide (NO)
Sulfur Dioxide (SO <sub>2</sub> )	Nitrogen Monoxide (NO <sub>2</sub> )
Ozone (O <sub>3</sub> )	Nitrogen Oxides (NO <sub>x</sub> )
Meteorological measurements (10 separate, including wind speed and direction, air temperature and humidity, barometric pressure)	PM2.5--Speciation (detailed analysis for 59 chemicals, including 48 metals)
Carbonyls (formaldehyde, acetone, acetaldehyde)	Volatile Organic Compounds (VOC) (78 chemicals)
Coarse Particulate Matter PM10 (under 10 micrometers)	Fine Particulate Matter PM2.5 (under 2.5 micrometers)

### Selected Food & Water Chemistry Laboratory Tests

Aflatoxin: B1, B2, G1, G2	Conductivity	Nitrate As N
Alkalinity	Copper	pH
Allergens (egg, peanut, soy, wheat)	Cyanide	Potassium
Aluminum	Fish/Shellfish safety (histamine, heavy metals)	Selenium
Ammonia	Fluoride	Silver
Antimony	Hardness	Sodium
Arsenic	Indicators of spoilage (pH, acidity, alcohol, acetic acid)	Sodium Composite
Barium	Iron	Solids, Settleable
Beryllium	Lead	Solids, Suspended
Cadmium	Magnesium	Solids, Total
Calcium	Manganese	Sulfate
Chloride	Mercury	Thallium
Chromium	Nickel	Turbidity
Color	Nitrite	Zinc

## Overview of Organic Chemistry Laboratory Tests

Carbamates and by-products by EPA method 531.1 (8 carbamate pesticides)	Pesticide formulations composition
Ethylene Dibromide and Dibromochloropropane by EPA method 504.1	Drugs & poison screen (food) chlorophyll
Organochlorine Pesticides and PCB screen by EPA method 508	Volatile Organic Chemicals by EPA method 624 (30 volatile organic compounds in wastewater)
Herbicides by EPA method 515.3 (8 herbicides in drinking water)	Semivolatile Organics by EPA method 525.2 (44 synthetic organic chemicals in drinking water)
Volatile Organic Chemicals by EPA method 524.2 (65 volatile organic compounds in drinking water)	

## Biomonitoring/Blood Lead Laboratory Tests

Lead (screen, capillary or venous blood specimens)	Mercury, Lead and Cadmium in whole blood
Lead (diagnostic, venous specimens only)	Cyanide in whole blood
Metals panel in urine	Volatile Organic Compounds in blood
Selected chemical warfare agents & poisons	

## Forensic Tests

Alcohol Proof	Controlled Substance Identification
Autopsy Specimens: Drug and Poison Analysis	DNA Profiling
Blood Alcohol Concentration	Tests related to Driving Under the Influence of Alcohol (DUI)
Blood Identification	Tests related to Driving Under the Influence of Drugs (DUID)
Body Fluid Identification	Drug Assays
Breath Alcohol Testing: Training and Certification of Police Officers	Product Tampering
Breath Alcohol Testing: Certification of Breath Testing Instruments	Sexual Assault Evidence Collection Kits
Clandestine Drug Manufacturing Laboratories	Toxicological tests related to the investigation of the cause of death
Combined DNA Index System (CODIS)	Unknown Liquid/Beverage Testing

## **B. Accreditations**

Rhode Island Health Laboratories are accredited or inspected by the following agencies:

- Centers for Medicare & Medicaid Services Certificate of Compliance for High Complexity Clinical Laboratory (CLIA)
- US Environmental Protection Agency Ambient Air and Drinking Water Testing
- Federal Bureau of Investigation CODIS
- ISO17025-Forensic Laboratories: Toxicology, Forensic Biology (DNA Testing), Drug Chemistry
- Food and Drug Administration Dairy Product and Shellfish Testing
- Rhode Island Department of Health In-State Analytical Laboratory Certificate
- Rhode Island Department of Health In-State Clinical Laboratory License



## State Health Laboratories

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**Website:** [www.health.ri.gov/labs](http://www.health.ri.gov/labs)

