

STATE HEALTH LABORATORIES ANNUAL REPORT 2010



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April 2011

Message from the Director



April 2011

Dear Colleague:

I invite you to review the Fifth Annual Report from the Rhode Island Department of Health (HEALTH) Laboratories. State Health Laboratories are an essential component of state and national public health infrastructure. They conduct laboratory tests (many of which are not available in the community) in the areas of disease detection and prevention; food safety; environmental health and protection; forensic science; and emergency response. This annual report describes the breadth and professionalism of their work. It also highlights recent grants and awards received by the Laboratories to purchase new equipment, enhance testing capabilities, and expand support services.

The Laboratories have designed an annual customer satisfaction survey as one aspect of performance measurement instituted at HEALTH. The Laboratories serve many customers, both within state government and in the private sector. The results of their most recent survey confirmed that their programs and customers are very satisfied with their quick and efficient provision of test results.

I congratulate the State Health Laboratory staff on their dedication, professionalism, and service to the public. I invite you to read more about the important work they do to protect public health and safety across Rhode Island.

Sincerely,

A handwritten signature in black ink that reads "Michael Fine". The signature is written in a cursive style and is positioned above a thin vertical red line.

Michael Fine, MD
Interim Director of Health

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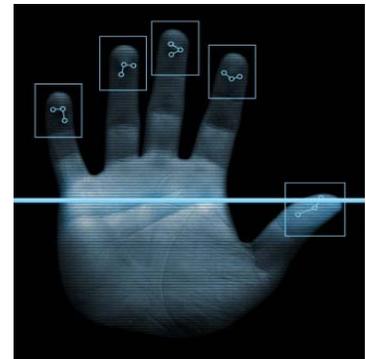
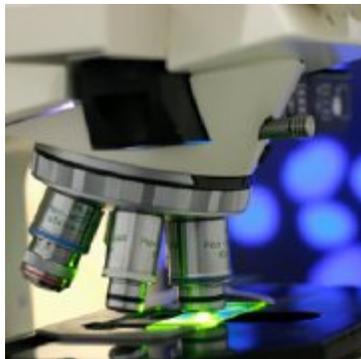
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Executive Summary

State Health Laboratories provide laboratory services and scientific expertise in support of state and federal public health, environmental, and public safety programs. This fifth annual report provides an overview of Rhode Island's state laboratory programs and summarizes the accomplishments and challenges of 2010.

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.

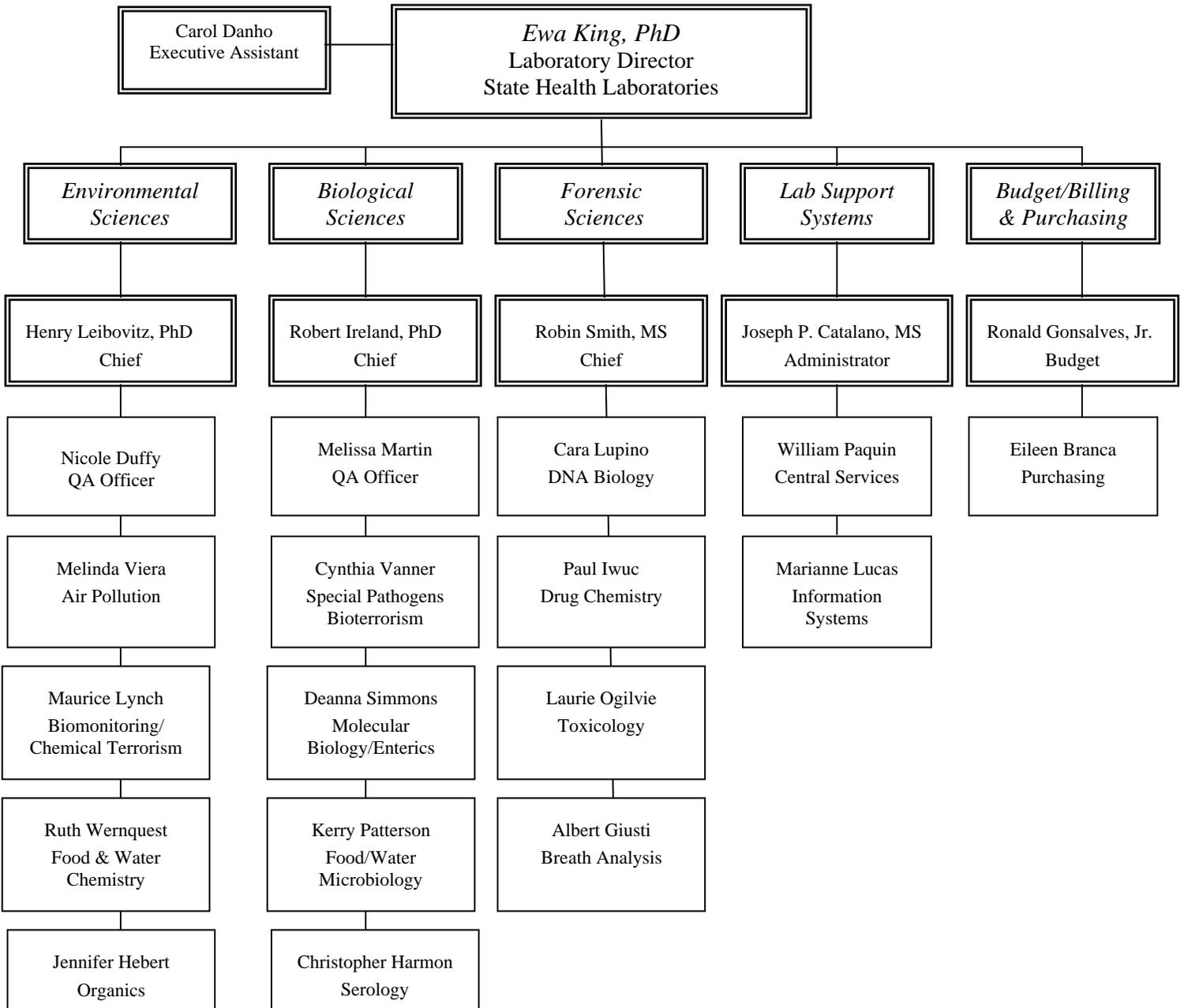
State Health Laboratories help mitigate the effect of environmental pollution on the health of populations and individuals. In cooperation with the Rhode Island Department of Health's Office of Drinking Water Quality, State Health Laboratories help assure safe drinking water by providing test results 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 also 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 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 2010, the state laboratories responded to an unusual number of foodborne disease outbreaks. The year began with an outbreak of Salmonella Montevideo that was linked to a processing plant in Rhode Island and eventually traced to black pepper, leading to a national recall. Several other outbreaks caused by contaminated food products followed. This underscored the importance of prompt and accurate laboratory response to detect pathogens in food and remove contaminated products from the market.

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, the Laboratory Administrator, and the Budget/Fiscal Administrator report to the Laboratory Director, who is responsible for the overall management and leadership of all Laboratory programs. The Laboratories are currently comprised of sixty-nine employees. This is approximately the same as in 2010, but a significant reduction from approximately eighty laboratory employees in 2006 and 2007. The Laboratories employ four scientists at the Doctoral (PhD) level, twenty-two Master's Degrees, thirty Bachelor's Degrees, four 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. Other critical activities such as bio-safety, security, and chemical hygiene are also among the primary responsibilities of the Administrative section.

The Fiscal Year 2011 budget for all laboratory programs is approximately \$8.3 million. About \$6.7 million of the budgeted total is from State General Revenues and \$1.6 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 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, STD program, and the Division of Infectious Disease and Epidemiology. These funds are not included in the laboratory budget request, but are incorporated in the expenditure trend analysis below.

As illustrated in the table below, in the past four years, the laboratory's total expenditures remained flat, despite rising wages and the ever-increasing cost of laboratory supplies. This is attributed mainly to a decreased number of staff, which is 15-18% lower in 2010 than in 2007.

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 (calendar years 2007-2010)

<i>Funding Source</i>	<i>2007</i>	<i>2008</i>	<i>2009</i>	<i>2010</i>
State Funds (General Revenue)	\$6,546,013	\$6,566,548	\$5,985,098	\$6,053,681
Federal Funds	\$3,713,135	\$3,572,109	\$4,204,867	\$3,517,126
Totals	\$10,259,148	\$10,138,657	\$10,189,964	\$9,570,807

Laboratory Customer Satisfaction Survey

State Health Laboratories are committed to meeting the needs of their partner programs, and they use customer satisfaction indicators as their main performance measure. 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 2011 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 2010. In addition to programs within the Rhode Island Departments of Health and Environmental Management, community customers such as hospital and commercial laboratories and community health centers responded to the survey. In 2011, the laboratories were able to survey customers of the forensic laboratories such as the state and local police departments. A total of 95 responses were received to the 2010 survey, a significant increase compared to the number of respondents to the 2009 survey (59). Overall, 95.8% of respondents rated laboratory services as exceeding or meeting expectations. These ratings are more favorable than those obtained in any other year since the survey began and demonstrate the laboratories’ continued responsiveness to customer needs.

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, monitoring, 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 pandemic H1N1 influenza, as well as established infectious diseases such as rabies 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. The section also performs microbiological testing to determine the quality of drinking and surface waters, locate sources of environmental pollution, and assess the safety of the food supply.

Programs and 2010 Highlights

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 continues to test clinical specimens and isolates submitted by area hospital laboratories for infectious disease organisms of public health significance including tuberculosis and to analyze suspicious powders and other evidence for potential agents of bioterrorism. During 2010, the laboratory analyzed 1678 specimens for *M. tuberculosis*, the causative agent of tuberculosis, representing a slight decrease in testing volume from 2009 totals.



The Special Pathogens Laboratory also tested 430 specimens for *B. pertussis*, a bacterium that causes pertussis, or whooping cough. Clinical laboratories throughout the state submitted 188 primary specimens, 83 bacterial isolates, and 26 blood parasite specimens requiring testing, confirmation, or shipment to the Centers for Disease Control and Prevention.

Grant received to implement rapid TB test

The Laboratory was the recipient of a grant from the Association of Public Health Laboratories to support the development of molecular diagnostic methods for the rapid identification of tuberculosis species. In conjunction with the Molecular Diagnostics Lab, Special Pathogens personnel are working to bring this important new tool to the clinicians in Rhode Island. The new nucleic acid amplification test will allow clinicians to know as soon as possible if a patient suspected of having tuberculosis needs to be kept in isolation until treatment has begun.



Paula Craig of the Special Pathogens Laboratory prepares samples for bacterial identification using the laboratory's new Vitek automated bacterial identification system.

Food and Water Microbiology Laboratory

The *Food and Water Microbiology Laboratory* conducts microbiological tests that monitor the quality of the environment and protect consumers. Specific tests include microbiological tests on water and food samples to assess the safety of the food and water supply. This laboratory conducts tests on shellfish for fecal contamination, on mussels for red tide toxin, and on dairy products for adherence to Food and Drug Administration (FDA) standards of 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.

As of the end of 2010, the Molecular Diagnostics Laboratory has consolidated food sample testing conducted by Epidemiology and the Office of Food Protection for microbial contamination in support of foodborne disease outbreak investigations.

In 2010, the number of drinking water tests performed by the Food and Water Microbiology laboratory remained nearly the same as 2009.

The Food and Water Microbiology Laboratory also performs all animal rabies testing at the State Health Laboratory. In 2010, the laboratory tested 439 animals for rabies virus, of which 29 were found to be positive for rabies virus.



Food and Water Microbiology Laboratory Testing Volume

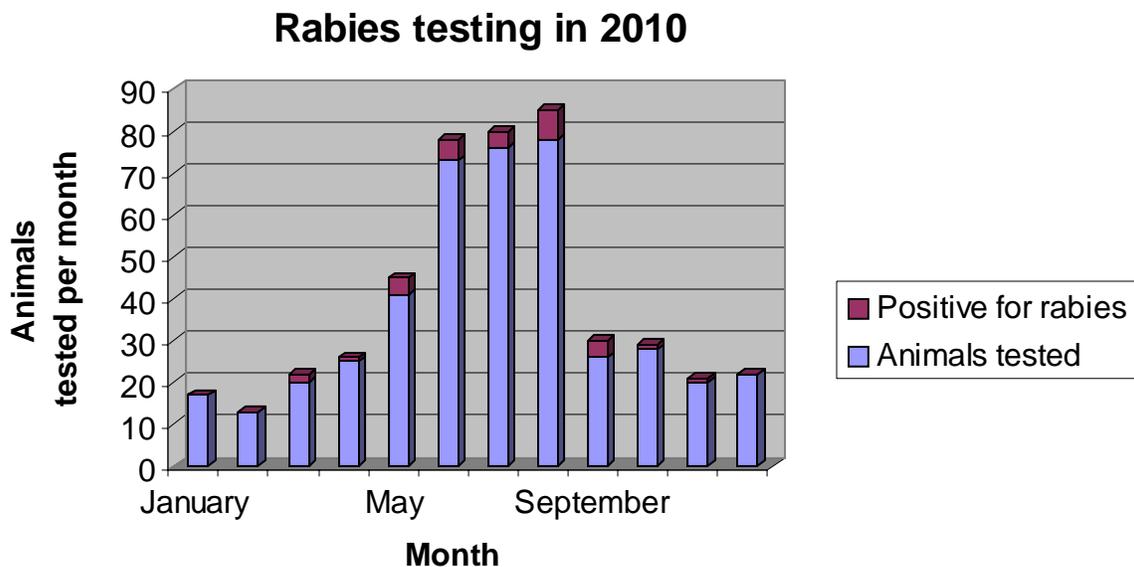
<i>Test Performed</i>	<i>Number of Tests Performed in 2010</i>
Drinking water samples	2651
Marine and shellfish water samples	3083
Beach and public pool water samples	3525
Food and dairy samples	3615

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 following graph illustrates the number of rabies tests performed by month in 2010. As expected, the highest number of tests occurs during the late summer months, but the data also show that rabies-positive animals can be found all year long. The total number of animals tested in 2010 was 439, with 29 tested positive.



Molecular Biology and Enteric Pathogens Laboratory

The *Molecular Biology and Enteric Pathogens Laboratory* provides rapid testing of clinical specimens for Pertussis, Norovirus, and Influenza. The laboratory also receives and characterizes microbial isolates potentially associated with foodborne disease outbreaks, with continued participation in national and international surveillance programs. In 2010, Norovirus testing levels remained about the same as in 2009 at 96 specimens tested. These tests are performed on specimens collected at long-term care institutions and schools to determine if Norovirus caused rapidly spreading outbreaks. Requests for pertussis tests continued to decline in 2010 to 429 specimens.

During 2009 the laboratory saw a dramatic increase in tests for Influenza due to the H1N1 pandemic. Thankfully this trend reversed itself in 2010 to a total of 474 flu sub-typing tests performed. Most of these were from the early part of 2010 and were a continuation of the 2009 H1N1 pandemic. The laboratory continued the use of rapid molecular methods for identifying Influenza A and B, as well as for identifying three subtypes of Influenza A.



New DNA Sequencing Capabilities Anticipated

In late 2010, the Molecular Diagnostics Laboratory was the recipient of a grant award from the Centers for Disease Control and Prevention to purchase a new DNA Sequence Analyzer. This instrument will complete the molecular diagnostic capabilities of the laboratory, allowing DNA sequence determination in support of a variety of testing programs, including determination of influenza drug sensitivity, tuberculosis (TB) drug sensitivity, TB strain identification, and the next generation DNA fingerprinting methods. The laboratory will set up the instrument in early 2011 and bring these new capabilities on board during 2011.

The Enteric Pathogens section of the laboratory completed screens on 68 specimens and received 375 microbial isolates during 2010. These isolates are received from hospital and clinical laboratories for definitive identification and sub-typing of these foodborne disease-causing pathogens. The section continues to participate in the global PulseNet surveillance program for identifying enteric bacteria associated with foodborne disease outbreaks, analyzing 206 specimens in 2010. Of these, several were Salmonella isolates associated with a national foodborne disease outbreak linked to a processing plant in Rhode Island. Rhode Island also received 55 isolates which were associated with 20 nationwide outbreaks by their DNA fingerprints. In total, 188 Salmonella, 1 E. coli 0157:H7, 16 Shigella, and 1 Listeria isolates were fingerprinted.

Molecular Biology/Enteric Pathogens Laboratory Testing

<i>Test Performed</i>	<i>Number of Specimens Tested</i>
Enteric Bacterial Isolates	375
Gonorrhea Cultures	355
Norovirus PCR	96
Parasitology	1024
PulseNet (PFGE)	206
Pertussis PCR	429
Stool Cultures	68
Influenza	474

FDA Microbiology Cooperative Agreement Program Update

In 2009 the State Health Laboratories received a Microbiology Cooperative Agreement Award from the US Food and Drug Administration to establish a new laboratory to augment their food testing capabilities. As of the end of 2010, the new laboratory has been up and running with a variety of new high-tech pieces of equipment and two new employees. Recently incorporated as part of the Molecular Diagnostics Laboratory, this new laboratory enhances foodborne disease investigation capabilities and provides new methodologies for routine screening of food to support the Department of Health’s Office of Food Protection.

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 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. In 2010, the laboratory completed 41,384 Chlamydia and Gonorrhea tests, a 19% increase from 2009. Syphilis testing decreased slightly to 7,529 tests, while HIV testing volume decreased to 15,130 as expected due to changes in the screening policies at the state's Adult Correctional Institution.

Hepatitis testing was expanded to include Hepatitis A and B, in addition to Hepatitis C. The total number of specimens tested for Hepatitis was 713.

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



In 2010, West Nile Virus (WNV) and Eastern Equine Encephalitis (EEE) testing continued as part of the Serology Laboratory. Federal grant funding supports surveillance testing programs for mosquito-borne diseases such as WNV and EEE, which involves mainly testing of mosquitoes trapped by staff at the Department of Environmental Management. In 2010, five mosquito pools were found to contain WNV. In addition, the laboratory identified one mosquito pool from which EEE was isolated.

New 4th Generation HIV Test to be Implemented

The Serology Laboratory began the upgrade of its HIV and Hepatitis testing equipment in late 2010 with the acquisition of the new Abbott Architect i1000 instrument. In conjunction with this new instrument, Hepatitis testing is being expanded to include Hepatitis A and Hepatitis B in addition to the previously implemented Hepatitis C. In 2011, this laboratory will also be one of the first public health laboratories in the country to begin using a new fourth generation test for HIV! This instrument is fully automated and increases the lab's flexibility in testing specimens quickly for these pathogens of major public health significance.

State Health Laboratories Continue to Support Community Health Centers

The State Health Laboratories continue to support the state's Community Health Centers through testing programs for important communicable diseases such as HIV, sexually transmitted diseases, and intestinal parasites. The laboratory also performs childhood blood lead screening tests for Community Health Center patients. These services provide important coverage for uninsured and underinsured Rhode Island residents. In 2010 the laboratory performed testing on close to 35,000 specimens in support of the Community Health Centers. These numbers increased by 20% in comparison to 2009.

Tests Performed for Community Health Centers

<i>Test Performed</i>	<i>Number of Specimens Tested In 2010</i>
Chlamydia/Gonorrhea	16,367
Syphilis	5,638
HIV	7,152
Lead	4,519
Ova & Parasites	1,015
Hepatitis A, B, + C	37
Total	34,951

Environmental Sciences

The primary mission of the **Environmental Sciences Section** of the Laboratories is to monitor the safety of public drinking water supplies, ambient air, and food supplies and to support the state's environmental protection programs. Monitoring tests conducted by the environmental sciences laboratories are used to detect and measure environmental contaminants in drinking water, air, and food, resources vital to public health. The Environmental Sciences laboratories test samples collected by personnel at the Department of Health, the Department of Environmental Management, other agencies, or private homeowners for a variety of chemical substances that can be harmful to human health and ecosystems. Tests for clean and safe 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). This laboratory section includes the Biomonitoring Laboratory that, using an alternative approach, can 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 2010 Highlights

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 394,100 air quality measurements in 2010. The pollutants monitored by this laboratory include ozone, particulate matter, sulfur dioxide, nitrogen dioxide, carbon monoxide, volatile organic compounds, polycyclic aromatic hydrocarbons, metals, particulates, 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 conditions and pollution forecasted using monitoring data collected by the Air Pollution Laboratory for Rhode Island are used to calculate the Air Quality Index, which is available on the website www.epa.gov/airnow

In 2010, the Air Pollution Laboratory marked a full year of using its most sensitive Gas Chromatograph and Mass Selective Detector (GC/MSD) to measure low concentrations of Volatile Organic Compounds (VOC) contaminants in air samples collected from the state's network of air monitoring sites.

Air Pollution Laboratory's East Providence Monitoring Station Approved in 2010 as EPA NCore Network Station

US EPA clean air regulations (40 CFR, Part 58, Appendix D) require states to establish and participate in a new monitoring network, called NCore, by January 1, 2011. In 2010, the Air Pollution Laboratory's East Providence station was approved by the NCore Program to meet its 2011 program air pollution measuring objectives to support scientific studies across public health, technology, and ecosystem assessment strategies. Testing will include 2.5 and 10 micron particulate matter, ozone, carbon monoxide, sulfur dioxide, nitrogen oxide, total reactive nitrogen, ammonia, nitric acid, and surface meteorology.



Darren Austin prepares a summa air sample canister for deployment at one of the air pollution monitoring stations in Rhode Island.

Biomonitoring and Chemical Terrorism Response Laboratory

The *Biomonitoring and Chemical Terrorism Response Laboratory* tests blood and urine specimens for chemical toxic substances such as lead or mercury. Growing in importance, tests termed “biomonitoring” help assess the type and quantity of chemicals that may 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 detect chemicals that may be used as agents of chemical terrorism in clinical samples collected from exposed individuals. The laboratory has demonstrated proficiency in several methods for the detection of industrial chemical poisons and chemical warfare agents.

The Biomonitoring laboratory includes a specialized blood lead 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 2010, 16,487 blood lead level screening tests were performed. Test results greater than 10 ug/dl require retesting at three months, resulting in an additional 427 follow-up diagnostic tests. These numbers are approximately the same as the number of tests performed in 2009.

This test volume comprises approximately 60% of all blood lead tests in the state. Two laboratories associated with lead clinics at Hasbro Children’s Hospital and St. Joseph Hospital analyzed the remaining 40% of blood lead tests in the state.



Prisca Simo and Anthony DellaGrotta perform blood lead screening tests.

Food and Water Chemistry Laboratory

In 2010, 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 and Shellfish programs.

The State Health Laboratories resumed its private well water testing program in 2010 in response to the aftermath of the March floods. 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 or arsenic.

The laboratory also performs chemical analysis of food products submitted by the Office of Food Protection that are suspected of chemical adulteration or spoilage. The laboratories performed 254 tests on food samples submitted by the Office of Food Protection in response to customer complaints or food borne disease outbreaks.

In 2010, this laboratory performed 4,681 separate water chemistry tests, including tests for nitrite and nitrate, lead, arsenic and several other metals and minerals. The breakdown of these tests is shown in the table below.

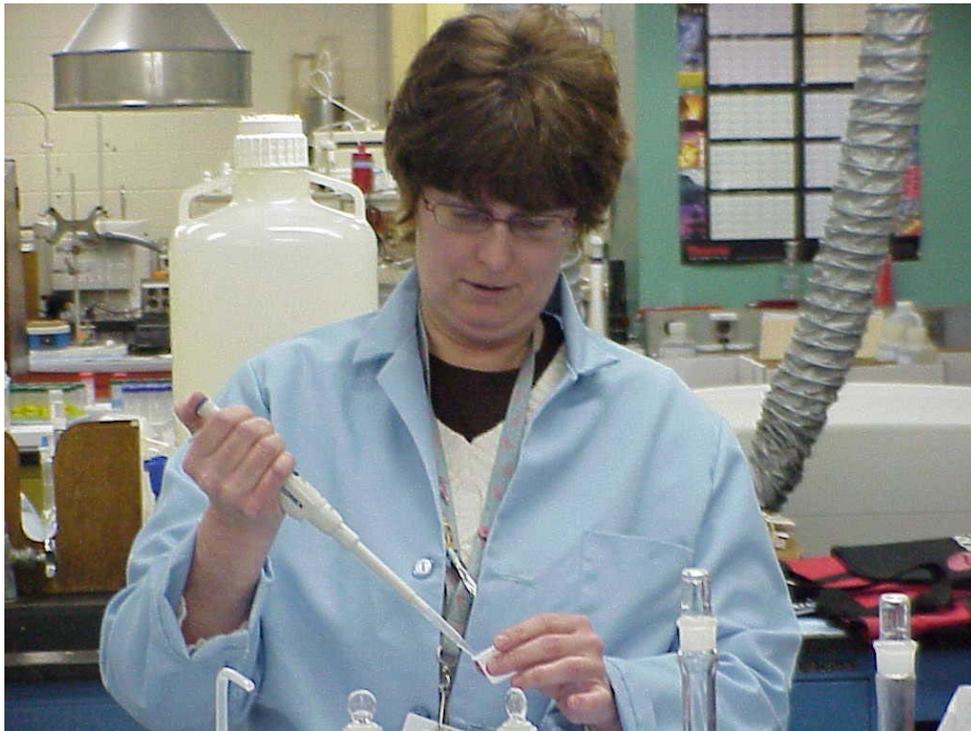
The Food and Water Chemistry Laboratory participates in the national environmental response networks including the Food Emergency Response Network (FERN) administered by the FDA/USDA and the Environmental Response Laboratory Network (ERLN) administered by the EPA. These networks strengthen the emergency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



Food and Water Chemistry Laboratory Inorganic Chemistry Tests In 2010	
Cyanide	121
Mercury	122
Iron	51
Minerals	257
Lead & Copper	1,099
Metals	1,327
Other	1,704
Total Water Chemistry Tests	4,681

Aflatoxins Can Be Found In Food

In 2010, the Food and Water Chemistry Laboratory continued its participation in the Aflatoxin Share Testing Exercises which are interlaboratory calibration exercises performed among a group of eleven states to ensure their capability to test and measure aflatoxin concentrations in contaminated food products. Aflatoxins are naturally occurring food toxins that can be produced by molds or fungus in spoiled foods or food ingredients during storage. Though rare, aflatoxins are toxic to humans at trace concentrations. In addition to aflatoxins the Food and Water Chemistry Laboratory maintains the ability to test for histamine in spoiled fish and other toxins associated with shellfish poisoning.



Ruth Wernquest of the Food and Water Chemistry Laboratory prepares analytical standards for trace analysis of heavy metals in drinking water.

Organic Chemistry Laboratory

The *Organic Chemistry Laboratory* tests drinking water, ambient waters and wastewater for pesticides, herbicides, volatile and semi-volatile contaminants. In 2010, this laboratory performed 410 tests for a total of 17,778 chemicals tested. Historically, the organic contaminants entered the environment from industrial and household processes, the use of petroleum and its by-products and from pesticides applications. These chemicals do not readily decompose and remain in the ground 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 RI Department of Environmental Management's Division of Agriculture to monitor Rhode Island's rivers and streams for evidence of improper pesticides applications.

Organic Chemistry Laboratory: Tests Performed in 2010

Pesticides & Herbicides	1,347
Volatile Organic Chemicals	14,847
Synthetic Organic Chemicals	1,584
Total Organic Chemistry Tests	17,778

Organic Chemistry Laboratory Deploys ELISA Test

In 2010, the Organic Chemistry Laboratory validated a cost effective screening test for methoprene, a chemical commonly applied to drainage and sewer systems in Rhode Island to control mosquito populations by disrupting mosquito larvae in their aquatic stage. The method utilizes an enzyme-linked immunosorbent assay (ELISA) test specific to methoprene and its derivatives and gas chromatography/selective ion monitoring (GC/SIM) confirmation. The analytical approach was tested in conjunction with the DEM Mosquito Abatement Program in 2010 to show that measurable concentrations of methoprene did not remain in Rhode Island watersheds and estuaries following application.



Leslie Nolan of the Organic Chemistry Laboratory prepares drinking water sample extracts for analysis using a new gas chromatograph/mass spectrometer. This instrument identifies a large number of pesticides & industrial chemicals that may contaminate drinking water supply.

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 2010, the office certified 87 laboratories including thirty-three laboratories in Rhode Island and fifty-four out of state laboratories.

The office also responds to customer concerns and answers technical and customer service questions from programs served by the laboratories. 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: <http://www.health.ri.gov/programs/laboratory/index.php>

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 2010 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.

Since the program began in Rhode Island, 13,043 convicted offender's 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. In 2010, there were seventeen offender hits, three forensic case to case hits, with two investigations aided at the national level. There were twenty offender hits, three forensic case hits, with six investigations aided at the state level.

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. 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 2010, there were 472 submissions for examination, with each case often containing multiple items.



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 the State Medical Examiner to carry out its mission. The Toxicology Laboratory has received a total of 772 Medical Examiner cases in 2010. 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 2010, 203 Driving Under the Influence of Alcohol or Drugs (DUI) cases were received and analyzed for the presence of alcohol and drugs. This reflects an 18% increase in submissions to the laboratory under this program.



Rebecca Conway-Novik and Chelsey Danella prepare samples for toxicology testing.

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 2010. As a result of funding available for additional staff, the laboratory has implemented a new, more sensitive ELISA screening method. The new instrument detects 17 different compounds, including both drugs of abuse and therapeutic drugs. The previous drug screening method detected 10. Using federal funds, the laboratory has also been able to purchase blood collection kits for law enforcement agencies. This provides both police and medical personnel with standardized, written instructions to follow when collecting blood samples from suspected drunk drivers.

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 2010, over 700 breath instruments currently in operation were inspected on-site at 42 facilities, and greater than 200 new instruments were initialized and inspected before being put into use.

This program also trains and certifies the operators of breath testing instruments. In 2010, instructional sessions were conducted for Rhode Island law enforcement agencies to train approximately 1800 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 12-15 times per month throughout the State's Court System, as well as on-call support. Our participation in the Mobile Breath Alcohol Testing vehicle campaign kick-off in Providence resulted in the arrest of several impaired operators, and demonstrated the benefits of a mobile breath testing vehicle.

This program works very closely with the RI Department of Transportation (DOT) Highway Safety Office, and has been the recipient of federal funding through this agency.



Al Giusti of the Breath Analysis program conducts a training session for breathalyzer operators.

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 2010, 3,346 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 2010, a total of 5,817 separate identifications were made.



Larry Allen prepares laboratory reports for mailing to police departments.

<i>Top Five Submitting Agencies</i>	
<i>Providence Police Department</i>	<i>29%</i>
<i>RI State Police</i>	<i>15%</i>
<i>Pawtucket Police Department</i>	<i>8%</i>
<i>Woonsocket Police Department</i>	<i>5%</i>
<i>Central Falls Police Department</i>	<i>5%</i>

<i>Top Five Drugs Identified</i>	
<i>Cannabis</i>	<i>30 %</i>
<i>Cocaine</i>	<i>19 %</i>
<i>Heroin</i>	<i>7 %</i>
<i>Oxycodone</i>	<i>3 %</i>
<i>Hydrocodone</i>	<i>2 %</i>

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	Determining the 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 (EIA 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 ₂)	Nitrogen Monoxide (NO ₂)
Ozone (O ₃)	Nitrogen Oxides (NO _x)
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

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

Overview of Organic Chemistry Laboratory Tests

Carbamates and By-products by EPA method 531.1 (8 carbamate pesticides)	Atrazine Screen by Immunoassay
Ethylene Dibromide and Dibromochloropropane by EPA method 504.1	Metolachlor Screen by Immunoassay
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 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—CLIA (Certificate of Compliance for High Complexity Clinical Laboratory)
- US EPA (Environmental Protection Agency)—Ambient Air and Drinking Water Testing
- FBI (Federal Bureau of Investigation)—CODIS
- ISO17025-Forensic Laboratories: Toxicology, Forensic Biology (DNA Testing), Drug Chemistry
- FDA (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

Chapin Laboratory Building
50 Orms Street
Providence, RI 02904

Phone: 401-222-5600

Fax: 401-222-6985

Hours of Operation: Monday-Friday, 8:30 a.m. to 4:30 p.m.

Website: www.health.ri.gov/labs

