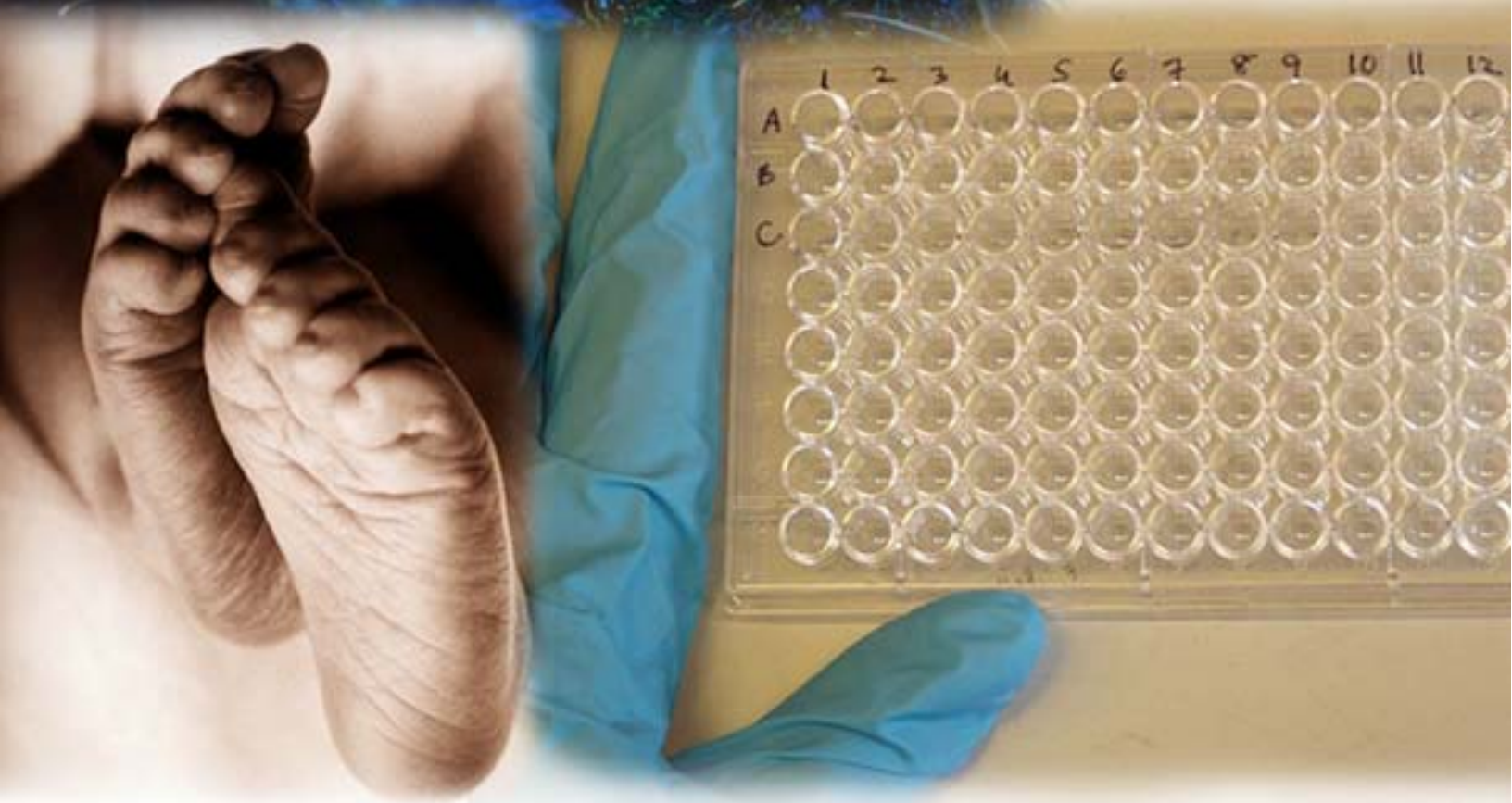


Laboratory Services Division



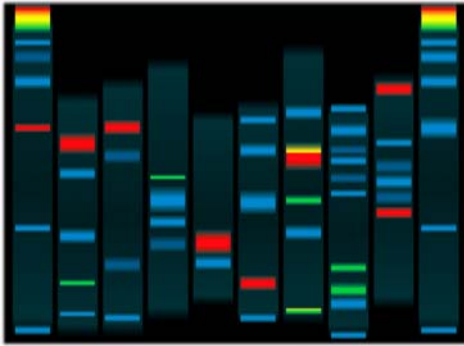
Colorado Department
of Public Health
and Environment

Annual Report - Fiscal Year 2007-08



Rapid Detection for the Public's Protection

The **mission** of the Laboratory Services Division is to protect the health, safety and environment of all Coloradans by providing accurate and timely laboratory analyses and information.



The **vision** of the division is to be recognized as an innovative and quality public health laboratory in the state of Colorado.

As a leader in the industry, the division will use advanced, leading-edge technology, employ a highly skilled workforce, and have the respect and support of all its customers, stakeholders and partners.

Dear Customers and Stakeholders,

I am pleased to present the division's annual report for the fiscal year ending June 30th, 2008.

This year was very challenging financially. We experienced cuts in all of our federal grants, most notably in the Public Health Preparedness Grant.

Additionally, we had staff turnover in three very key positions. Several vacancies have been held open to try to address the "structural" deficit the division experienced at fiscal close.

In spite of these setbacks, we strive to provide excellent customer service and pursue new grant-funding opportunities.

Technical advances in analyses were implemented in the newborn screening program, namely the cystic fibrosis gene mutation analysis. This new method enables us to more accurately screen for cystic fibrosis and to identify carriers.

Thank you for your continued confidence and support,



David A. Butcher, MBA, MT (ASCP) SM
Laboratory Services Division Director

Table of Contents

	Page
Introducing the Laboratory Programs Chemistry, Microbiology, Newborn Screening,	5
Evidential Breath Alcohol Testing, Certification and Training	6
Laboratory Support Teams Central Services: Expanding Courier Network and New Mailing Procedures	7
Accessioning: Processing Specimens and Samples for Laboratory Testing	7
Information Technology: Improving Data Management Processes	7
Quality Assurance: Ensuring Quality Results	8
Fiscal: Streamlining Billing Processes	8
Showcase of Accomplishments A Healthy Start for Newborns	
Cystic Fibrosis Screening by Gene Mutation Analysis – Reducing Parental Stress and Cost of Follow-Up	9
Disease Control and Prevention	
New Syphilis Test Improves Detection	10
New HIV Testing Detects Recent Infection	10
Rabies Testing – Responding to Nationwide Vaccine Shortage	11
Uncovering <i>Salmonella</i> in Local Drinking Water Supply	11
Identifying <i>Salmonella</i> in Jalapeno Peppers	12
Detecting <i>E. coli</i> in Correctional Facility Food	12
Conducting Surveillance of Dairy and Retail Food Products	12
Expanding Molecular Testing	12
Water Testing and Environmental Protection	
Lab Attains EPA Certification to Test Drinking Water	13
Partnering to Screen Colorado Rivers for Pesticides	14
Improving Technology for Detection of Radiation in Water	14
Detecting Sulfur in Drinking Water	14
Measuring Chlorophyll to Determine Water Quality	15
Monitoring Banned Substance in Nail Products	15
Monitoring Exposures to Environmental Toxins	
Arsenic Exposure and Diabetes	16
Emergency Preparedness and Response	
New Test for Botulinum Toxin Detection	16
Upgrading Regional Public Health Labs	17
Training Hospital Labs Statewide	17
Responding to Biological Threats	18
Responding to Chemical Threats	18
Environmental and Public Health Testing on the Western Slope	19
Certification of Testing Laboratories	19
Drug and Alcohol Testing	22
Protecting Colorado from Drunk Drivers	23
Overview of Fiscal Year 2007-08 Laboratory Funding	24

Laboratory Services Division Staff



Front row (from left):

Joyce Knutsen, Flor Jabola, Dr. Kimberly Keene, Kay Reilly, Elisa Ayo, Victoria Fadeyi, Huong Nguyen and Ashley Worrall

Second/Third rows (from left):

Dr. Hugh Maguire (interim Microbiology Program manager), Dr. Laura Gillim-Ross (Public Health Microbiology/Serology lab supervisor), Karen Xavier, Greg Waidmann, Melissa Nucci, Mark Dymersky, Cory Porter, Paula Brallier, Marilyn Heil, Brenda Moore (**Information Technology/Accessioning manager**), Adene Elsner, Mari Washington, **Andrea Smith (Fiscal Officer),** Linda Pritchard and Suzanne Kelley (**Client Relations/Training manager**)

Back row:

Justin Nucci, Fred Cobb, Dee Jae Dutton, Marty Piper, Ligita Lapins, Patrick May, Skip Gossack, Kim Greeley, **David Butcher (Division Director), David Sikes (Quality Assurance Officer),** Ken Johnson, **Tony Harrison (Radiochemistry lab supervisor),** Ben Chouaf and Pat Ayres.

Not pictured:

Brandon Anderson, Mark Angerhofer, Rick Bates, Jasmine Bozeman, Jeffery Brown, William Brumfiel, **Cynthia Burbach (Toxicology lab supervisor),** Edward Carroll, Mary Cichon, Susannah Craig, Vi Esparza, Joel Fay, Jeana Foster, Juanita Giles, Chris Goodwin, Audrey Griffin, **Jeff Groff (CLIA/EBAT manager),** Margi Haas, David Heinrich, David Heltzel, Jyoti Kochhar, Elisabeth Lim, Vickel Maharaj, Kristin Mayo, Mike Merrell, Cecelia Moore, Aaron Olivas, Leoncio Palomino, **Laurie Peterson-Wright (Chemistry Program manager),** Jennifer Richardson, **Larry Sater (All Hazards Coordinator),** Joshua Saul, Pauline Schmidt, Vanessa Simmons, Mike Smith, John Struxness, **Michael Trujillo (Building Operations manager),** Rhonda Webb, Harold Wells, **Dan Wright (Newborn Screening Program manager)** and **Labertta Cano (Grand Junction lab supervisor).**

Inroducing the Laboratory Programs

The Laboratory Services Division comprises six major programs, which provide essential services through scientific testing, new method development, training and regulation of private medical laboratories, and technical equipment support and training for law enforcement and legal communities, ensuring the health and safety of Colorado citizens and the environment in which they live.

Chemistry Program

The Chemistry Program provides a wide array of tests for the detection of chemicals, from both environmental samples and human specimens, which can pose a significant threat to the public's health or the environment. Environmental samples tested by this program include drinking water, air filters, rivers, soil and factory waste.

The program also performs radiological testing on both environmental sources and humans, to detect background measurements or contamination. Food sources can also be measured for additive levels or intentional contaminants.

Additionally, the Chemistry Program tests blood and urine samples to detect alcohol or drug abuse and assist in the enforcement of state laws.

Recent enhancements enable the Chemistry Program to provide specialized testing to detect intentional chemical or radiological releases by terrorists.

Microbiology Program

The Microbiology Program performs testing to detect and monitor bacterial contamination in food and water and related outbreaks; to keep a watchful eye on the spread of known communicable diseases, such as tuberculosis, pertussis (whooping cough), HIV, chlamydia and gonorrhea; to track outbreaks of highly infectious diseases such as norovirus, and influenza; and to provide surveillance for animal-borne diseases affecting humans, such as plague, tularemia, rabies, and West Nile Virus.

This program also maintains readiness and surge capacity with regard to the detection of bioterrorist activities, as well as new, emerging bacterial or viral strains.

Newborn Screening Program

The Newborn Screening laboratory is the only laboratory in the state that is designated to conduct tests to screen for 30 metabolic conditions in newborns.

Newborns are tested twice, shortly after birth and at the first well-baby check-up (8-14 days), using a simple heel-stick procedure.

Medical conditions detectable by these two screens typically show no obvious symptoms initially in newborns, but can cause severe illness, mental retardation and in some cases, if not found and treated very early, can result in infant death.

More laboratory programs found on next page.

Additional Laboratory Programs

Evidential Breath Alcohol Testing Program

The division's Evidential Breath Alcohol Testing (EBAT) Program maintains and certifies the Intoxilyzer 5000EN breath alcohol testing equipment used by Colorado law enforcement agencies, conducts on-site inspections of the equipment, oversees the training and certification of instructors and operators of the equipment, and often testifies in court on the reliability of the results obtained from the equipment.

Certification Program

The Certification Program conducts on-site inspections of clinical laboratories, water-testing laboratories, milk testing laboratories and alcohol/drug/toxicology testing laboratories, to ensure these laboratories meet established standards of performance and certification standards of federal regulation agencies.

Training Program

The Training Program coordinates training and proficiency exercises for both internal laboratory staff members and external clinical laboratory partners. Training focuses primarily on proper collection of specimens or samples and safe handling and shipping to the state public health laboratory for advanced testing.

The Training Program is approved by the American Society of Clinical Laboratory Sciences Professional Acknowledgement of Continuing Education program, to provide continuing education and training that not only satisfy employer requirements, but also will satisfy federal regulation, state licensure and certification requirements for clinical laboratory testing.

Additionally the Training Program collaborates with the Association of Public Health Laboratories, Centers for Disease Control and Prevention, Clinical and Laboratory Standards Institute, American Society for Microbiology and American Society for Clinical Pathology to deliver high quality training experiences on topics such as infectious disease testing, environmental testing, newborn screening testing, quality assurance, safety and more.

Laboratory Support Teams

Four major support units: Fiscal/Central Services, Accessioning, Information Technology and Quality Assurance; play critical roles in the daily business operations of the state public health laboratory. By implementing new business procedures or technology, the support teams guarantee smooth operations and rapid test reporting by the laboratory testing programs.

Expanding Courier Network and New Mailing Procedures

The Central Services Unit provides infrastructure support for the safe receipt, distribution and proper disposal of public health and environmental samples and specimens.

The unit processes customer requests for supplies used in specimen collection and oversees compliance with state-mandated document retention schedules and federal hazardous waste storage and disposal guidelines.

During fiscal year 2007-08, the **Central Services Unit** oversaw the expansion of the statewide courier system using a third-party vendor.

The **Central Services Unit** also implemented direct shipping and mailing services from the Lowry location instead of shipping through the mail at the department's main campus.

Processing Specimens and Samples for Laboratory Testing

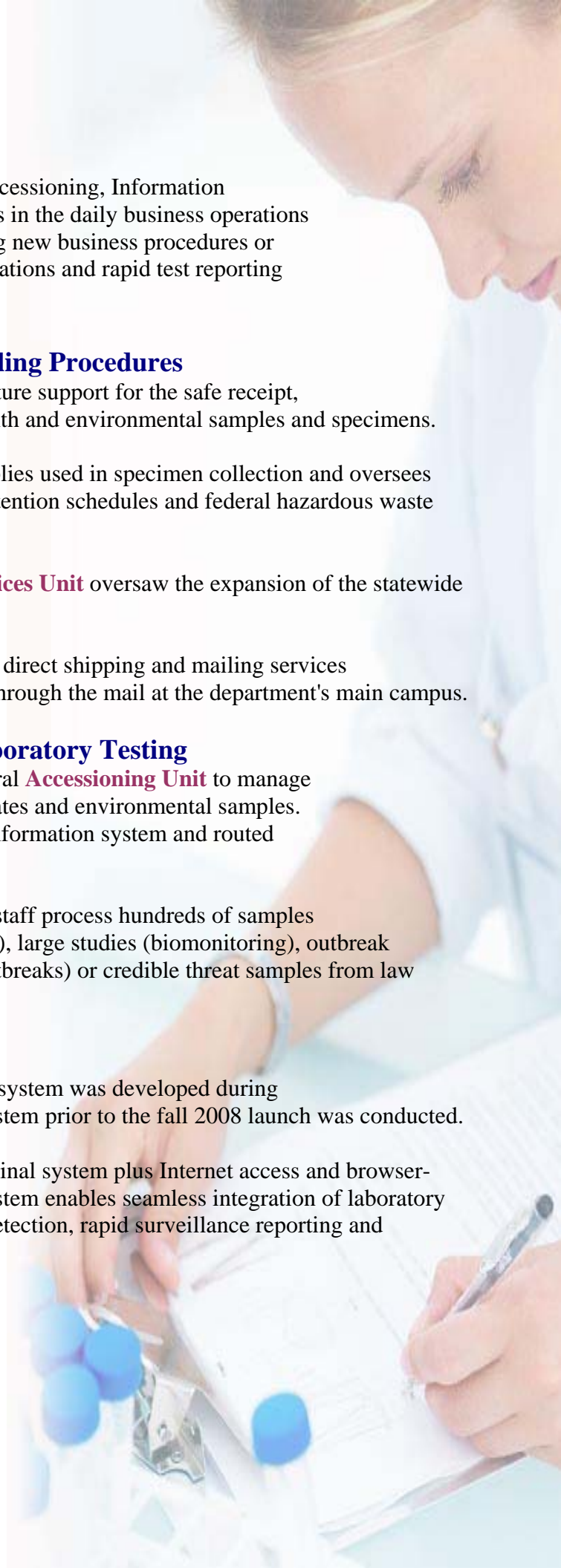
The Laboratory Services Division uses a central **Accessioning Unit** to manage all incoming patient specimens, bacterial isolates and environmental samples. Specimens and samples are entered into the information system and routed to the appropriate testing laboratory.

Data accuracy and efficiency are essential as staff process hundreds of samples requiring chain of custody (toxicology testing), large studies (biomonitoring), outbreak situations (foodborne or infectious disease outbreaks) or credible threat samples from law enforcement.

Improving Data Management Processes

A newer, more robust laboratory information system was developed during fiscal year 2007-08 and beta testing of this system prior to the fall 2008 launch was conducted.

The new system combines features of the original system plus Internet access and browser-based technology. This client server-based system enables seamless integration of laboratory and epidemiologic data to support outbreak detection, rapid surveillance reporting and laboratory data management.



Ensuring Quality Results

Established at both the state and national levels, proficiency testing is a quality assurance requirement of all clinical and environmental laboratories.

Regulatory agencies provide samples to the Laboratory Services Division for testing, to determine the aptitude of the laboratory scientists. The lab performs testing on the unknown samples, and reported results are evaluated against the correct value by the regulatory agency. For desired performance, 80 percent of test results must be within the accepted range. During the fiscal year 2007-08, the laboratory's overall score was 98.77 percent correct, testing 2199 analytes.

During the Laboratory Services Division monthly Quality Assurance (QA) Committee meetings, committee members look at issues with the goal of improving overall quality of each laboratory section.

Issues examined by the committee originate from

- new standards set by regulatory agencies;
- deficiencies uncovered in self audits;
- incorrect results on proficiency tests;
- customer complaint tracking.

Quality benchmark results established by the QA Committee in 2007-08 included:

- the establishment of a shipping-temperature monitoring program;
- the storage of laboratory documentation, duration and location;
- quality verification of supply items, such as water and gas.

Streamlining Billing Processes

The **Fiscal Office** manages all purchasing, accounts payable/accounts receivable, budgeting, federal grant, and cash fund functions for the Laboratory Services Division, in compliance with State of Colorado fiscal and procurements rules and regulations, as well as Colorado Department of Public Health and Environment guidelines.

The office establishes business plans and practices to ensure optimal use of operating and personal service funding, responds to customer concerns regarding invoicing issues and provides financial information as needed.

At the close of fiscal year 2007-08, the Fiscal Office began strategic planning with the Information Technology Unit to launch a streamlined billing process in the upcoming fiscal year.

Showcase of Accomplishments

A Healthy Start for Newborns

Cystic Fibrosis Screening by Gene Mutation Analysis – Reducing Parental Stress and Cost of Follow-Up

Cystic fibrosis is an inherited chronic disease that affects the lungs and digestive system of about 30,000 children and adults in the United States. A defective gene and its protein product cause the body to produce unusually thick, sticky mucus that:

- clogs the lungs and leads to life-threatening lung infections; and
- obstructs the pancreas and stops natural enzymes from helping the body break down and absorb food.¹

Since 1996 the **Newborn Screening Laboratory** has routinely tested for cystic fibrosis (CF) in both the first and second newborn screening panel of tests. The sole laboratory method used to test for CF was immunoreactive trypsinogen (IRT).

This test detects a deficiency in the pancreas, which is most commonly associated with cystic fibrosis in newborns. If an elevated IRT test result is reported, the infant's pediatrician will recommend a sweat chloride test to confirm the diagnosis of cystic fibrosis.

Over the past 20 years of using the IRT lab testing method, a false negative rate of 5.4 percent has been observed. In addition to the challenge of false negatives, confirming an abnormal positive IRT screen result by sweat chloride testing can take up to 30 days.

In an effort to address this delay in CF confirmation and reduce the rate of false negatives, the Laboratory Services Division implemented a combined screening test profile using both IRT and gene mutation analysis. In Colorado, 92 percent of newborns diagnosed with cystic fibrosis display a mutation of the F508 gene.

Using the gene mutation testing method, recommended by the American College of Obstetricians and Gynecologists, the state public health laboratory expects to detect 98.2 percent of patients with the F508 gene mutation.

By employing technology that detects this genetic mutation, a new screening algorithm was developed, and approved by the Board of Health, that reduces both false negatives and false positives, and minimizes associated genetic counseling needs, reduces parental stress and the cost of screening and follow-up.





Disease Control and Prevention

New Syphilis Test Improves Detection

Syphilis, a sexually transmitted disease with significant complications for patients and unborn fetuses, still remains an important problem in urban areas of the United States. Between 2005 and 2006, syphilis rates increased 15.2 percent in the western states.²

To improve detection of antibodies in patients infected by *Treponema pallidum*, the bacterium that causes syphilis, the **Serology Lab** updated the laboratory testing algorithm in fiscal year 2007-08. The revised algorithm incorporates a new assay to replace the old fluorescent treponemal antibody-absorption (FTA-ABS) assay.

The laboratory rapidly validated and implemented the *Treponema pallidum* particle agglutination (TPPA) assay recommended to state labs by the Centers for Disease Control and Prevention. Like the FTA-ABS test, the TPPA assay is a qualitative test, indicating the presence or absence of antibodies to the syphilis organism in human blood.

While this new assay is similar to the FTA-ABS in its ability to detect syphilis infection at different stages of the disease, the major advantage is its ability to greatly improve the time from testing to results reporting.



New HIV Testing Detects Recent Infection

There are two strains of human immunodeficiency virus (HIV) known to exist in humans: HIV-1 and HIV-2.

During fiscal year 2007-08, the **Serology Laboratory** implemented a revised HIV testing algorithm, based on the CDC's HIV testing algorithm, which led to more timely and definitive HIV testing.

In the new testing algorithm the second-generation HIV-1 enzyme immunoassay (EIA) has been replaced with a third generation EIA (Bio-Rad HIV-1/2 plus O) that detects HIV antibodies earlier in the course of infection and can detect antibodies to both HIV-1 and HIV-2 simultaneously.

The HIV-2 EIA has been replaced with the Bio-Rad Multispot HIV-1/HIV-2 rapid test, which is an immunoassay that detects and differentiates circulating antibodies to HIV-1 and HIV-2.

In November 2007, in collaboration with Denver Health Medical Center the laboratory validated and implemented nucleic acid amplification (NAAT) testing for HIV-1 RNA. NAAT testing is more sensitive than antibody-based testing for identification of individuals recently infected with HIV-1. Using this technique the laboratory has identified a number of new HIV-1 infections, undetectable by the antibody-based testing methods.

Rabies Testing – Responding to Nationwide Vaccine Shortage

Rabies virus infection, a disease that is nearly always fatal, occurs as a result of a bite or lick, or aerosolized saliva, from infected wild or domestic animals such as raccoons, dogs, cats, foxes, coyotes, skunks, wolves or bats. In 2008 a national shortage of rabies vaccine was announced, and physicians suspecting a patient's rabies exposure were required to contact a state public health official for case review before obtaining the vaccine.

The **Serology laboratory** responded to the vaccine shortage crisis by updating its rabies animal testing procedure in fiscal year 2007-08 to comply with the protocol developed by the National Working Group on Rabies Prevention and Control, which ensures rapid and reliable test results in assessing a rabies exposure. New changes included the use of more specific and sensitive antibodies for the detection of rabies virus in deceased animals as well as stricter requirements for animal specimen submission. Animal specimens submitted with unrecognizable anatomy, extensively dried or liquefied, or with extensive bacterial contamination will no longer be accepted for rabies testing, as national testing standards indicate that negative test results from these types of animal specimens do not ensure the absence of the rabies virus.

Identifying Bacterial Contamination in Food and Drinking Water Sources

People infected with the bacteria *Salmonella* develop fever, nausea and diarrhea within 12 to 72 hours after ingesting the organism. Most recover within a week, but those with reduced immune systems, usually the elderly and infants, sometimes require hospitalization.

Likewise, people infected with the Shiga toxin producing bacteria *Escherichia coli* O157:H7 (*STEC*), develop symptoms similar to *Salmonella*, but develop bloody diarrhea and hemolytic uremic syndrome (HUS).

It is important for hospital labs to send these bacterial isolates discovered from patient specimens to state public health laboratories so the specific strain of organism can be determined and compared with food sources locally and nationally.

Uncovering Salmonella in Local Drinking Water Supply

In response to a large outbreak of gastrointestinal illness in Alamosa, Colorado, in March 2008, the **Environmental Microbiology** laboratory rapidly identified the cause as *Salmonella* contamination in the municipal water supply system.

By comparing bacteria isolated from human specimens and drinking water samples, using pulsed-field gel electrophoresis (PFGE), also known as DNA fingerprinting, the lab was able to rapidly link the *Salmonella* strain detected in the water to the bacterial strain that isolated from clinically ill patients.

Molecular-based testing also was used as a tool to monitor the effectiveness of the water treatment response during this outbreak.





Identifying *Salmonella* in Jalapeno Peppers

Following outbreaks of foodborne illness that sickened more than 1,300 people nationwide in June 2008, the laboratory staff successfully isolated the disease-causing agent, *Salmonella* Saintpaul strain, from specific food products and linked their presence to the appearance of human illness.

While numerous state and federal agencies speculated that tomatoes were the contaminated food responsible for this outbreak, the **Environmental Microbiology** and **Molecular** labs were able to establish a definitive link between jalapeno peppers and the bacteria causing the widespread illness.

Detecting *E. coli* in Correctional Facility Food

In July 2007 an outbreak of gastrointestinal illness affected 70 inmates at the Jefferson County correctional facility in Golden, Colorado. Laboratory staff identified the cause of this outbreak as Shigatoxin producing *E. coli*.

The event was unusual in that multiple strains of the bacteria were being spread simultaneously.

A rapid response by the state lab in identifying the bacteria resulted in containment of the disease and no spread to the surrounding community outside of the institution.

Conducting Surveillance of Dairy and Retail Food Products

The **Environmental Microbiology Laboratory** continues to provide low-cost testing services to Colorado dairy operators. Testing is performed on raw and pasteurized milk in addition to cultured dairy products.

As part of a multi-state collaboration with the Centers for Disease Control and Prevention (CDC), staff initiated a study in fiscal year 2007-08 to determine the extent of contamination of broiler chickens sold at retail outlets with *Campylobacter* bacteria. The laboratory is a member of the Food Emergency Response Network and participates in the investigation of outbreaks of national scope upon request by federal agencies. FoodNet members' staff share test results with other state food testing laboratories and epidemiologists in an effort to curtail or minimize foodborne illness.

Expanding Molecular Testing

The molecular science laboratory is characterized by its flexible, rapid response capabilities. New test offerings continue to be developed and implemented by the work unit to enhance existing programs or to support the detection of newly emerging infectious agents that impact the public's health.

Molecular-based test methods such as polymerase chain reaction (PCR), pulsed-field gel electrophoresis (PFGE), multilocus variable number of tandem repeat analysis (MLVA), DNA sequencing, and Luminex technology complement traditional microbiological methods available at the Laboratory Services Division.



As a result of the speed and sensitivity provided by molecular testing methods, early detection of infectious agents allows multiple agencies to mount a public health response sooner than could be done in the past.

Expanded testing for respiratory viruses enables the lab to detect 19 virus types using a single test and supports year-round surveillance for infections caused by these viruses. New tests developed and implemented by staff in 2007-08 included PCR testing for the presence of the major cause of respiratory illness in young children, respiratory syncytial virus, and causative agents in foodborne illnesses, *Listeria monocytogenes*, *Campylobacter spp.*, and *E. coli* shigatoxin.

Using traditional staining, cultural and biochemical techniques, the **Public Health Microbiology Laboratory** functions independently to provide hospital labs with the identification of unknown organisms affecting patients, and works collaboratively with the **Molecular Science Laboratory** in disease outbreak investigations. Identifying bacteria from clusters of ill patients often provides the first clue to a potential outbreak and alert state epidemiologists to investigate the situation.

New molecular test methods in the **Public Health Microbiology Lab** provide for rapid result reporting for Chlamydia and gonorrhea tests, as well as tuberculosis detection. DNA sequencing technology currently is being used to aid in identification of both bacteria and fungi.

Water Testing and Environmental Protection

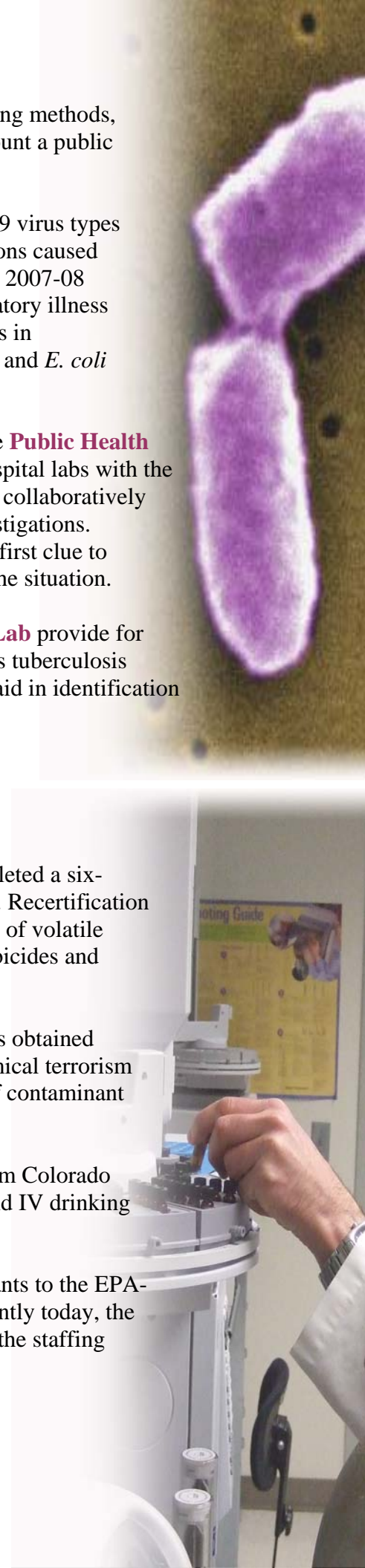
Lab Attains EPA Certification to Test Drinking Water

During the fiscal year, the **Organic Chemistry Laboratory** completed a six-year effort to become recertified for the analysis of drinking water. Recertification required the setup and operation of six instruments for the analysis of volatile organic compounds, synthetic organic compounds, pesticides, herbicides and disinfection byproducts.

Much of the instrumentation used in the recertification process was obtained from the Centers for Disease Control and Prevention through chemical terrorism response and biomonitoring funding and modified to be capable of contaminant testing under stringent EPA quality-assurance rules.

The **Organic Chemistry Laboratory** now can accept samples from Colorado public drinking water suppliers for the analysis of all Phase I, II and IV drinking water analytes, sometimes called “regulated parameters.”

This accomplishment adds more than 50 drinking water contaminants to the EPA-certified status of the chemistry laboratory. Operating more efficiently today, the laboratory is able to maintain this enhanced testing with one-third the staffing capacity than in the prior certification year 2000.





Partnering to Screen Colorado Rivers for Pesticides

Health effects associated with the presence of synthetic organic compounds in water vary depending on many factors such as the type of contaminant present, amounts found, and the duration of the exposure. Generally, health effects associated with exposure to synthetic organic compounds include the risk of cancer, anemia, damage to the eyes, liver, kidneys and spleen, and problems with the cardiovascular, nervous, and reproductive systems.³ Sources of synthetic organic compound contamination in water are often agricultural herbicides and pesticides.

The Colorado Department of Public Health and Environmental Laboratory, Environmental Protection Agency and the Colorado Department of Agriculture performed a joint pesticide surface water study during fiscal year 2007-08. Samples from nine river and stream locations were collected and screened for the presence of large classes of pesticides. Sampling sites included the South Platte, Cache La Poudre, Little Thompson, Big Thompson and St. Vrain rivers, and Bear Creek, Clear Creek, and South Boulder Creek. The study has been completed and results are being analyzed by the EPA to determine the impact of pesticides on these natural bodies of water.

Improving Technology for Detection of Radiation in Water

Alpha radiation emitters can be a serious health hazard if they are ingested, such as if they are consumed from water contaminated with radioactive materials. Many alpha radiation emitters are naturally occurring, but some are man-made. Examples include plutonium, radon, radium, uranium and thorium.⁴

During fiscal year 2007-08 the **Radiochemistry Laboratory** developed a new method to detect gross alpha radiation. The newly developed method is a validation of the EPA 00-02 (coprecipitation) method with a modified reagent. The routine procedure used for gross alpha radioactivity is the evaporation (EPA 900.0) method, which is limited by high dissolved solids or salts in the water and required longer counting time and smaller amount of sample, thus decreasing the test sensitivity. With the added coprecipitation method, the laboratory's testing capability is greatly enhanced, allowing alpha radiation to be analyzed from cloudy water with complex matrices such as high salt content and high solid concentration. At the end of the fiscal year more than 44 samples had been analyzed for the Colorado Radionuclide Abatement and Disposal Strategy project and for the public and private customers.



Detecting Sulfur in Drinking Water

Sulfate is a substance that occurs naturally in drinking water. Health concerns regarding sulfate in drinking water have been raised because of reports that diarrhea may be associated with the ingestion of water containing high levels of sulfate.⁵ Sulfur can also react with water or bacteria to form hydrogen sulfide, a noxious gas with a characteristic odor of rotten eggs which may cause irritation to the eyes, nose, or throat. It may also cause difficulty in breathing for some asthmatics.⁶

During fiscal year 2007-08 the **Inorganic Chemistry Lab** developed a method for the analysis of sulfur by inductively coupled plasma. The ICP method provided the laboratory with enhanced capability for analyzing a small amount of sample (approximately 30 ml) and shorter analysis time (less than an hour per sample).

Measuring Chlorophyll to Determine Water Quality

The abundance of algae in lakes and streams is commonly used as an indicator of nutrient enrichment and the ability to support plant and animal life in the body of water. Measuring chlorophyll provides a convenient and practical measurement of the abundance of algae in lakes and streams.

Colorado is in the process of evaluating chlorophyll criteria for protection of water quality in lakes throughout the state using the U.S. Environmental Protection Agency's recommendations regarding the amount of chlorophyll consistent with the desired water quality.

The **Organic Chemistry Laboratory** developed a new method in 2001-08 to extract chlorophyll directly from algal cells present in water samples.

The database of sampling for Colorado includes almost 4,000 chlorophyll measurements, obtained from 84 lakes. Laboratory data will become part of the hearing record when the CDPHE Water Quality Control Division submits a proposal for a rule-making hearing in 2010.

Monitoring Banned Substance in Nail Products

The Food and Drug Administration regulates nail products for personal and professional salon use; however, the operation of nail salons and the licensing of their technicians are regulated by state and local authorities.⁷

The **Organic Chemistry Laboratory** developed an analysis by headspace gas chromatography to help the Department of Regulatory Affairs monitor the levels of a banned substance, methyl methacrylate (MMA), in nail polish samples. Laboratory results have revealed several samples that exceed the allowable threshold of 5 percent MMA. These results enable the Colorado Department of Regulatory Agencies to address workplace safety for nail salon employees who are constantly exposed to the banned substance.

Monitoring Exposures to Environmental Toxins

Biological monitoring, or biomonitoring, is the direct measurement of a person's exposure to toxic substances in the environment by testing for the actual substance or its metabolites in human specimens, such as blood or urine.

Biomonitoring studies can be helpful in determining the extent of human exposure to either manmade or natural substances and how well these substances are metabolized in the human body. These studies also provide insight into investigations of geographic clusters of diseases, to determine whether or not a public health action is required.

The Centers for Disease Control and Prevention (CDC) provides grant funding for the Rocky Mountain Biomonitoring Consortium comprising Arizona, Colorado, New Mexico, Utah, Wyoming and Montana.





Arsenic Exposure and Diabetes

Arsenic occurs naturally in rocks, soil and water and can be further released into the environment through natural activities (erosion of rocks and forest fires) or through human actions. Higher levels of arsenic tend to be found more in groundwater sources of drinking water than in surface water (i.e., lakes and rivers). The demand on groundwater from municipal systems and private drinking water wells may cause water levels to drop and release arsenic from rock formations. Compared to the rest of the United States, western states have more systems with arsenic levels greater than EPA's standard of 10 parts per billion (ppb). Arsenic also is found in wood preservatives, paints, dyes, metals, drugs and soaps and also can come from certain fertilizers and animal feeding operations.⁸

During the fiscal year, the last year of funding for the Rocky Mountain Biomonitoring Consortium, the Colorado laboratory analyzed 160 samples as part of case-controlled study to determine whether an association exists between urine arsenic levels and diabetes. This is a multi-year study beginning in 2005 and final data review is expected in the spring of 2009.

Through scholarship funding provided by the Association of Public Health Laboratories, Colorado was able to provide training to scientists from Arizona and Minnesota so they can speciate arsenic in urine to support their state biomonitoring studies.



Emergency Preparedness and Response

The Laboratory Services Division continued to serve Colorado's citizens through emergency preparedness and response activities in fiscal year 2007-08 by upgrading local public health labs, comprehensive training programs and response to actual biological threats within the state.

New Test for Botulinum Toxin Detection

Botulism is a serious illness characterized by paralysis and death by respiratory failure, and caused by the nerve toxin produced by the bacterium *Clostridium botulinum* (commonly found in soil). Eating toxin-contaminated foods causes foodborne botulism. Wound botulism is caused by toxin produced from an infected wound. Consuming the bacterial spores, which then grow in the intestines and release toxin, causes infant botulism. In the United States, approximately 1 percent of botulism cases are foodborne, 65 percent are infant botulism, and 20 percent are wound botulism. Botulinum toxin also is considered to be a bioterrorism agent, because of its abundance and ease of distribution to the public.

During fiscal year 2007-08, a new test for the detection of botulinum toxin was launched, enabling same-day results reporting. Previously, patient specimens or food samples were required to be sent to California for testing and results could be delayed for 24 hours.

Upgrading Regional Public Health Labs

Upgrading regional local health department laboratories with confirmation testing capabilities reached two major milestones:

All five of the local health laboratories have been admitted by the CDC into the Laboratory Response Network, gaining the ability to test for, and confirm the presence of, bacterial select agents that cause diseases such as anthrax, plague and tularemia. Since 2001, the Laboratory Services Division has worked with the local health departments in Colorado Springs, Denver, Grand Junction, Greeley and Pueblo to upgrade and equip their laboratories to provide rapid testing capabilities to test for naturally occurring outbreaks and low-level credible bioterrorist threats in their regions.

DNA testing capability, called polymerase chain reaction, was established in each of the local health laboratories through the placement of instruments and the training of laboratory staff. Since implementing this technology, these laboratories have used this tool for rapid detection of plague and West Nile virus, with future applications planned to detect other bacterial and viral diseases such as anthrax, tularemia, brucellosis and influenza.

State laboratory analysts made site visits and inspections and provided advanced training and technical assistance to each of the local health laboratories during the year.

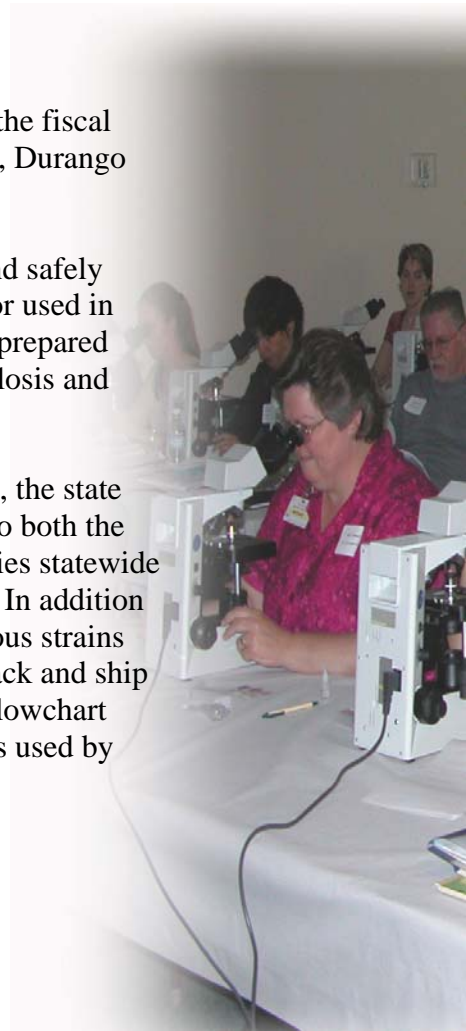


Training Hospital Labs Statewide

Statewide training of hospital laboratory staff continued throughout the fiscal year, with state laboratory trainers hosting wet workshops in Denver, Durango and Greeley.

Fifty new lab analysts across the state were trained in recognizing and safely testing for five lethal bacterial agents frequently found in Colorado or used in bioterrorist events. As a result, local community hospitals are better prepared to rapidly identify patient cases of anthrax, plague, tularemia, brucellosis and glanders disease.

To effectively test the preparedness of Colorado clinical laboratories, the state public health laboratory administered proficiency-testing programs to both the hospital labs and regional public health labs. More than 40 laboratories statewide participated in an extensive proficiency testing exercise in fall 2007. In addition to being evaluated for correctly ruling out or identifying non-infectious strains of bacterial agents, the laboratories also were required to properly pack and ship suspect cultures to the state public health laboratory. A lab-testing flowchart was provided to each participating laboratory in the exercise and was used by the state laboratory in grading the exercise.





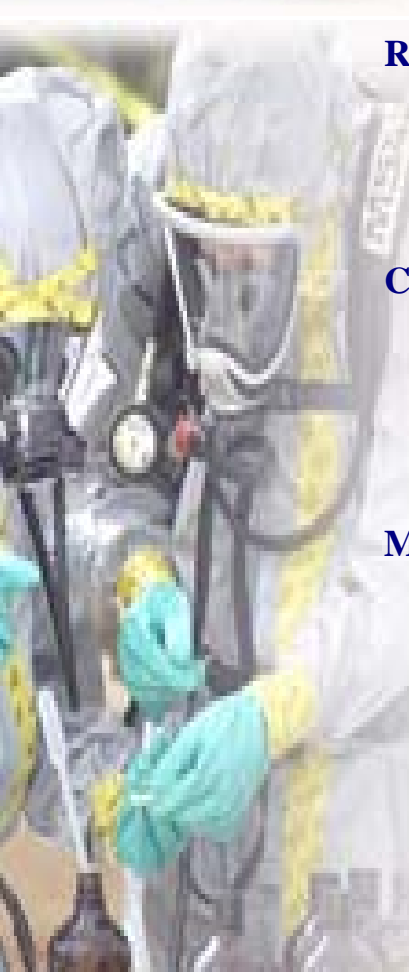
Responding to Biological Threats

Throughout the year the state public health laboratory stands ready to assist the Federal Bureau of Investigation, the 8th Civilian Support Team of the Colorado National Guard, and local law enforcement officials in determining whether perceived or announced biological threats are valid. Several such activities during the year warranted the state laboratory's expert testing response. The Laboratory Services Division received suspicious materials and hostile threat letters for rapid identification testing. All threat materials received were determined to be non-hazardous to Colorado citizens by the state laboratory analysts within two-to-three hours of receipt. Improved testing strategies and instrumentation were key to this rapid response.

The Laboratory Services Division is an active member of the national Laboratory Response Network (LRN) and serves as the state site for confirmation testing of select agents (anthrax, plague, tularemia, *Brucella*, *Burkholderia*, and smallpox).

As components of a Laboratory Response Network site, the **Molecular Science**, **Public Health Microbiology** and **Serology Labs** coordinated testing efforts to rapidly rule-out or confirm natural outbreaks associated with these bacteria and also supported Federal Bureau of Investigation agents in the determination of credible and non-credible threats.

In the coming year, laboratory staff members plan to roll out a number of new molecular diagnostic tests that will contribute to a rapid response by the division to an even broader array of infectious agents and toxins.



Responding to Chemical Threats

The **Chemistry Laboratory** is classified by the Centers for Disease Control and Prevention Laboratory Response Network as a "Level 2" laboratory, capable of detecting toxic chemicals such as cyanide, volatile organic compounds and heavy metals in human specimens.

Chemical Emergency Response Exercise

During fiscal year 2007-08, the lab participated in an emergency response exercise with the EPA Region 8 laboratories, comprising Colorado, Montana, North Dakota, South Dakota, Utah, and Wyoming state public health labs. The Colorado lab was able to identify and quantify the chemical methomyl, a carbamate pesticide with limited use due to its high toxicity in humans.

Measuring Arsenic in Emergency Disinfection of Drinking Water

During the salmonellosis outbreak in the town of Alamosa, concerns arose regarding the potential of naturally occurring arsenic levels increasing during the drinking water disinfection process. The **Chemistry Laboratory** analyzed more than 40 emergency water samples to verify that arsenic levels were not increasing, and water was safe for citizens to drink.

Measuring Human Exposure to Plutonium in Boulder Lab Incident

Following the discovery of a cracked vial of a certified research reference sample of plutonium at the National Institute of Standards and Technology (NIST) laboratory in Boulder⁹, the **Radiochemistry laboratory** assisted potentially affected NIST employees by performing whole body (radiation) counts to determine radiation received in the lungs, liver and other organs.

Responding to Citizen Concerns Regarding Uranium Mining

In response to the resurgence of uranium mining in Northern Colorado in early 2008 and an increasing number of customer concerns regarding the impact of mining and the potential for radioactive substances entering groundwater, the Chemistry program developed a mining and drilling baseline water testing package which will benefit all mining communities in Colorado.

Environmental and Public Health Testing on the Western Slope

In partnership with the Mesa County Health Department, the Colorado Department of Public Health and Environment maintains a Branch Laboratory on the western slope of Colorado. The laboratory is located in the Mesa County Health and Human Services building in Grand Junction.

Services offered include water testing, syphilis serology testing, Group A *Streptococcus* testing, bioterrorism support, animal-borne disease detection and state-supported milk testing for dairy producers.

The Branch Laboratory is one of five regional laboratories in the state designated to perform DNA testing using real-time polymerase chain reaction technology, which extends and enhances current diagnostic capabilities. The Branch Laboratory is currently using this platform for West Nile virus surveillance.

Certification of Testing Laboratories

Certification of testing laboratories is under the oversight of federal authorities, such as:

- Centers for Medicare and Medicaid Services
- Clinical Laboratory Improvement Amendments (CLIA),
- Food and Drug Administration (FDA),
- Environmental Protection Agency Safe
- Drinking Water Act and state Board of Health rules and regulations.

These authoritative agencies establish quality standards of performance to ensure the accuracy, reliability and timeliness of patient test results that testing laboratories must meet to gain certification.

The Laboratory Services Division Certification Program conducts on-site inspections to ensure that testing laboratories meet established certification standards in 12 essential areas.

Standards for Laboratory Operations

The 12 essential elements of laboratory operations are

- personnel qualifications;
- standard operating manuals;
- analytical processes;
- proficiency testing;
- quality control;
- security;
- chain of custody processes;
- specimen retention;
- work and storage space;
- records;
- results reporting;
- quality assurance.





Proficiency Testing

As part of the certification process, laboratories are required to receive samples from professional testing organizations and analyze the samples, using the approved methods for which they hold certification, to demonstrate laboratory proficiency. The Certification Program reviews the results to verify the testing laboratory meets all criteria for initial or continued certification.

Certification by Laboratory Type

Drinking Water Laboratories

The Safe Drinking Water Act is the main federal law that ensures the quality and safety of drinking water for Americans.

Either the Environmental Protection Agency or the state in which testing is performed must certify laboratories that analyze drinking water samples for compliance with the Safe Drinking Water Act.

The Certification Program conducts on-site inspections every two years for in-state drinking water testing laboratories and select out-of-state laboratories.

A current list of certified "safe drinking water testing laboratories" is provided on the state website at www.coloradostatelab.us.

The Certification Program also collaborates with the Colorado Department of Public Health and Environment's Water Quality Control Division to stay abreast of new rules and regulations and reviews areas of these labs that are impacted by new changes to verify full compliance. Any change in test methods, or addition of new tests requires review by the state Certification Program.

Milk Laboratories

In July 1969, the U.S. Food and Drug Administration (FDA) assumed responsibility for assisting states in preventing disease transmitted through milk.

The FDA promotes and helps ensure compliance with the model Laboratory Quality Assurance Branch, Grade A Pasteurized Milk Ordinance (PMO), a document that is recommended for legal adoption by states, counties and municipalities to encourage a greater uniformity and a higher level of excellence of milk sanitation practice in the United States.

In the state Certification Program, a milk laboratory evaluation officer (LEO) evaluates and certifies dairy testing laboratories to ensure compliance with the FDA's Laboratory Quality Assurance Branch, Grade A PMO.

The LEO reviews the quality systems used by laboratories testing raw and finished milk products as well as dairy plants that perform antibiotic screening of bulk milk tankers.



Clinical Laboratories

Under the Clinical Laboratory Improvement Amendments (CLIA), a clinical laboratory is defined as any facility that performs testing on specimens derived from humans for the purpose of providing information for the diagnosis, prevention or treatment of disease; or impairment or assessment of health.

The U.S. Congress passed CLIA in 1988, establishing quality standards for all clinical-laboratory testing and placing all clinical laboratories under the authority of the amendments. The Centers for Medicare and Medicaid Services administer CLIA at the federal level. Clinical laboratories that receive Medicare or Medicaid payments must be CLIA-certified.

Colorado provides CLIA certification for in-state clinical laboratories. As part of the certification process, CLIA clinical laboratories are required to analyze proficiency-testing samples three times per year in the same manner and by the same individuals as those performing the patient testing.

The Certification Program conducts required on-site inspections every two years to ensure sustained compliance with CLIA requirements.

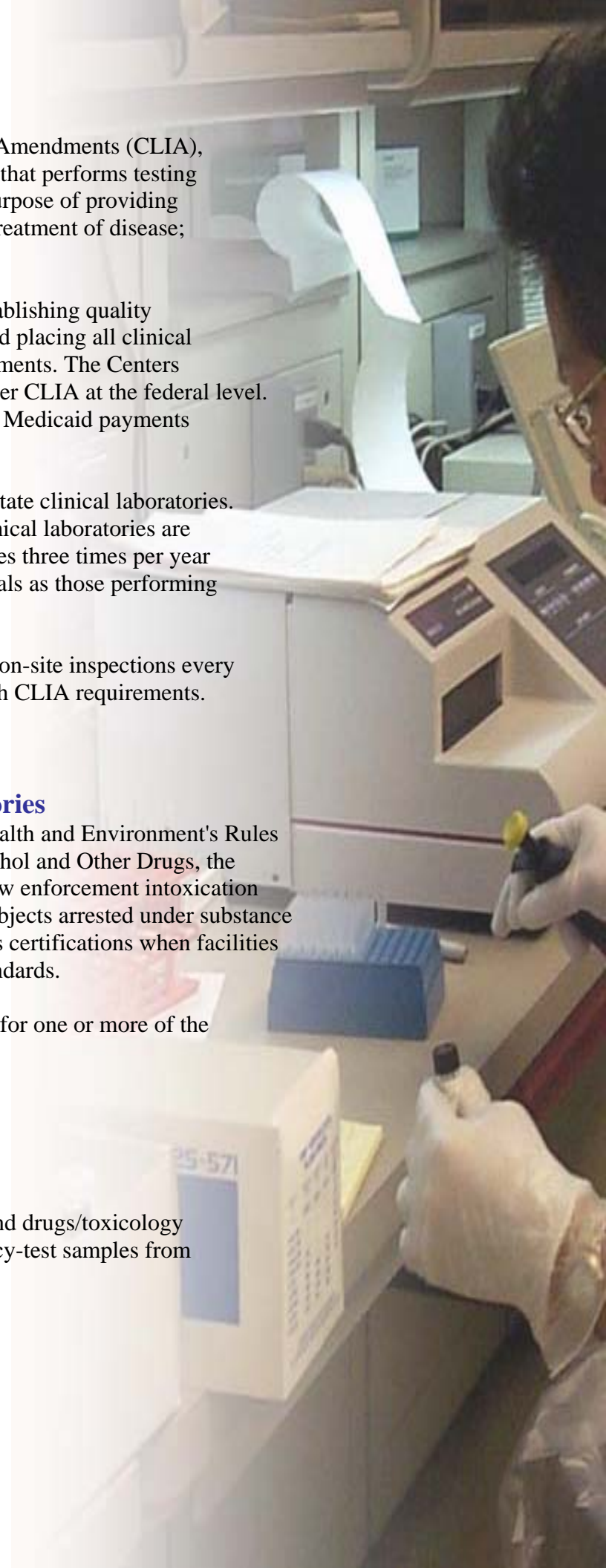
Alcohol and Drug/Toxicology Laboratories

Under the Colorado Department of Public Health and Environment's Rules and Regulations Concerning Testing for Alcohol and Other Drugs, the Certification Program annually inspects all law enforcement intoxication and drug laboratories that perform tests on subjects arrested under substance abuse laws as they relate to driving and issues certifications when facilities demonstrate compliance with department standards.

Forensic toxicology laboratories are certified for one or more of the following testing categories:

- blood alcohol
- blood drugs
- urine drugs
- post-mortem

As part of the certification process, alcohol and drugs/toxicology laboratories are required to analyze proficiency-test samples from commercial vendors three times per year.





Drug and Alcohol Testing

The Toxicology laboratory routinely analyzes blood and urine specimens for ethyl alcohol, drugs of abuse and volatile substances to assist law enforcement agencies in administering drinking and drugged driver laws. Several advances in drug and alcohol testing were realized during fiscal year 2007-08.

Benzodiazepines, widely prescribed medications affecting the central nervous system, are depressants that are commonly used to produce sedation, relieve anxiety and muscle spasms. Abuse frequently is associated with adolescents and young adults who take benzodiazepines to obtain a “high,” with the resulting intoxication diminishing inhibition and impaired judgment.

The Toxicology laboratory added Benzodiazepine quantitative testing from blood samples to its testing menu last year, enhancing support of law enforcement agencies protecting Colorado highways.

Three drugs, delta-9-tetrahydrocannabinol (THC), cocaine and amphetamines, greatly impact a user’s judgment and driving ability and pose a challenge for law enforcement agencies in ensuring safety to other motorists.

The Toxicology laboratory validated several test methods on blood samples last fiscal year, to detect THC, cocaine, opiates, amphetamines, and a gas chromatography-mass spectroscopy scan for the identification of prescription drugs, such as Ambien.

Additionally, the lab implemented a dual-column testing method for blood alcohol testing, utilizing the J&W DB-ALC1 and DB-ALC2 gas chromatograph columns, resulting in data collection without additional sample preparation that provides greater accuracy and efficiency and benefits law enforcement agencies with faster, more reliable results.

Protecting Colorado from Drunk Drivers

In Colorado, it is a misdemeanor for any person to drive a vehicle while under the influence of alcohol or drugs or both (driving under the influence, DUI) or while impaired by alcohol or drugs or both (driving while ability impaired, DWAI).

The Intoxilyzer 5000EN is the evidential breath alcohol testing instrument used by law enforcement agencies in Colorado to determine whether a person is driving under the influence of alcohol. The instrument measures a person's breath alcohol content, expressed in grams of alcohol per 210 liters of breath. The results from the Intoxilyzer 5000EN have been proven to be scientifically accurate and precise. Results generated by the Intoxilyzer 5000EN are the only breath testing results that are allowed as evidence in Colorado courts.

The rules governing the DUI/DWAI program in Colorado are the Rules Pertaining to Testing for Alcohol and Other Drugs (5 CCR 1005-2). These rules are established by the Colorado Department of Health and Environment and approved by the Colorado Board of Health.

Maintaining and Certifying Equipment

The division's **Evidential Breath Alcohol Testing (EBAT) program** routinely maintains, repairs, calibrates and annually certifies the Intoxilyzer 5000EN instruments for use by state law enforcement officers. The EBAT program also conducts on-site inspections annually to ensure instruments are being operated in an adequate environment.

Additionally, the EBAT program approves preliminary breath testing devices and ignition interlock devices. Law enforcement officers use preliminary breath testing devices to establish "probable cause" for arrest for driving under the influence of alcohol. However, the results generated by these devices are not considered of evidentiary quality and are not admissible as evidence in Colorado courts.

Training and Certifying Law Enforcement Officers

The EBAT program is responsible for certifying law enforcement officers operating the Intoxilyzer 5000EN to perform DUI testing on suspected drunk drivers. It is responsible for certifying those law enforcement officers who act as instructors, verifying their competency as qualified to teach their staff how to operate the equipment.

Intoxilyzer 5000EN operators undergo an initial certification process with the EBAT program and are subsequently re-certified by a qualified instructor at an approved law enforcement facility using the equipment. All records of certification for each instructor and operator are maintained at the law enforcement agency. Currently there are about 500 certified instructors and about 4,500 certified operators of the Intoxilyzer 5000EN in Colorado.



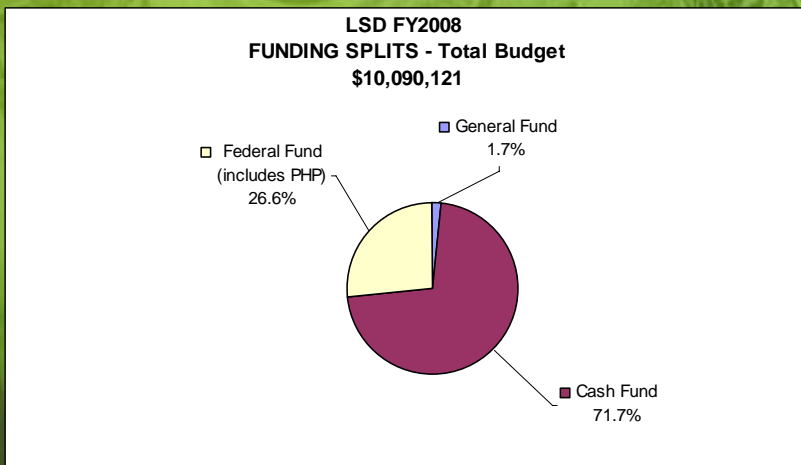
Overview of Fiscal Year 2007-08 Laboratory Funding

Federal grant funding and cash revenues, generated through fees for laboratory services, represent the main sources of funding for the operation of the Laboratory Services Division's programs.

After reviewing the fee structure cash revenues and fiscal year 2008 budget requirements, the Laboratory Services Division elected to continue most FY2009 environmental testing fees at the same level as FY2008 pricing. The fee structure in the Certification Program was adjusted to reflect nationwide industry standards, while the Toxicology Program fees were revised to reflect the addition of blood drug testing.

Cash Revenues by Program Fiscal Year 2007-08	
Laboratory Program	Revenues
Certification	\$92,685
Public Health Micro (inc Chlamydia)	\$324,296
Toxicology	\$484,063
Chemistry	\$329,940
EBAT	\$3,180
ENV Micro	\$208,900
Serology (inc HIV)	\$141,470
Molecular/Virology	\$177,727
NBS	\$3,774,894
Total Fee Revenues	\$5,537,155
Other Cash Revenues by Source	
Law Enforcement Assistance Fund (LEAF)	\$758,068
Water Quality Control Division (WQCD)	\$537,237
Air Pollution Control Division (Odor School)	\$7,079
Miscellaneous Other Cash	\$68,452
Total Other Cash	\$1,370,836
Total Cash Revenues	\$6,907,991

Grants Received Fiscal Year 2007-08	
Grant Provider	
Public Health Emergency Preparedness (PHP)	
Epidemiology and Laboratory Capacity	
Tuberculosis Elimination and Laboratory Program	
Emerging Infections Programs	
Pandemic Influenza Grant	
Public Health Biomonitoring Planning Grant	
Refugee Preventive Health Grant	
Public Health Laboratory Interoperability Program	
Preventive Health and Health Services Block Grant	
Clinical Laboratory Improvement Amendments	
Disease Control and Environmental Epidemiology Division (DCEED)– Hepatitis C Serosurveillance Testing	
DCEED – Syphilis Serology Grant	
DCEED – Human Immunodeficiency Virus Grant	
Hazardous Waste and Waste Management Division (Rocky Flats)	
Prevention Services Division (Fluoride)	
*The entities listed above provide grant funds that vary in amount and duration to support the Laboratory's public health functions	



Expenditures – Fiscal Year 2007-08	
Total Indirect Paid	\$1,220,316
Total Personal Services	\$5,927,363
Total Operating	\$2,981,464
Total Expenditures	\$10,129,142

Appendix A: Workload Reports

Workload reports represent laboratory work performed during state fiscal years.

Fiscal year (FY) 07 = July 1, 2006 - June 30, 2007

Fiscal year (FY) 08 = July 1, 2007 - June 30, 2008

INORGANIC CHEMISTRY	FY 07	FY 08
<u>Sample Submitter</u>	<i>Number of Tests Performed</i>	
Hazardous Materials	34	4
Water Quality Control Division - River/Streams	23,493	21,546
Water Quality Control Division - Tech Services	139	202
Cash - Municipal	6,641	7,866
Cash - Private	4,462	6,677
Dental Health	753	724
Consumer Protection	53	21
Air Pollution	0	0
Colorado Geological Survey	0	0
Human Biomonitoring	384	120
Other Tests	413	452
Quality Control Audits	93	161
Total Analyses	36,465	37,773
Total Number of Specimens	5,775	5,499

ORGANIC CHEMISTRY	FY 07	FY 08
<u>Sample Submitter</u>	<i>Number of Tests Performed</i>	
Hazardous Waste	17	0
Water Quality Control Division - River/Streams	11	154
Water Quality Control Division - Tech Svcs	0	121
Cash - Municipal	1,849	1,294
Cash - Private	192	239
Dental Health	0	0
Consumer Protection	14	6
Air Pollution	0	0
Other Tests	75	32
Quality Control Audits	45	62
Total Analyses	2,203	1,908
Total Number of Specimens	324	430

RADIOCHEMISTRY	FY 07	FY 08
<u>Sample Submitter</u>	<i>Number of Tests Performed</i>	
Cash Funded	228	754
Rocky Flats Program	95	0
Hazardous Materials (non-Rocky Flats)	138	24
Water Quality Control Division	258	578
Other Agencies	202	18
Quality Control Audits	21	12
Total Analyses	942	1,386
<u>Radiation Counting Facility Analyses</u>	<i>Number of Tests Performed</i>	
C-14	14	12
Gamma Spectroscopy	71	31
Gross Alpha/Beta water	108	492
Gross Alpha/Beta contamination survey	244	236
Ni-63 Contamination surveys	17	18
Radon 222	36	103
Radium 226	72	183
Radium 228	97	189
Americium 241	17	3
Plutonium-238/239	20	3
Isotopic thorium	54	11
Isotopic uranium	173	180
Total uranium	49	131
Whole Body Counts	9	18
Quality Control Audits	51	7
Total Analyses	1,032	1,617

TOXICOLOGY	FY 07	FY 08
<u>Analytical Services</u>	<i>Number of Tests Performed</i>	
Blood Alcohol	5,524	5,598
Methamphetamine Wipes	31	19
Blood Drug Analyses*	1,855	4,142
Confirmations	276	651
Urine Analyses	18,895	19,310
Confirmations	3,541	3,091
Total Specimens Received	8,175	8,214
Total Analyses (includes confirmations)	30,122	32,811
QA/QC	N/A	12
Total Analyses	30,122	32,823
*Blood drug testing implemented in June 2006.		
<u>Other Services</u>		
Court Appearances	95	152
Litigation Packages	385	367

Appendix A: Workload Reports

MOLECULAR & VIROLOGY	FY 07	FY 08
Molecular Typing**	<i>Number of Tests Performed</i>	
Pulsed Field Gel Electrophoresis		
<i>Burkholderia cepacia</i>	0	0
<i>E. coli</i> O157	72	108
other <i>E. coli</i> STEC	25	57
<i>Klebsiella</i>	0	0
<i>Legionella pneumophila</i>	0	0
<i>Listeria monocytogenes</i>	16	5
Methicillin-resistant <i>Staph aureus</i>	176	70
<i>Pseudomonas aeruginosa</i>	0	0
<i>Salmonella</i>	587	747
<i>Shigella sonnei</i>	179	62
<i>Shigella flexneri</i>		49
<i>Shigella boydii</i>		1
<i>Streptococcus</i>	0	0
Other	43	29
Total Molecular Typing	1,098	1,128
<i>**Influenza testing method changed to PCR in FY05, with full implementation 7/07</i>		
Polymerase Chain Reaction (PCR)	<i>Number of Tests Performed</i>	
Anthrax	11	2
Positive	0	0
<i>Brucella spp.</i>	19	17
Positive	6	1
<i>Burkholderia spp.</i>	7	0
Positive	0	0
Influenza A	315	202
Positive	0	100
Influenza B	309	180
Positive	14	20
Mumps	N/A	8
Positive	N/A	1
Norovirus	559	1339
Positive	183	442
Pertussis	842	633
Positive	50	17
Plague	538	227
Positive	4	5
Ricin	7	1
Positive	0	0
Respiratory Syncycial Virus	N/A	7
Positive	N/A	5
Shigella	N/A	10
Positive	N/A	0
St Louis Encephalitis	459	331
Positive	0	0
Tularemia	521	212
Positive	25	9
Varicella-Zoster Virus	1	0
Positive	0	0
Variola	2	0
Positive	0	0
West Nile, RT-PCR		
Bird/Mosquito Specimens	3,032	1,854
Positive	249	35
Human	129	1
Positive	29	0
Western Equine Encephalitis	N/A	330
Positive	N/A	0
Total Polymerase Chain Reaction	6,751	5,354
Total Polymerase Chain Reaction Positives	560	635
DNA Sequencing*		30
<i>*DNA Sequencing added in FY2008.</i>		

PUBLIC HEALTH MICROBIOLOGY	FY 07	FY 08
<i>Campylobacter</i> Cultures	207	221
Isolates	174	107
<i>Campylobacter</i> Confirmations	45	45
Isolates	27	31
Chlamydia and Gonorrhea Tested by Aptima	37,147	17,550
Positives	1,355	1,314
GC (Gonorrhea) Positive	79	56
CT (Chlamydia) Positive	1,174	1,211
CT & GC Positive	102	47
Enteric Culture Specimens	1,098	2,014
Enteric Isolates:		
<i>Salmonella</i> Positive	620	756
<i>Shigella</i> Positive	223	125
<i>E. coli</i> O157 Positive	89	197
Neisseria Specimens	24	16
Isolates:		
<i>N. gonorrhoeae</i>	2	0
<i>N. meningitidis</i>	22	15
<i>Ova and Parasite</i> Testing		
Specimens Examined	1,003	1,506
Positives	359	724
Reference Bacteriology		
Miscellaneous Cultures	754	1,258
<i>Y. pestis</i> (Plague)	169	90
<i>Y. pestis</i> (other)	6	14
<i>V. cholerae</i> (Vibrio)	22	23
<i>Francisella tularensis</i> (Tularemia)	182	95
<i>B. anthracis</i> (Anthrax)	21	16
Total Reference Identifications	1,154	1,496
Positives	176	139
Specimens Sent to the CDC		
Specimens Submitted	187	161
Positives	73	39
Streptococcus Cultures		
Specimens (Group A, Group B, Strep pneumoniae)	635	707
Positives	3	0
Tuberculosis Specimens	1,779	1,146
Isolates:		
<i>M. tuberculosis</i> Complex	14	13
Avium Complex	0	0
Smear Positive	59	49
Culture Positive	85	87

SEROLOGY	FY 07	FY 08
<i>Plague - Animal</i>		
Total Plague specimens	502	1
Testing Positive	61	0
<i>Plague - Human</i>		
Total Plague specimens	18	0
Testing Positive	2	0
<i>Rabies</i>		
Specimens Examined	800	692
Specimens with bite exposure	309	326
Specimens testing positive	59	40

Appendix A: Workload Reports

SEROLOGY	FY 07	FY 08
ELISA Serology		
Measles IgM	3	3
Positive	0	0
Mumps IgM	1	0
Positive	0	0
West Nile Virus	129	125
Positive	29	13
Hantavirus		
Human IgG	122	183
Reactive	3	2
Human IgM	122	184
Reactive	9	9
Rodent IgG	0	0
Reactive	0	0
Total ELISA Analyses	377	495
Total ELISA Positives	41	24
Febrile Serology		
Brucella	156	14
Positive	0	2
Tularemia	0	0
Positive	0	0
Total Febrile Analyses	156	14
Total Febrile Positives	0	2
Hepatitis Serology		
Hepatitis A	6	7
Reactive	0	0
Hepatitis B Surface Antigen (HBsAG)		
Refugee sera	394	704
Reactive *	N/A	N/A
Non-refugee sera	228	98
Reactive	32	54
Anti-Hepatitis B Surface Antibody (Anti-HBs)		
Refugee sera	395	704
Reactive *	N/A	N/A
Non-refugee sera	224	52
Reactive	237	274
Hepatitis B Surface Antigen (HBsAG), Neutralization		
Refugee sera	24	54
Reactive *	N/A	N/A
Non-refugee sera	9	0
Reactive	26	54
Hepatitis C	478	438
Reactive	6	0
Total Hepatitis Analyses	1,752	2,050
Total Hepatitis Reactives	307	389

*Included with reactives for non-refugee sera

SEROLOGY	FY 07	FY 08
Human Immunodeficiency Virus		
ELISA		
Serum**	2,398	1,210
DBS	N/A	N/A
Oral Fluid	3,598	1,814
Total ELISA reactive	121	142
HIV-1 RNA, TMA (pooled)		7,509
HIV-1 RNA, TMA (non-pooled)		146
Reactive		13
HIV-1, 2 plus O EIA		1,994
Reactive		54
HIV-1/2 Multispot		15
Reactive		0
Western Blot	355	19
Total WB positive	233	18
HIV-2	50	52
HIV reactive	0	11
Total HIV Analyses	6,401	12,759
Total HIV Reactive	354	238
<i>**On-site rapid testing initiated in 2004 causing HIV specimens to decrease.</i>		
IFA Serology		
Rocky Mountain Spotted Fever***	0	1
Positive	0	0
Legionella pneumophila	0	0
Positive	0	0
Colorado Tick Fever***	0	0
Positive	0	0
Coxiella burnetti (Q Fever)		
Phase I	5	0
Phase I Positive	0	0
Phase II	5	0
Phase II Positive	2	0
Total IFA Serology Analyses	10	1
Total IFA Serology Positives	2	0
<i>***Transferred to CDC sendouts in FY07</i>		
Rubella Serology		
Premarital Specimens Total	N/A	N/A
Specimens with titer <1:10	N/A	N/A
Miscellaneous	N/A	N/A
Positive	N/A	N/A
Specimens Sent to the Centers for Disease Control		
Specimens Submitted	92	96
<i>Labs send specimens to CDC for investigation of viral, bacterial and mycology agents</i>		
Syphilis Serology		
Routine RPR	12,106	12,536
Reactive	342	372
VDRL (Spinal Fluid)	253	255
Reactive	4	9
VDRL (non-Spinal Fluid)	5	8
Reactive	0	8
FTA	1,216	1,454
Reactive	497	538
Titer	339	344
Reactive	263	322
Total Syphilis Analyses	13,919	14,597
Total Syphilis Reactive	1,106	1,249
Virus Complement Fixation		
Number of Specimens		
Paired sera	0	0
Single sera	0	0
Total VCF Analyses	0	0

Appendix A: Workload Reports

ENVIRONMENTAL MICROBIOLOGY	FY 07	FY 08
<i>Water Analyses</i>		
Drinking Water Specimens		
Private Specimens	1,588	1,511
Municipal Specimens	4,764	4,532
Miscellaneous Tests in Drinking Water (Confirmation, Fecal, Strep, Coliform)	30	182
Waste Water		
Sewage Effluents Analyses	168	207
Stream Pollution Study Specimens	632	778
Miscellaneous Analyses (Confirmation, Fecal, Strep, Coliform, Legionella)	4	8
Total	7,186	7,217
QA/QC		
Total Water Analyses	7,186	7,217
<i>Food Analyses</i>		
Food Samples	679	643
Total Food Analyses	N/A	2,280
QA/QC	N/A	224
Total Food Analyses	N/A	2,504
<i>Milk Analyses*</i>		
Finished Milk	1,369	1,460
Raw Milk	288	312
Coliform (Plate count for total coliform bacteria)	1,348	1,438
DMSCC (Direct Microscopic Cell Count)	210	216
Freezing Point (test for added water)	197	207
Inhibitors (test for antibiotics in milk)	1,058	1,116
Phosphatase (test for complete pasteurization)	999	1,043
Standard Plate Count (total bacterial content of milk)	1,323	1,427
%Fat	978	1,045
Total Milk Tests	6,113	6,492
QC	540	525
Total Milk Analyses	6,653	7,017


CERTIFICATION PROGRAM	FY 07	FY 08
<i>Laboratory Certifications</i>		
CLIA Laboratory Certifications	207	229
<i>Number of laboratories cited for deficiencies</i>	175	180
NCIMS Certifications	8	8
Drug Residue Certifications (LEAF)	13	11
MQSA Inspections	12	12
<i>Safe Drinking Water (SDW) Act</i>		
Radiochemistry Certifications	2	1
Microbiology Certifications	28	28
Chemistry Certifications	19	19
<i>Number of SDW laboratories cited for deficiencies</i>	40	38
Desk Survey Reviews (in-state)	47	97
Desk Survey Reviews (out-of-state)	44	44
TOTAL SURVEYS	380	449

EVIDENTIAL BREATH ALCOHOL PROGRAM	FY 07	FY 08
<i>Alcohol Test Program (LEAF)</i>		
Technical and Court Assistance/Expert Testimony	770	575
Alcohol standard solutions	2,040	2,400
Breath test operator/instructor certification	4,648	4,104
Instrument Certification	480	378
Facility on-site inspections	105	112
Number of facilities cited for deficiencies	78	47
Proficiency Testing/QA	457	80
Certified record and subpoenas processed	1,080	838
Alcohol Class Kits Prepared	157	215

NEWBORN SCREENING	FY 07			FY 08		
Submitter State	Specimen Totals	2nd Screens	Total Analyses	Specimen Totals	2nd Screens	Total Analyses
Colorado	70,165	65,578	2,493,831	70,707	64,939	2,505,076
Initial	7,254	5,164	246,514	7,157	6,071	250,050
Wyoming	4,756	2,526	155,606	3,845	1,842	124,399
Other States/Territories						
Total	82,175	73,268	2,895,951	81,709	72,852	2,879,525
QA/QC	4,400	4,000	8,400	4,400	4,000	8,400
Total Analyses	86,575	77,268	2,904,351	86,109	76,852	2,887,925

Total Newborn Screening Abnormal Results	FY 07	FY 08
Congenital Adrenal Hyperplasia1	814	779
Hemoglobin Abnormals	2,920	3,298
Phenylketonuria Abnormals	66	62
Biotinidase Deficiency Abnormals	204	304
Hypothyroidism Abnormals	741	1,572
Cystic Fibrosis Abnormals	179	276
Galactosemia Abnormals	3	3
MS/MS		423
Total Abnormal Results	4,927	6,717

Appendix A: Branch Lab Workload Reports

GRAND JUNCTION BRANCH LAB		
	FY 07	FY 08
Environmental Microbiology		
Water Bacteriology		
Samples Tested	3,283	4,147
QA/QC	97	160
Milk Bacteriology		
Samples Tested	612	875
QA/QC	458	364
Total Environmental Microbiology	4,450	5,546
Public Health Microbiology (Mesa County Revenues - effective FY2005)		
Streptococcus Cultures		
Specimens	2,485	2,343
Positives	612	478
Neisseria		
Specimens	0	0
Positives	0	0
Plague DFA		
Specimens		1
Positives		0
Plague PCR		
Specimens		1
Positives		0
Syphilis Serology (RPR)		
Specimens	123	142
Positives	0	0
Tularemia Culture		
Specimens		1
Positives		0
Tularemia PCR		
Specimens		1
Positives		0
Chlamydia Specimens1		
Tested by DNA Probe	0	0
Positive	0	0
West Nile		
Bird/Mosquito Specimens	465	262
Positive	45	14
Yersinia Culture		
Specimens		1
Positives		0
QA/QC		316
Total PH Microbiology/ Serology	3,073	3,068
Total PH Microbiology/ Serology Positives	657	492

References

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- ²CDC STD Surveillance 2006 – National Profile Syphilis <http://www.cdc.gov/std/stats/syphilis.htm>
- ³Synthetic Organic Compounds in Water-Wisconsin Department of Natural Resources <http://dnr.wi.gov/org/water/dwg/OpCert/HTML/chapter4/contam6.htm>
- ⁴Water and Wastewater Security Product Guide – EPA http://cfpub.epa.gov/safewater/watersecurity/guide/productguide.cfm?page=radiation_detectionequipment2
- ⁵Sulfate in Drinking Water – EPA <http://www.epa.gov/safewater/contaminants/unregulated/sulfate.html>
- ⁶Department of Health and Human Services - Agency for Toxic Substances & Disease Registry <http://www.atsdr.cdc.gov/tfacts114.html>
- ⁷U.S. Food and Drug Administration <http://www.cfsan.fda.gov/~dms/cos-nail.html>
- ⁸Arsenic in Drinking Water – EPA <http://www.epa.gov/safewater/arsenic/basicinformation.html>
- ⁹National Institute of Standards and Technology (NIST) News Release http://www.nist.gov/public_affairs/releases/plutonium.html#10

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