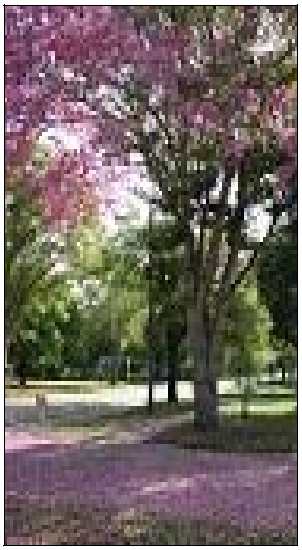

Rapid Detection for the Public's Protection

LABORATORY SERVICES DIVISION
COLORADO DEPARTMENT of PUBLIC HEALTH and ENVIRONMENT

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The Laboratory Reporter

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Inside this issue:

Cystic Fibrosis Screening by Gene Mutation Analysis

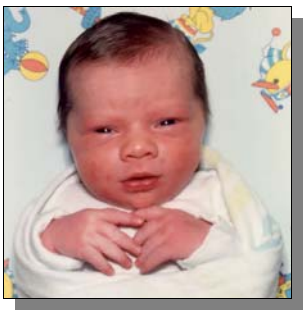
by *Dan Wright,* Newborn Screening Program Manager

In 1982, the Laboratory Services Division added cystic fibrosis (CF) testing to the newborn screening panel of tests. In 1996, this test was added to the newborn screening second panel of tests.

The laboratory method used to test for CF was immunoreactive trypsinogen (IRT). This test detects pancreatic insufficiency, which is most commonly associated with cystic fibrosis in newborns.

If an elevated IRT test result is reported, the infant should have a sweat chloride test to confirm the diagnosis of cystic fibrosis.

The IRT method has been used to screen 1,153,000 infants, detecting 315 positives, for an incidence rate of 1 in 3,663 births. Ten percent of the CF-positive infants may be identified as carriers" (normally 3 percent of the population). Over 20 years of using this method, a false negative rate of 5.4 percent has been observed. In addition to the challenge of false negatives, confirming an abnormal IRT screen result by sweat chloride testing can take up to 30 days.



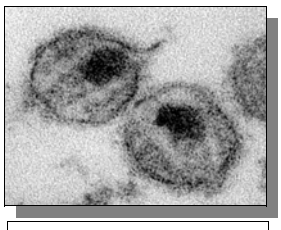
In an effort to address this delay in CF confirmation and reduce the rate of false negatives, the Laboratory Services Division is moving to a combined screening employing both IRT and gene mutation analysis. In Colorado, 92 percent of newborns diagnosed with cystic fibrosis display a mutation of the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

(Continued on page 3)

Changes in HIV-1 Reporting With Implementation of a More Sensitive EIA

by *Laura Gillim-Ross,* PhD, Public Health Microbiology/Serology Supervisor

With the development of new, more sensitive assays for the detection of HIV, public health laboratories around the country are re-evaluating their HIV diagnostic testing algorithms.



Electron micrograph of two *"human immunodeficiency virus"* (HIV) virus particles
CDC/ Dr. A. Harrison; Dr. P. Feorino

The Colorado Department of Public Health and Environment laboratory has validated a new enzyme immunoassay (EIA) capable of detecting antibodies against HIV-1 (Groups M and O) and HIV-2 in patient sera as early as three weeks post-infection.

All specimens received by the laboratory for HIV testing will be screened using the new EIA, and Western blot analysis will be used to confirm any specimen testing positive in the EIA.

(Continued on page 4)

Chemistry Contaminant Corner

by *Laurie Peterson-Wright,* Chemistry Program Manager/Chemical Hygiene Officer

What are nitrates?

A nitrate group is made up of one nitrogen and three oxygen atoms. When ingested, nitrate is converted by bacteria in the gastrointestinal tract to form nitrite, which is made up of one nitrogen and two oxygen atoms.

Nitrates are very soluble and have a high potential to migrate to ground water. Because they do not evaporate, nitrates/nitrites are likely to remain in water until consumed by plants or other organisms.

"Babies have more exposure to nitrates because they consume large quantities of water relative to their body weight."

Where do nitrates come from?

Most nitrogen-containing materials in natural waters tend to be converted to nitrate. Primary sources of organic nitrates include human sewage and livestock manure, especially from feedlots. The primary inorganic nitrates that may contaminate drinking water are potassium nitrate and ammonium nitrate, both of which are widely used as fertilizers.

How can nitrates get into my drinking water?

Nitrate can get into your drinking water from runoff or seepage into groundwater from farms, golf courses, home lawns and gardens. Other sources of nitrate and nitrite in water include landfills, poorly managed animal feedlots and faulty septic systems.

How can I be exposed to nitrate?

Eighty to 90 percent of the nitrate most people consume comes from vegetables, but this is unlikely to cause health problems because very little of the nitrate in vegetables is converted to nitrite. Meat products account for less than 10 percent of nitrate in the diet, but 60 to 90 percent of the nitrite consumed, primarily because sodium nitrite is added to foods such as hot dogs, bacon and ham. Fruits, grains and dairy products contribute almost no nitrate or nitrite to people's diets. Usually, water is the source of a negligible percentage of an adult's nitrate intake. Nitrates and nitrites in water are not a health concern when showering or bathing.

What are the health effects of nitrates and nitrites?

Short-term exposure to drinking water with nitrates is a potential health problem, primarily for infants. The serious illness, methemoglobinemia or "blue baby" syndrome, in infants is due to the conversion of nitrate to nitrite by the body, which can interfere with the oxygen-carrying capacity of the child's blood.

Babies have more exposure to nitrates because they consume large quantities of water relative to their body weight, especially if water is used to mix powdered or concentrated formulas or juices. Also, their immature digestive systems have lower levels of enzymes that keep the conversion in balance. Symptoms include shortness of breath and blueness of the skin.

Other people who are more susceptible to nitrate/nitrite methemoglobinemia are pregnant women, individuals with reduced gastric acidity and individuals with a hereditary lack of methemoglobin reductase.

(Continued on page 5)

Cystic Fibrosis Screening by Gene Mutation Analysis

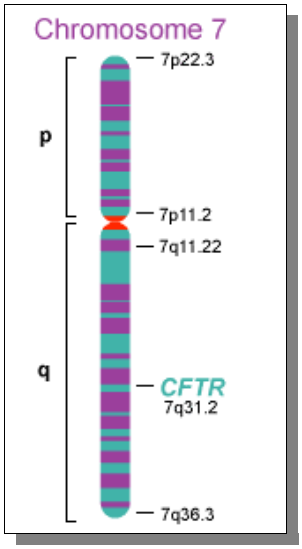
(Continued from page 1)

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.

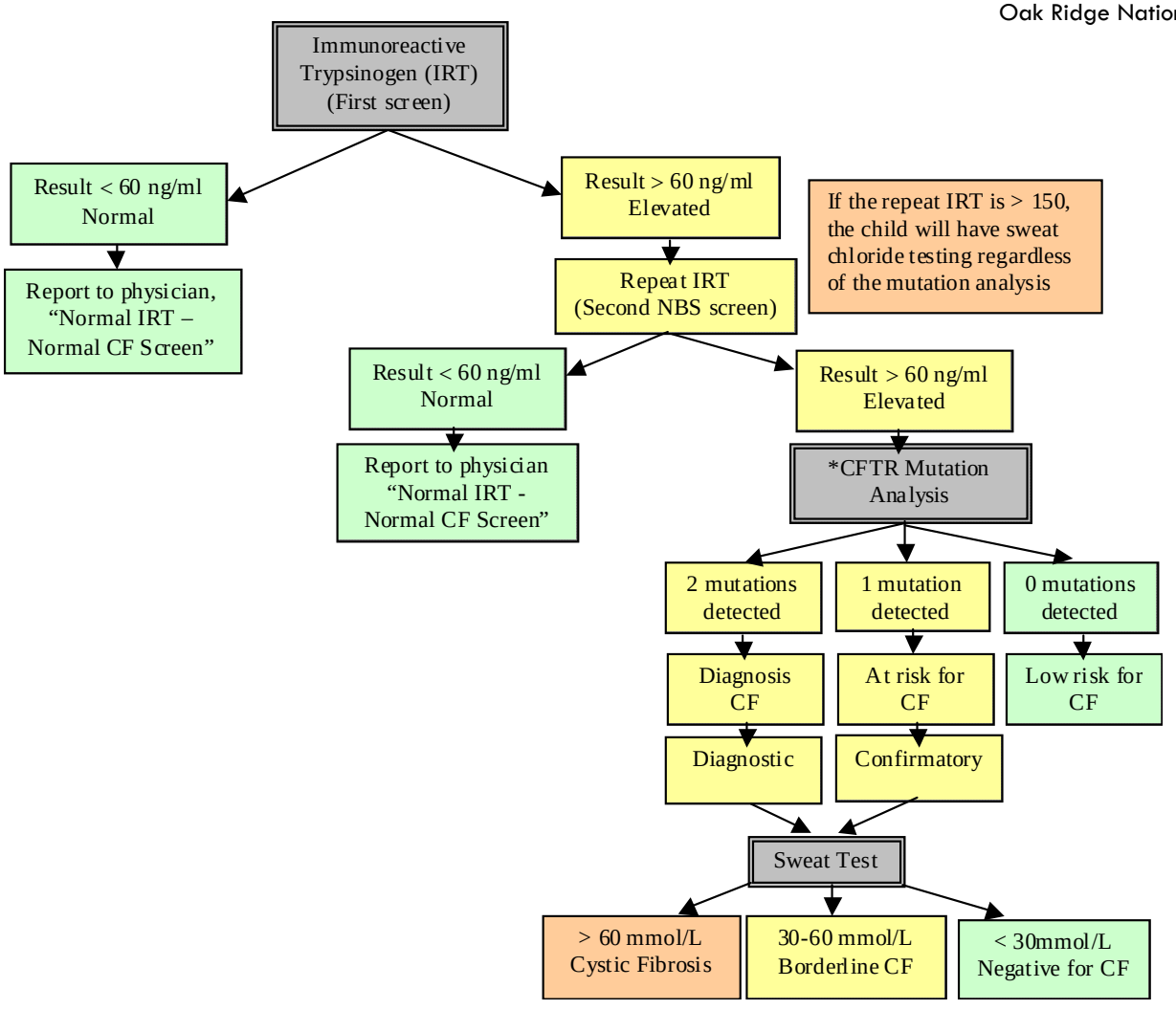
By employing technology that detects these mutations, a new screening algorithm was developed, and approved by the Board of Health, that will reduce both false negatives and false positives, thereby minimizing associated genetic counseling needs, reducing parental stress and reducing the cost of screening and follow-up.

In the new IRT/IRT/DNA screen, the first screen IRT cutoff will be decreased from 105 ng/ml to 60 ng/ml, first and second screen specimens will be linked for each newborn, and the second screen will be tested only if the first screen result is greater than 60 ng/ml. Testing for a DNA mutation will occur if both screens have an IRT greater than 60 ng/ml.

The new testing algorithm used by the laboratory will be as follows:

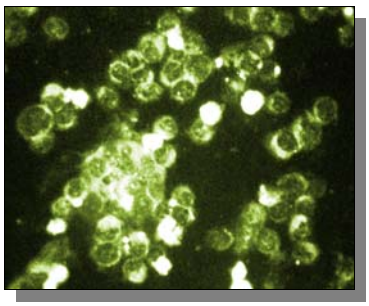


CFTR = The Gene Associated with Cystic Fibrosis
Photo credit:
Oak Ridge National Lab



Respiratory Syncytial Virus

by *Kimberly Keene,* PhD, Virology Scientist



Respiratory syncytial virus (RSV) using indirect immunofluorescence technique

Photo credit: CDC
CDC/ Dr. H. Craig Lyerla

Respiratory Syncytial Virus, or RSV, is a respiratory virus most frequently seen among children younger than 3 years old. Most children will have a RSV infection at some point in the first few years of life. The symptoms of RSV infection can include fever, runny nose, cough and wheezing. According to the Centers for Disease Control and Prevention, between 25 and 40 percent of children's symptoms will progress to bronchiolitis (swelling of the airways in the lungs) or pneumonia. Each year, up to 2 percent of children infected require hospitalization. In rare cases, death can occur.

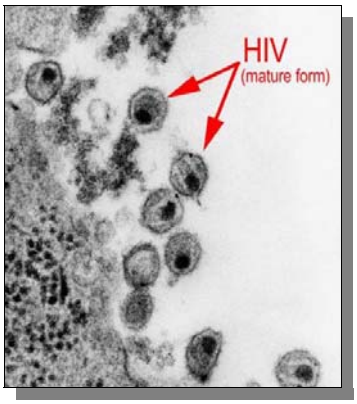
"Most children will have a RSV infection at some point in the first few years of life."

Currently, there is no vaccination available to prevent this disease. Once a child is infected, the only treatment options are supportive care such as acetaminophen (to reduce fever) or oxygen therapy. To prevent the spread of RSV, people can take precautions such as frequent hand washing and discouraging the sharing of utensils, cups and toys can be utilized.

The peak of RSV season is from late fall to early spring.

The Molecular Sciences Laboratory at the Colorado Department of Public Health and Environment now performs testing for RSV on a fee-for-service basis. The method is a real-time reverse-transcriptase polymerase chain reaction (RT-PCR) test that can detect whether the virus is present in a patient nasal wash specimen. Turn-around time for this test generally is one business day.

For questions regarding specimen collection or testing fees, please call Dr. Kimberly Keene at 303-692-3486 or the Molecular Sciences Lab at 303-692-3286.



Mature forms of the *human immunodeficiency virus* (HIV) in a tissue sample.
Photo credit: CDC

Changes in HIV-1 Reporting With Implementation of a More Sensitive EIA

(Continued from page 1)

Western blot analysis is not able to detect antibodies against HIV-1 until at least six weeks post-infection, three weeks later than the EIA. Therefore, it is possible that results from the EIA and Western blot analysis may disagree if the patient serum is collected earlier than six weeks post-infection.

The laboratory will report the EIA and western blot test results on separate lines of the report, and will include a note in the comments section explaining that any discrepancy between results may be due to differences in the sensitivity of the two tests.

The laboratory will continue to offer HIV-2 EIA and Western blot analysis as individual tests.

Please contact Dr. Laura Gillim-Ross (303-692-3484) if you have questions regarding testing or results interpretation.

Chemistry Contaminant Corner

(Continued from page 2)

Nitrite also can form a variety of nitrosamines by reacting with proteins in the stomach. Some of these compounds have been found to cause cancer in animals, but the data is inadequate at this time to determine whether exposure to nitrate and nitrite in drinking water can result in human cancer.

Long-term exposure to nitrates and nitrites has the potential to cause increased urine output and increased starchy deposits and hemorrhaging of the spleen.

What are the drinking water regulations?

In 1962, the U.S. Public Health Service recommended a permissible level equal to 10 parts per million (ppm) of nitrate-nitrogen in drinking water. Since this standard takes available health effects information into account, infants are unlikely to have methemoglobinemia caused by drinking water that contains nitrate at or below this level. This level is the same as the federal maximum contaminant level (MCL) established by the U.S. Environmental Protection Agency and adopted by the Colorado Department of Public Health and Environment. The MCL for nitrite-nitrogen is 1 ppm.

How do I know if nitrates and nitrites are in my water?

If the levels of nitrate or nitrite exceed their MCLs, your public water system must notify you.

Where can I get my water tested for nitrate?

Public water supplies in Colorado are tested for nitrate every 1-3 years depending on the source water groundwater or surface water) and classification of the system. You should be able to get the results of tests from your water supplier.

If you use a private water supply, there are no routine tests done for nitrate. You can get your water tested for nitrate/nitrite at the state's Chemistry Laboratory. Call 303-692-3048 for a sample kit.

How can I lower the nitrate level in my current water supply?

If your drinking water sample tested above the MCL for nitrates and you or someone else in your home is at risk of developing health problems due to high nitrates, it is recommended that you do not drink the water. Find a safe, alternative water supply until you decide on a more permanent solution. Another possibility is to try to remove or reduce the source of nitrate contamination. There are no simple ways to remove nitrate from water in the home.

Distillation, reverse-osmosis and anion-exchange units can remove nitrates, but each has its specific limitations. Another possibility is to try to remove or reduce the source of nitrate contamination.

Contacts For More Information

U.S. Environmental Protection Agency
Safe Drinking Water Hotline
(800) 426-4791,
www.epa.gov/safewater

NSF International (800) 673-6275,
www.nsf.org

Colorado Department of Public Health and Environment, Drinking Water

"Public water supplies in Colorado are tested for nitrate every 1-3 years ."

Colorado Department of Public Health and Environment

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Monday through Friday
Closed holidays.

Mission

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

Testing Services Include:

Drinking water testing (lead, nitrites and more)
Newborn Screening (38 disorders)
Tuberculosis, Parasite Identification, Confirmation of food poisoning bacteria (and more)
Human Immunodeficiency Virus (HIV)
Influenza (and other respiratory viruses)
Preparedness (Anthrax, Plague, and more)
Food and Milk Bacterial Contaminants
Visit our website for more information:
www.cdphe.state.co.us/lr

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Calendar of Training Events

More information and registration at: www.peopleware.net/1885a
Training below offered at the State Public Health Lab unless otherwise noted

Toxicology Training—Z drugs

May 22nd—4 p.m. - 5 p.m.

Epidemiology and Clinical Presentation of Pertussis

June 10th—11 a.m. - 12 p.m.

Trends in Laboratory Diagnosis of Leishmaniasis

September 30—11 a.m. - 12 p.m.

State Public Health Laboratory Plays Key Role in Alamosa Water Investigation

by *Hugh Maguire,* PhD, Public Health Microbiology Program Manager

The Laboratory Services Division was one of many state agencies that collaborated during the investigation into the waterborne outbreak of *Salmonella* infection centered in the town of Alamosa, Colorado. Investigations began following an increase in patient cases of *Salmonella* infection reported by the San Luis Valley Medical Center.

The state public health laboratory scientists performed serological testing to further identify the causative bacterium as *Salmonella typhimurium*. Patient samples also were tested for other bacteria known to cause illness from contaminated water or food, such as *Cryptosporidium*, *Giardia*, *E. coli* and *Norovirus*, but none of these bacteria could be detected.

After further investigation revealed a possible contamination of the city's water supply, the state public health laboratory scientists obtained water samples from multiple sites throughout the water supply system and discovered *Salmonella typhimurium* in the water, similar to that found in patient specimens.

Additional laboratory testing identified that both the *Salmonella* found in the water supply and in the patient specimens were identical, demonstrating the cause of the illness outbreak as the public water supply.

The Centers for Disease Control and Prevention also assisted in testing the Alamosa water supply and, in addition to detecting *Salmonella*, also detected *Giardia* and *Cryptosporidium*, two protozoan parasites that cause diarrhea if ingested.

One hundred and eleven patient cases have been confirmed as *Salmonella typhimurium* by the state laboratory, and an investigation into the source of the *Salmonella* in the water system is ongoing. There have been no restrictions on use of city water since April 11.