

Scientific Laboratory Division News

Spring 2009

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From the Director David Mills, Ph.D., HCLD

We were very pleased at the enthusiastic response to our inaugural newsletter, and we appreciate the comments and feedback we received. In the future, we will do our best to provide a mix of topics in each issue that will be of interest to our broad range of clients across the state. If you have suggestions for articles that you think would be of interest to our readers, I would welcome your suggestions. We also welcome suggestions for our distribution list—if you know of someone who might benefit from the newsletter, please email me their email address and I will add them to our list.

For those of you who have not already heard the news, the SLD and its co-tenants of the current laboratory building (the NM Department of Agriculture Veterinary Diagnostic Services and the NM Office of the Medical Investigator), will be moving into a new facility in early 2010. You can see the new 5-story facility, currently under construction, immediately to the east of I-25, just south of Indian School Road. The new facility, which will almost double the SLD's current space, will have state-of-the-art laboratories that are well designed for the latest molecular and chemical analytical procedures, while providing a safe and secure environment for our laboratory scientists. In addition, the new facility will have several training/conference rooms where SLD will conduct external training programs (e.g. Intoxilyzer operator and key operator certification classes,

sentinel clinical laboratory technical training, and continuing education classes for our community partners). Perhaps the most exciting news for our clients is that the new facility is directly accessible from Frontage Road, north of Lomas Blvd, and will have ample visitor parking! We will tell you more about the new facility as it gets closer to completion. Until then, I hope you enjoy the articles in this issue.

David.Mills@state.nm.us



Above: Tri-Lab building site at I-25 Frontage Road north of Mountain Road.

Below: Architect rendition of the future Tri-Lab building.



Celina Phelps, Editor	
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- SLD Main Office, 505-841-2500
Fax: 505-841-2543
- Laboratory Director,
David Mills, Ph.D., 505-841-2523
- Deputy Director,
Twila Kunde, 505-841-2530
- Biological Sciences Bureau
- Chemistry Bureau Chief,
Phillip Adams, Ph.D., 505-841-2510
- Toxicology Bureau Chief,
Rong-Jen Hwang, Ph.D., 505-841-2562
- Program Support Bureau Chief,
Rocky Baros, 505-841-2524
- Quality, Safety, Security, and Emergency
Preparedness Office Director,
Gary Oty, 505-841-2585

www.sld.state.nm.us

SLD Mission Statement

The mission of the Scientific Laboratory Division is to provide analytical laboratory support and scientific advisement services for tax-supported agencies and groups or entities administering health and environmental programs for New Mexico citizens.

Toxicology Helps Epidemiologists Solve Puzzle

By Afton Martinez, Drug Confirmation Section, Toxicology Bureau

The Toxicology Bureau at the Scientific Laboratory Division (SLD) primarily focuses its activities on DWI cases for New Mexico law enforcement and autopsy cases for the Office of the Medical Investigator (OMI). Recently, these activities took an unusual turn that landed the toxicology laboratory in the middle of an investigation by Department of Health epidemiologists. The investigation involved a cluster of patients with agranulocytosis (reduced white blood cell count) that had been identified and reported to the Department by the University of New Mexico and Tri-Core laboratories.



During the course of routine analytical duties, which include examining blood samples from DWI arrests and OMI autopsy cases, toxicologist Afton Martinez noticed an unusual pattern. While identifying samples containing cocaine, she found a correlation with the presence of the drug levamisole. While levamisole had been detected on very rare occasions in the past, it seemed that it was occurring more frequently in recent months. Ms Martinez notified her supervisor, Ginger Baker, and the Department's epidemiologists in the Epidemiology and Response Division were told of this unusual observation. What SLD was unaware of, however, was that the epidemiologists were already investigating a local cluster of patients with agranulocytosis. While it was known to the epidemiologists that several of these individuals reported cocaine use, the cocaine itself did not explain the symptoms reported.

The call from SLD proved to be timely and important because it provided the missing link for the epidemiologists. Levamisole, a veterinary anti-helminthic (de-wormer) and an anti-neoplastic medication used in the treatment of colon cancer, can cause agranulocytosis. Upon further research, it was learned that levamisole is apparently being used as a cutting agent in cocaine. The co-appearance of levamisole with cocaine has also been reported recently

in Canada, the U.K., and in several states within the U.S.

After gathering the data from SLD, it is evident that Ms Martinez's initial hunch was correct; there were 18 cases seen by SLD in 2008, 3 in 2007, and 1 in 2005. SLD is now working with the Epidemiology and Response Division of the Department of Health, the University of New Mexico, TriCore Reference Laboratory, and the Office of the Medical Investigator to investigate this issue further, including looking for levamisole in all cocaine cases received from OMI and the state DWI program.

The proximity of the three scientific bureaus (Biological Sciences, Chemistry, and Toxicology) along with the Office of the Medical Investigator provides an opportunity for unique and important collaborations. This case demonstrated how these cross-interactions may aid in identifying trends that may be significant to one of SLD's many partners.

Specimen Receiving- The Face of the SLD

By Barbara Dobie, Supervisor, Specimen Receiving

The Specimen Receiving Section (SR) of the Scientific Laboratory Division is the public "face" presented to clients who deliver samples to the laboratory for analysis. The SR section is a component of the Program Support Bureau of the SLD, which supports the activities of the three analytical bureaus (Chemistry, Biology, and Toxicology).

The SR section is split into three units: specimen receiving, results reporting, and kit preparation.

The **Specimen Receiving Unit** receives samples that are sent to the laboratory for analysis and accessions them into the laboratory database. It is also the unit's responsibility to document sample transport conditions, including the receipt temperature. For example, the SR staff uses an infrared thermometer to take the temperature of water samples that are sent for bacteriological testing. Biology specimen transport conditions are tracked as "not refrigerator-



ated", "cold," or "frozen." In addition, any anomalies in transport are noted, such as leaking specimens or broken primary containers.

The **Results Reporting Unit** of the SR section is responsible for ensuring that the hard copies of analytical results reach the appropriate clients. In the example of bacteriological testing of drinking water, this includes sending analytical results to program managers, environmental field offices, and to the parties responsible for the drinking water system itself. Biology specimen results are sent to the state's public health offices, area hospitals, school-based health clinics, and to private clinics that collect public health specimens under a memorandum of agreement with various public health programs in the state.

The **Kit Preparation Unit** provides necessary materials for the proper collection of clinical and environmental samples for submission to the laboratory. These materials range from water containers provided to the state Environment Department (for drinking, surface, and ground water collection) to clinical collection kits that are created in the SLD's Media Section of the Biology Bureau. Care is taken to ship those specimen transport materials in the proper state (on ice packs, for example) and with appropriate preservatives, with attention given to ensure the prompt receipt by the laboratory clients.

As the "face" of the SLD, the SR section has the most direct contact with the laboratory's clients. The SR section is notified by clients for collection kit requests; they receive samples directly from the collector; and they are responsible for relaying analytical results and data back to the clients. The SR section is there at the very beginning of each client's interaction with the laboratory and it is the SR section that completes the circle of that interaction. It is this unique relationship that has earned the SR section the nickname of "the alpha-omega" section of the SLD.

Currently, the SR section is front and center in the new Laboratory Information Management System (LIMS) im-



plementation at the SLD. As each laboratory section enters its implementation phase, the SR section will have to accession and perform dual data entry to include both the old and new LIMS. This will occur for several weeks in order to assure that the new database is working properly and that no data are lost. This means double the data entry work while learning a new system! The SR staff has earned the respect and kudos of the LIMS consultants in their quick understanding and acceptance of the new system.

The Role of the Scientific Laboratory Division in an All-Hazards Event

By Gary Oty, Office Director,
Office of Quality, Safety, Security
and Emergency Preparedness

The Department of Health is the state agency with primary responsibility to respond to public health emergencies in New Mexico, and the Scientific Laboratory Division (SLD) is integral to that response as New Mexico's state public health laboratory. In the specific instance of a sample obtained from an all-hazards incident (a potential biological or chemical threat), the SLD is uniquely qualified to respond as a reference-level laboratory of the Laboratory Response Network (LRN) and is the designated bioterrorism and chemical terrorism response laboratory for New Mexico.

The LRN is a collaborative effort between a number of Federal agencies and the Association of Public Health Laboratories which, since its inception in August 1999, has created a national network of laboratories with the capability to respond to a variety of public health threats using sophisticated analytical technologies. As a member of the LRN, the SLD has access to reagents, equipment, and procedures that are not available to other laboratories and. As part of this network, the SLD can tap into an international cadre of laboratories for assistance.

In the event of an all-hazards incident in New Mexico, (for example, a white powder found in a threatening letter or the potential use of dangerous chemicals against citizens or infrastructure) the response typically begins with a call to 911. Local police, Hazardous Materials Teams, and sometimes the NM National Guard Civil Support Team will

respond on site; the FBI, the New Mexico Emergency Operations Center, and the Department of Health are then brought into the picture. If law enforcement determines the incident to be a credible threat, the Epidemiology and Response Division (ERD) of the Department of Health notifies the SLD which then begins preparations for the receipt and testing of samples.

While the material is being field screened, sampled, packaged, and transported to the SLD, specially trained staff prepare the equipment that will be needed; on-call personnel are called in if the incident occurs after hours. Upon arrival of the samples at the laboratory, chain of custody documentation is completed and the specifics of the incident are discussed, including the results of field screening tests.



to several tests to detect the presence of explosives, radiation, volatile organic compounds, corrosive materials, or chemical warfare agents. Portions of material are also analyzed by two different spectroscopic devices that scan for hundreds of different compounds; many times, the material can be identified as being primarily composed of a known substance, such as baking powder, with a high degree of confidence. Once the sample is deemed to be chemically safe to handle, portions are packaged, removed from the glove box and further tested for biological organisms. The suspect material is tested by a panel of extremely sensitive molecular biology assays to look for the highest-risk biological agents and biological toxins. These assays are performed according to LRN protocols using LRN standards, controls, and reagents. The assays are very specific and will only detect their intended targets. Samples are also inoculated onto standard bacteriological media and incubated to look for the growth of any microorganisms that can then be identified. This "old fashioned" microbiology work is considered the Gold Standard of testing.



During this time, the various agencies involved, and those who may have been exposed to the material in the field, are waiting for the results of this testing. The chemical analyses performed in the glove box are usually completed in 1.5 hours, with another 4 hours or so required to complete the molecular biological assays. Public health actions may be initiated based upon the chemical and molecular results, however, the biological final result must wait until the final bacteriological assays (attempts to grow the organism) are reported in seven days.

As results become available, the SLD reports them to the ERD for interpretation and response. The ERD is staffed by Department of Health infectious disease specialists, veterinarians, and environmental scientists with the knowledge and expertise to respond appropriately to the incident based on the results provided by the laboratory. The ERD releases the results, along with any recommendations regarding medical and public health concerns, to law enforcement, first responders, public information officers and other involved groups.

The SLD responded to approximately five incidents per year from 2005-2008, and has responded to three in the first quarter of 2009.

Environmental Protection Agency (EPA) Audits at the Scientific Laboratory Division

By Phillip Adams, Ph.D.,
Chemistry Bureau Chief

The quality of drinking water from public water supply systems in New Mexico is regulated under the federal Safe Drinking Water Act. The EPA routinely audits the SLD for its ability to provide analytical data to the New Mexico Environment Department (NMED), the City of Albuquerque, and other clients. A complete list of the regulated contaminants may be found at <http://www.epa.gov/safewater/contaminants.index.html>.

In New Mexico, the SLD is the State's EPA primacy laboratory for drinking water testing, and undergoes a certification inspection by a team of EPA auditors every three years. The most recent

EPA audit of SLD took place in 2008 when the Environmental Microbiology, Heavy Metals, Organics, Radiochemistry, and Water Chemistry laboratory sections were examined

(with a successful outcome!). In all, the auditors looked at about 30 different test procedures run by the SLD that cover approximately 80 regulated contaminants. The auditors included a range of people from outside New Mexico who are knowledgeable in the laboratory methods and have attended and passed the annual EPA Laboratory Certification Officers' training course.



The audit process begins months before the auditors actually visit the laboratory. The SLD first provides the lead auditor with copies of all relevant documents, including operating procedures, lists of personnel, methods, and instrumentation, the SLD quality assurance plan, and applicable quality control data. After reviewing the provided documents, the auditors spend about a week in the laboratory. During this time, the auditors ask the analysts and supervisors questions, review data, check proficiency test results, observe testing, and generally look for any instances where internal standard operating procedures or EPA methods are not being followed. One month after the audit, the laboratory receives the report of findings and recommendations from the lead auditor. The report includes notification whether each particular method will be recertified, provisionally certified, or non-certified, pending action by the lab to correct any findings. The laboratory then responds to the audit report, indicating how it will deal with the audit findings.

A flurry of activity usually follows the audit report, as analysts address the audit findings, and rerun methods incorporating the auditors' suggested changes. Reruns are expected to show that the data generated with the changes are still acceptable. Often, the operating procedures have to be adjusted, new proficiency test samples will be run, and analysts are tested to demonstrate their capabilities following the changes. Once testing and reviews are completed, the labora-



tory will be recertified by the EPA. Certification documents are provided to list all of the methods for which the laboratory is certified to perform for the next three years.

Since the SLD will be moving into a new laboratory facility in 2010, the next EPA audit will take place shortly after the move, rather than at the usual three year interval. Results for drinking water analyses will not be available until after the new audit has taken place and the laboratory is re-certified by the EPA. The timing of moving into the new building and planning the EPA visit will be crucial for laboratory operations and the SLD will work closely with partners to minimize the disruption and inconvenience to sampling schedules during the transition.

The SLD Hosts Visitors from Azerbaijan

By Pamela Morden,
Laboratory Bioterrorism Readiness Coordinator

During the first week of March, the Scientific Laboratory Division (SLD) hosted a visit by officials from Azerbaijan, a former member state of the Soviet Union. The visit was funded by a US Department of Defense grant under the Defense Threat Reduction Agency. The Biological Threat Reduction Project grant was awarded to the University of New Mexico and Pennsylvania State University. The goal of the project is to support the facilities, educational programs, and management of the current and future labs designed to monitor biological threats in the area of the Caucasus Mountains, including the countries of Kazakhstan, Russia, Uzbekistan, Georgia, Ukraine and Azerbaijan.

Azerbaijan is building a Central Reference Laboratory in its capital city of Baku and the Azeris wanted to tour a comparable lab in the United States. The SLD was chosen for the tour because it demonstrates certain features and functions within the public health structure that the Azeris plan to implement in their own laboratory. The SLD and University of New Mexico staff led the tour for officials from the Azeri Ministries of Health and Agriculture,



their interpreter, a member of the U.S. Army Corps of Engineers, and representatives from Science Applications International Corporation. Over the course of 3 days, the group toured the SLD, the NM Dept. of Agriculture Veterinary Diagnostic Lab (VDS), Cibola General Hospital, a UNM Biosafety Level 3 (BSL3) research laboratory, and the new Tri-lab construction site. The agenda of presentations, tours, and discussions focused on the typical operational support and facility engineering activities at NM state public health, clinical diagnostic, and research laboratories.



The UNM grant organizers, Greg Mann and Dr. Lee Danielson, organized the visit and introduced the concepts of quality control and quality assurance. Dr. David Mills, Director at the SLD, provided an overview of testing activities at the SLD, presented the plans for the new Tri-lab building, and arranged for a tour of the construction site of the new laboratory. Todd Parker, a National Laboratory Response Network (LRN) technical advisor from Atlanta, presented an overview of the LRN. The LRN is an integrated network of national and international laboratories that can respond quickly to acts of chemical or biological terrorism, emerging infectious diseases, and other public health threats and emergencies.

Pamela Morden, of the SLD, gave a presentation on plague, tularemia, and other biological threats in New Mexico and used a theoretical patient case to demonstrate how the SLD fits into the public health system to deal with dangerous pathogens. The case study began with a visit to Cibola General Hospital in Grants. The group observed operations in an LRN sentinel laboratory as technicians received and processed a patient "sample." A presumptive identification of plague or tularemia was followed by referral of the sample to an LRN reference laboratory—the SLD—for confirmation. The following day, Greg Jillson, Director of Technical Operations at the NM Department of Agriculture Veterinary Diagnostic Lab (VDS), gave a tour of

* Pictured above, from left to right: 1. Nidal Jadalla, Radio Chemistry.

2. Dr. Mills and Azerbaijani guests studying blueprints.

3. Azerbaijani guests and construction foreman at building site

the VDS animal facility. He further explained how an animal sample related to our theoretical patient with plague or tularemia would be handled. Once the “sample” was received at the SLD, the group picked up the trail in General Microbiology, Molecular Biology, and the BSL3 suite—where confirmatory testing takes place. The group then visited the UNM research laboratory of Dr. Rick Lyons to see how a



BSL3 laboratory with an animal component contrasts with clinical and public health laboratories.

The last day was devoted to presentations and discussions on surveillance and the feasibility of applying the New Mexico public health laboratory structure in Azerbaijan. Drs. Chad Smelser and Paul Etestad, of the Department of Health Epidemiology and Response Division, provided overviews of infectious disease surveillance in New Mexico and the multi-disciplinary approach to agricultural and public health concerns. When asked what advice the Azeris had for us, they offered and open invitation for us to visit **their** lab! They also expressed an interest in a return visit once the new Tri-lab is completed. The Biological Threat Reduction Project provides the opportunity to demonstrate examples of laboratory and public health systems for application in other countries, such as Azerbaijan. The ultimate goal is to increase transparency, encourage high standards of conduct by scientists, reduce biological threats, and improve public health world-wide.

A Modern Tool in Outbreak Investigation

By Pascale Leonard, Ph.D.,
Supervisor, Molecular Biology

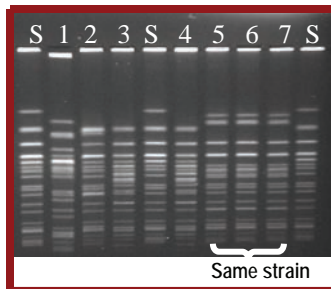
Pulse Field Gel Electrophoresis (PFGE) is a powerful tool used by the state laboratory to help epidemiologists in the Epidemiology and Response Division (ERD) identify and track outbreaks of infectious disease in animals, humans, and food. It is a tool used to characterize bacterial isolates beyond their species or serotype name, it char-

acterizes down to the strain level; a DNA “fingerprint.”

How does it work? Laboratory technologists must first obtain a pure colony of bacteria from a patient or environmental sample. The genomic material (DNA) is collected from the bacteria and special enzymes are used to cut the DNA in very specific and unique locations. The size, number, and electrical charge of the resulting fragments vary with each strain; which produces a characteristic ‘pattern.’ The pattern is entered into a database and compared to other isolates retrieved from patients and environmental samples.

The picture at right shows how the fragments are sorted by size so that comparisons of isolates can be made. In this example, there

are three lanes with Standards (S) that allow the laboratory to confirm that the method worked. Seven samples are shown (1-7), of which three (5-7) have the same pattern and are thus considered to be of the same strain.



What is the significance? When the pattern of two or more isolates match, the strains are considered identical. The laboratory informs the ERD and Epidemiologists interview patients from whom the specimens were obtained, looking for something that they have in common (restaurant or grocery store, places they visited, etc.). Samples are collected from the suspected sources, PFGE is performed on isolates from the samples, and results are compared for patterns that match the patient samples. A match indicates a link between the two.

The SLD, along with other state public health laboratories and several international public health laboratories, submits PFGE patterns to the Centers for Disease Control (CDC), which maintains a database of patterns called PulseNet. PulseNet enables the CDC to identify links between submitted patterns so that outbreaks can be tracked not only at the state level, but at the national and international level.

Local Example

Each spring, the SLD discovers a

cluster of *Salmonella* cases that are linked to baby chicks or ducks given to children for Easter. PFGE enables the SLD and ERD to link ill patients to specific animal sources, which are further traced to the vendors and breeders of the animals.

National Example

In September 2006, Wisconsin and Oregon identified an outbreak of *Escherichia coli* O157:H7. The epidemiologists in those states suspected that spinach was the source but had been unable to isolate *E. coli* from bags of spinach. In New Mexico, the SLD identified several patient isolates of *E. coli* bacteria that were also O157:H7. PFGE performed on the local cases, revealed that they had the same banding pattern as the Wisconsin and Oregon cases, indicating that all were of the same strain of the same outbreak. Epidemiologists from the ERD interviewed patients and found that spinach was the common denominator among them. Several bags of spinach were retrieved from the homes of patients and submitted to the SLD for testing. *E. coli* O157:H7 was isolated from the spinach and PFGE demonstrated that the pattern of the spinach strain matched that of the patient strain! The SLD notified the CDC who were able to trace the brand, batch identification, and lot numbers on the bags. Within 24 hours, Federal agencies were able to track the contaminated spinach back to 3 fields in California and issue a nation wide press release about the source of the outbreak. Contaminated spinach was removed from the national food supply and the public was reassured that other sources of spinach were safe to eat, limiting economic damage to other spinach producers.

The SLD routinely performs PFGE on all *Salmonella*, shigatoxin-producing *E. coli*, and *Shigella*, but also performs PFGE on several other species as needed or requested by the ERD. Last year the SLD performed PFGE on 781 bacterial isolates and identified 71 clusters from human, animal, and food sources. Local epidemiologists pursued all of these and identified 14 of these clusters as part of national outbreaks. So, please wash fruits and vegetables, cover when you cough, wash your



hands, and don't let small children play with baby chicks!

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Please direct suggestions, comments, or questions to Twila Kunde, Deputy Director SLD at: twila.kunde@state.nm.us or by mail at: P.O. Box 4700 Albuquerque, NM 87106-4700.

New Mexico Scientific Laboratory Division
700 Camino de Salud, NE
P. O. Box 4700
Albuquerque, NM 87106
505-841-2500