

Oklahoma PHL Brings Molecular Diagnostics to Heartland

by Nancy Maddox, writer

*“Oklahoma where the wind comes
sweeping down the plain
Where the wav-in wheat can sure smell
sweet
When the wind comes right behind the
rain.”*

*“Oklahoma”
Oscar Hammerstein*

Oscar Hammerstein’s well-known “Oklahoma,” still rings true today. With roughly 3.5 million people spread across 70,000 square miles, John Mathewson said, “Most of the state is rural and the living is from agriculture.” Indeed, Oklahoma is the second most prolific wheat-producing state in the nation and ranks fourth in production of cattle and pecans. The official state website proclaims that Oklahoma is home to more horses than any other state and has the only capitol building in the world with an oil well under it.

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Mathewson came to this former Indian Territory by way of Texas, where he served as assistant director for clinical testing for the Houston city public health laboratory. When he took over as chief of public health laboratory services for the Oklahoma State Department of Health in 2001, he came to a facility that had been without a leader for some time. “It was kind of an old-fashioned lab,” said Mathewson, who noted, for example, that it had no thermocycler.

With an almost instant bounty of bioterrorism grant money, Mathewson said, “We’ve really moved on.” Instead of two small BSL-3 suites, the laboratory now has three functional suites. And instead of relying solely on microbiology, the laboratory performs cutting edge molecular diagnostics, including real-time polymerase chain reaction (PCR) and DNA sequencing techniques.

Despite some testing for esoteric agents such as arbovirus, tularemia, malaria and tickborne organisms, the laboratory focuses primarily on common infectious diseases (such as influenza and sexually transmitted diseases) and newborn screening. It also performs all of the state’s tuberculosis testing and is currently busy responding to the largest syphilis outbreak seen in Oklahoma for the past 10 to 15 years.

As the only Laboratory Response Network site in Oklahoma, the state laboratory oversees virtually all public health testing in the state. Just two cities—Oklahoma City and Tulsa—have their own health departments, but neither performs advanced diagnostics.

Similarly, while every county in Oklahoma has a county health department, all of their on-site laboratory testing comes under the aegis of the state laboratory’s Clinical Laboratory Improvement Amendments (CLIA) license.

Given the prominent position of the state department of health laboratory, Mathewson has implemented two innovations to facilitate consultation with public health and clinical laboratories: the use of a private courier system that

operates “24/7” to retrieve specimens throughout the state and the use of a device called STATPack® to enable secure, real-time video transmission of



photo courtesy of Oklahoma Public Health Laboratory

Mike Lytle, supervisor, Microbiology

laboratory images. STATPack® was piloted by the Nebraska state public health laboratory, and Mathewson contracted with that facility to implement it in Oklahoma.

He said, “We try to put it in more rural areas that have less laboratory capability. We want them to have access to (laboratory) expertise. And it saves a courier run if we can consult over the phone.” Mathewson also noted that Oklahoma is prone to tornadoes and violent thunderstorms that can preclude the use of the courier service. Both an on-call molecular biologist and on-call microbiologist carry STATPack® software on their laptops for use in just such emergencies.

Another of the chief’s pet projects is a training program for Oklahoma’s clinical laboratorians. “We’ve gone all around the state and talked to (clinical laboratorians) about rule-in and rule-out procedures (for BT agents) and packaging and shipping requirements. We’re trying to build that training capability.” Site visits are supplemented by a quarterly newsletter with information about changes in CLIA and select agent requirements and other news. The next

step will be the installation of a wet laboratory for hands-on training at the state facility.

Newborn screening is a forte of the state laboratory and, with about 50,000 births/year, one of its high-volume activities. When Mathewson arrived, the state mandated screening for four disorders, funded by the sale of the form used for heel stick blood collection. Today, the state screens for seven disorders. But with newly acquired tandem mass spectrometry capabilities, it plans to expand its screening panel to 31 conditions

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within the next two years. Because fee income is no longer adequate to support the newborn screening program, Mathewson has begun charging Medicaid for newborn screening and is “trying to get into the business of billing private insurance companies.”

The laboratory itself is situated on the campus of the Oklahoma University Medical Center, about five or six blocks from downtown Oklahoma City, which has, said Mathewson “everything (one might need), but no traffic jams.”

The laboratory building is of cinder block construction and dates to the early 1980s. Recent improvements include the addition of two BSL-III suites and a number of new security features, including three layers of electronic key card access and electronic surveillance cameras.

Updating the facility’s information technology (IT) infrastructure is an ongoing challenge. Currently, two full-time IT staff members oversee the LITS-Plus laboratory information management system (LIMS) that was once supported by the CDC and a separate Neometric Software system dedicated to newborn screening and newborn screening

follow-up. Although Mathewson and his staff are “still evaluating everything at this point,” a likely scenario is that LITS-Plus will be retained as the LIMS core for the time being with a new system built around it. “When LITS-Plus no longer suits our needs,” said Mathewson, “we can take it out and put in a new core.”

A second challenge is staffing. The laboratory has 48 full-time equivalents and two vacancies. “The economy here is such that we get a lot of applicants,” said Mathewson. But finding skilled scien-

tists is difficult. “We have primarily taken people right out of college and we’ve trained them ourselves. We lose some of these as they get older and get skilled, but we retain some as well. We have a lot of good supervisors who are



photo courtesy of Oklahoma Public Health Laboratory

This processor automates the sample handling associated with high volume amplified molecular testing.

adept at training.”

Mathewson recognizes that non-competitive state salaries pose an impediment to recruiting experienced staff members and is working to reclassify several positions so that he can adjust salaries upward.

In one respect, though, the laboratory

has been extremely fortunate: having health officers who “understand the importance of the laboratory.” The state commissioner, Mike Crutcher, and deputy commissioner of health, Joe Mallonee, “make sure I’ve got what I need,” said Mathewson. For example, since the laboratory charges only nominal fees for testing, it relies on the state to supplement federal grant funding to maintain its \$5 million to \$6 million annual budget. “The (health) agency supports us when we need it,” said Mathewson. “It has only done good things for the lab.”

Mathewson is also pleased to be living in the “Sooner State,” home to one of the largest Native American populations in the US—with nine independent Indian nations—and growing Hispanic and African American communities.

Before relocating to Oklahoma City, the laboratory chief spent much of his career on the coastal plain of Texas. He earned a doctorate at Texas A&M University and then accepted an infectious diseases fellowship at the University of Texas Medical School in Houston, where he later became a faculty member, researching enteric diseases. This work took the Illinois native to Mexico, Jamaica, India, Egypt and Zambia to study the causes and most promising treatments for diarrheal disease.

Today, Mathewson’s attention is focused squarely on the Oklahoma state public health laboratory. The chief’s goals for the future are, he said, “pretty straightforward”: accurate quality control, exceptional quality assurance, expanded molecular diagnostic capabilities (with additional molecular biologists on staff) and implementation of the laboratory’s expanded newborn screening test panel. “I’ve spent a lot of time trying to build (the laboratory),” he said. “It’s very important to me. The team in the laboratory are first class laboratorians and they know their important role in public health.”