On the Front Line of Michigan Security

The new Diagnostic Center for Population and Animal Health protects the state's people and animals from disease.

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On a typical day, the MSU Diagnostic Center for Population and Animal Health (DCPAH) receives between 600 and 1,200 pieces of mail. Most of these contain samples of tissue, blood or other parts of animals that are suspected of harboring a disease.

"There may be one sample per box or 300 per box — we don't know until it's opened," said Steve Bolin, MAES pathobiology and diagnostic investigation researcher who is also chief of the DCPAH Immunodiagnostics and Parasitology sections and serves as associate director of the center. "Each sample comes with a form that tells us which tests to run — more than one test may be done on each sample. Our technicians sort everything into specific refrigerators for each lab. A signal light then goes on in the lab to let them know that a new sample is in and ready for testing. Now that we're all in one building, rather than being spread out across five buildings on campus, the intake process is more efficient."

Dedicated in September 2004, the new DCPAH facility allows MSU scientists to run more than 1.3 million tests per year, making it one of the top three diagnostic labs in the country, according to DCPAH Director Willie Reed, who is also chairperson of the Department of Pathobiology and Diagnostic Investigation in the College of Veterinary Medicine. The tests range from rabies to West Nile virus to bovine tuberculosis (TB) to chronic wasting disease, and the center's clients are in all 50 states and several foreign countries.

"Our mission, as it has been for the last 30 years, is to protect animals and humans from the health threats of disease and toxic substances," Reed said. "We do this through accurate and rapid detection of infectious diseases to prevent spread and minimize animal losses and human illness."

"We don't offer treatment, just diagnosis," said Richard "Mick" Fulton, chief of the Anatomic Pathology-Necropsy Section of the DCPAH. "We figure out why the animal died or is sick. Our clients range from private citizens and private veterinarians to state and federal governments."

The original collection of campus labs, known as the Animal Health Diagnostic Laboratory, was created in the 1970s in response to the accidental introduction of PBB, a chemical fire retardant, into the food supply.

"We grew rapidly," Reed said, "and became one of the busiest labs in the country in terms of the number of tests run and complexity of problems we dealt with. The bovine TB issue that started a few years ago underscored the need for new facilities — located in one spot — so samples could quickly and easily be examined and go to different labs for tests. We were struggling to handle the large number of deer and cattle submitted to the lab. We wanted to be able to make more rapid diagnoses safely and securely. With our old set up, we couldn't make the final diagnosis of bovine TB here at MSU. We had to send the samples to the USDA lab in Ames, Iowa, which increased the turn-around time for providing the results of the tests. In our new facility, we can make the final diagnosis here, which is more efficient for everyone."

Situated a bit south of the main MSU campus, the new DCPAH facility houses labs, offices and classrooms in one building that provides better personnel safety, high levels of biocontainment and the ability to offer expanded services. Because protecting human and animal health is critically important to Michigan, the state funded the construction of the facility through a special appropriation. State officials and MSU scientists analyzed emerging disease trends and tried to create a facility that was ready to handle just about anything that could potentially happen.

"We tried to take everything into account when we were planning and designing the building," Reed said. "We wanted to be able to deal with anything and everything — as much as we could possibly think ahead, we did."

The result is a diagnostic center that is one of the most advanced in the nation. The DCPAH is a member of the USDA National Animal Health Laboratory Network and the Centers for Disease Control (CDC) Laboratory Response Network. Both networks aim to diagnose and report diseases of concern, such as chronic wasting disease, foot and mouth disease, classical swine fever and avian influenza.

"For example, the BSE [bovine spongiform encephalopathy] case in Washington in 2003 triggered the national surveillance program, so we were ready to do testing as needed," Reed explained. "The labs in the networks perform just as federal labs do and have to have the capabilities to handle these agents of concern. Our goal is to detect them quickly before they spread. The USDA controls which facilities can run tests for these high-risk agents."

"The Diagnostic Center is equipped to address animal health in all species, from fish and wild animals, to agriculture and companion animals," Reed said. "Not all labs can offer all these services."

The DCPAH has several biosafety level III (BL-3) labs and containment facilities. They are used to support the state's bovine TB eradication program, as well as identifying dangerous pathogens that threaten both human animal health, such as strains of *Salmonella* that are resistant to multiple drugs and West Nile virus.

"No other diagnostic center has a BL-3 necropsy floor," Reed said. "This gives us a unique opportunity to partner with state government to address emerging diseases."

"If some type of biological attack or outbreak occurred, it's probable that it would be seen in animals first," said Carole Bolin, MAES pathobiology and diagnostic investigation scientist who is chief of the Bacteriology Section. "We are certified to work with nine agents of concern that are on the federal government's overlap list, which means they affect both animals and humans."

For security reasons, she couldn't name the specific agents the DCPAH was certified for, but the federal government's list includes the pathogens that cause anthrax, Eastern equine encephalitis virus and tularemia. Over the past 20 years, nearly 75 percent of the approximately 30 new diseases discovered in humans were zoonotic, meaning they are transmissible between animals and people. Of the more than 1,650 human disease conditions, nearly 60 percent are caused by pathogens that also infect animals.

"Because agricultural animals are outside much of the time, they may be the first ones to contract anything in aerosol form -- many of the agents on the overlap list can be transmitted via aerosols," Carole Bolin said.

"If it is suspected that these agents of concern are involved, the Diagnostic Center does the testing," she continued. "We have a grant from the Michigan Department of Community Health [MDCH] to serve as an auxiliary lab in the Centers for Disease Control network. MDCH coordinates this. We're also ready to act as a back-up to the Department of Community Health. For example, if there were a suspected anthrax outbreak, it might require thousands of tests, which would overwhelm the MDCH lab. We have the resources to provide the people and the space to do the testing."

"The DCPAH is why Michigan is a leader in coordinating and integrating systems for animal and human health," Carole Bolin continued. "We are a national model. The creation of the Diagnostic Center facility, which consolidated services and lab space, has helped with this great integration. If something happens, we have the inherent capabilities, we have the knowledge and training, and we have the surge capacity to handle a large volume, which is key. ."

"The Diagnostic Center represents a long-term commitment to public and animal health and safety, and better prepares Michigan to handle emerging issues," said Dan Wyant, past director of the Michigan Department of Agriculture. "This facility is a shining example of what can be accomplished with strong state, university and industry partnerships and collaboration — a model that Michigan has come to be known for."

Cutting-edge Capabilities

The Diagnostic Center encompasses 10 sections or labs:

- Anatomic Pathology, (which includes Surgical Pathology, Immunohistochemistry and Necropsy),
- Clinical Pathology,
- Endocrinology,
- Immunodiagnostics,
- Bacteriology,
- Parasitology,
- Virology,
- Nutrition,
- Toxicology,
- Epidemiology,

as well as administrative, computer services and quality assurance units. Except for the Epidemiology Section, which analyzes incidences of disease and other data and issues reports on trends, all the sections offer specific diagnostic tests for clients. Scientists from the Michigan Department of Natural Resources also share a lab to test deer for bovine TB and to detect diseases in other wildlife.