



Getting an earful of information. Eric Vanzant, animal and food sciences, is using battery-powered ear tags on cattle to track information such as body temperature and head position, which can tell him if cattle are eating or drinking. That information is valuable because it can indicate if a cow is healthy or sick. This animal health monitoring system is a critical link in Homeland Security-funded biosurveillance research at UK.

Biosecurity

Down on the Farm

by Holly Wiemers

Jared Wright, manager of a small horse farm in southern Kentucky, wakes at 6 a.m., drinks his one quick mug of coffee, and heads off to the barn. There, he moves from stall to stall with morning grain for his five mares. Since they are all pregnant and due to foal within days or weeks, he is especially attentive to their behavior. Do any of them appear to be in distress? Are they eating with their usual enthusiasm? When he gets to the last stall, he realizes one of a broodmare manager's worst fears: the mare has aborted.

The manager checks the condition of the mare, who is contentedly eating her grain. He removes the fetus and placenta from the stall, calls the veterinarian, and finishes the morning chores. Then there's one last thing he needs to do.

He goes back to his office, clicks on to a computer program and enters his observations, highlighting the sad news of the aborted foal.

He also looks over an interactive map of Kentucky that shows the state's current animal health conditions to see if there are any common illnesses or odd behavior among horses at other farms. Then he logs off and continues his day.

The computer program has been developed by the University of Kentucky Livestock Disease Diagnostic Center (LDDC), and the daily information-sharing process was part of a pilot project conducted by the LDDC in August 2007. Dur-

Craig Carter, director of the UK Livestock Disease Diagnostic Center, led the development of a computer program for horse farm managers and others to record and share animal health data.



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ing the study, which was funded by the Department of Homeland Security, UK researchers partnered with 13 Central Kentucky horse farms to capture 30 continuous days of animal health data. Information was fed into a web-based program, and data was statistically analyzed daily by the LDDC to identify possible clusters of illness or disease.

“It’s like a neighborhood watch,” says LDDC director Craig Carter. “Infectious diseases can insidiously creep in. *Rhodococcus* and *Salmonella* raise their ugly heads every year, but with this computer program in place, we can get a good jump on fighting these diseases.”

Since coming to Kentucky three years ago, Carter, a colonel in the U.S. Army Reserves with a military career spanning four decades, has led the development of this computer program—Kentucky’s first fully integrated animal health information and surveillance system chronicling animal health. When it’s fully operational and in wider use, Carter says, this system will become the information hub for the health of Kentucky’s animals.

The software being used has been customized for our state’s unique needs, and it will link Kentucky’s two state labs with the state veterinarian’s office for the first time. This information nexus will get the word out—fast—if there are clusters of similar observations that exceed a statistical threshold. The network will generate automated alerts to farm managers, veterinarians and others. In addition, the new system will generate maps, charts and disease-trend data on the web to help veterinarians and farmers around the state stay current regarding the prevalence of animal disease around the commonwealth.

“If farmers, for example, went to our website and saw the overview map showing cases of blackleg all over their county, they would be alerted to vaccinate their animals right away to head off this disease,” says Carter. The system won’t only collect and statistically analyze animal health data in the field, but also will offer near real-time information on the weather, soil, toxic plants, and insect populations, Carter adds.



Roberta Dwyer, a researcher at UK's Maxwell H. Gluck Equine Research Center, is working to improve equine disease surveillance and animal disaster plans for veterinarians and animal owners in Kentucky.

The Cost of Animal Disease

The economic impact of a widespread disease among animals can be devastating. During the 2001-2002 breeding season, Mare Reproductive Loss Syndrome (MRLS) hit Central Kentucky particularly hard: an estimated 30 percent of thoroughbred fetuses and foals died, and the state suffered close to \$340 million from losses in all horse breeds. This was a tough blow to Kentucky's horse industry, which has an estimated economic impact of \$4 billion annually and generates approximately 80,000 to 100,000 jobs directly or indirectly, according to U.S. Department of Agriculture figures.

"We ran all the health events surrounding MRLS into our current cluster detection engine. It generated alerts about the problem seven to 10 days earlier than it was recognized in the field at that time," Carter says. "How many foals would have been saved if action had been taken 10 days earlier?"

Equine influenza is another potentially devastating disease in Kentucky. Roberta Dwyer, a researcher at UK's Maxwell H. Gluck Equine Research Center, says that the LDDC surveillance program will also closely monitor any outbreaks of horse flu.

"If a new subtype of the virus was introduced to the United States, it may be possible that equine influenza could begin making the rounds here as it did in Australia in 2007," says Dwyer, who has studied equine infectious diseases for 20 years. "In Australia, equine influenza shut down breeding and racing altogether." Although most horses recuperated from the illness, it severely impacted Australia's economy, she adds. Thomas Chambers, a scientist who also works at the equine center, estimates the direct cost of controlling Australia's equine influenza outbreak to be around \$100 million, which is about \$2,000

for each infected horse. "And the indirect cost to the economy was estimated at \$150 million for the first week alone," he says.

Two of Dwyer's primary responsibilities are equine disease surveillance in Kentucky and the development of animal disaster plans for veterinarians and animal owners. Part of the reason this focus is so important, she says, is that animal disease surveillance is directly tied to human disease surveillance.

Beyond the devastating economic impact, a bigger concern to many of the scientists who monitor and respond to disease outbreaks is emerging diseases that are zoonotic, that leap from animals into humans and succeed there in making trouble. Examples of this animal-to-human contagion are West Nile Virus, *Salmonella* and rabies.

"The risk of human disease is the basis of the avian influenza surveillance program we're conducting," Carter says. "We want to detect diseases such as avian flu in animals as soon as we can—before that disease can begin infecting people."

Why Does Homeland Security Care about These Issues?

"Homeland Security is interested in our system because they want to preserve what they call the critical infrastructure in the United States," says Carter. "Agriculture is one piece of that critical infrastructure, and a huge part of our economy would crumble if animal agriculture was sabotaged."

And then there is agroterrorism, what keeps researchers who study all the possibilities of an attack on our agricultural industry working in overdrive.

The threat is real. According to a Congressional agroterrorism threats and preparedness report, evidence that agriculture and food in this country are potential al Qaeda targets was uncovered in 2002. Terrorist hideouts in Afghanistan contained agricultural documents and manuals describing ways to make animal and plant poisons.

And it's no secret that agricultural businesses in the United States are soft targets for such plans. Farms are mostly isolated. People can often enter or exit unnoticed. Farms and farmland are usually not guarded. Barns often store chemicals used on crops that could be used with malice elsewhere, such as the ammonium nitrate/fuel mixture Timothy McVeigh used in the Oklahoma City bombing.

"This means that data like that received directly from farmers in the August 2007 pilot project is all the more crucial to keeping Kentucky's animals and agriculture healthy," says Carter, who is now co-writing a grant proposal for a second round of Homeland Security funding. "I feel optimistic about our chances." ■