

# PROTECTING



Akhilesh Ramachandran analyzes the results from a fluorescent probe analysis. (Photo by Sarah Cripps)



Nagaraja Thirumalapura uses the automated fluorescent plate reader to quantify DNA. (Photo by Sarah Cripps)

**S**eptember 11. The day America lost its innocence. It was the day the security of the nation's borders was tested and found to be lacking.

After the terrorist attack on the nation, many new words and phrases started being used: homeland security, biosecurity, bioterrorism and agroterrorism.

"Many fear that there will be an attack using microorganisms or toxins from living organisms that will cause death or disease in humans, animals or plants," said Jerry R. Malayer, associate dean for research and graduate education for the Oklahoma State University College of Veterinary Medicine.

Biosecurity, however, includes many things other than preventing terrorist attacks. Many at OSU have seen a need for biological preparedness, but it took a tragedy for the rest of the nation to become aware.

"We felt that Oklahoma State was well positioned, because we had a running head start to make some real contributions to the nation," said Joe Alexander, vice president for research and external relations at OSU.

Many pathogens find their way into the United States naturally through foreign trade, animals and people.

The length of time it takes to detect unusual problems and get diagnostic results is one of the biggest issues with security. If a pathogen could hurt the nation's food supply or people, there needs to be a faster turn around time, said Jacqueline Fletcher, plant health scientist at OSU.

"We know certain countries have done research for biological warfare," said Fletcher.

In November 2001, John R. Bolton, the undersecretary of state for arms control, released a statement of six countries that were building arsenals of biological weapons.

Truly, today there is a need to develop a better defense against biological warfare.

During the next four years OSU will receive \$19 million for research on homeland security. The first \$6 million will go to the OSU Division of Agricultural Sciences and Natural Resources as well as the colleges of veterinary medicine, arts and sciences, human environmental sciences and engineering. The money will go to updating existing laboratories and constructing new centers.

"The common thread that ties this all together is that it is all sensor and sensor-related kinds of research," said Alexander.

Many different professors and students on campus are helping in the fight, including Fletcher.

Fletcher is president of the American Phytopathological Society, a nonprofit, professional scientific organization dedicated to the study and control of plant diseases. There are 5,000 members worldwide.

The U.S. Department of Agriculture has adopted some recommendations from a report the society published. The USDA is now organizing a system of connected plant and animal diagnostic labs. The labs will be in every state.

# THE NATION

## OSU conducts research on homeland security

For the plant diagnostic network, five states will serve as headquarters for all other states. The remaining states will be connected like spokes on a wheel. Kansas State University is the headquarters for Oklahoma, with OSU being the spoke through which communication flows.

Fletcher said the important thing about the new system is that all states are connected for better communication.

As APS president, she has also met with the Animal and Plant Health Inspection Service. APHIS is in charge of protecting the United States' borders.

Since Sept. 11, APHIS, along with other branches of the USDA and various professional groups, has focused on improving communications and working together to develop better standards.

"The research being done to help fight agroterrorism is not like the expensive military weapons that we hope we never have to use," said Fletcher. "The things we are doing will help agriculture even if we never have to use them against terrorism."

Others at OSU are also contributing to the improvement of homeland security.

For the past three years, veterinary medicine faculty members have worked with a Stillwater-based company on a sensor that will identify biological agents that might cause disease.

This sensor uses a fluorescent polymer and is based on other sensors that are already being used for explosives. It is still in the beginning stages, and will take some time before being put into use.

"The platform technology, with the polymer, works," Malayer said.

A prototype model should be up and running in about a year. When complete, the model will be able to detect diseases that affect animals or humans.

"What everyone is trying to get is the real-time sensor so you can walk around and it beeps you when something is detected," he said.

Right now the state-of-the-art sensor, at best, can have results every couple of hours.

The problem with these slow results is that a pathogen can spread before the results come back. Karnal bunt is an example of a disease that is working its way through the country. It is a fungal disease of wheat, durum wheat and triticale. The planting of infected seeds spreads the disease. During the flowering stage, infection occurs when the host plant

comes into contact with the infected spores.

At this point, Karnal bunt has been detected in Texas, but not in Oklahoma. However, all Oklahoma wheat must be tested. Delays in diagnosis can hamper management efforts, since potentially contaminated harvest machinery is moved from place to place, including across state borders, as crops mature.

In 2002, harvest machinery from Texas was in Oklahoma for two weeks before diagnostic reports came back.

Thankfully, Oklahoma wheat

has consistently tested bunt free, but this is a prime example of the problems that can occur when there is a slow turn-around time in diagnosis, said Fletcher.

The nation is spending more money than ever to protect the homeland. People are beginning to realize how important research is in areas that previously went unnoticed. At this point, there is no clear-cut solution to problems of biosecurity, but researchers at OSU will continue working beyond the time that the current threats subside.

*By Sarah Cripps, Ripley, Okla.*



Wheat producers across the nation are concerned with Karnal bunt because wheat harvesting machinery can carry spores across state borders. (Photo by Todd Johnson)