NewsWatch

BRI coming into full utilization

Key Points

- As NBAF goes up, the Biosecurity Research Institute grows.
- The BSL-3 lab studies animal, human, plant and food pathogens.
- Model unique in the world, poised to grow as complement to NBAF.

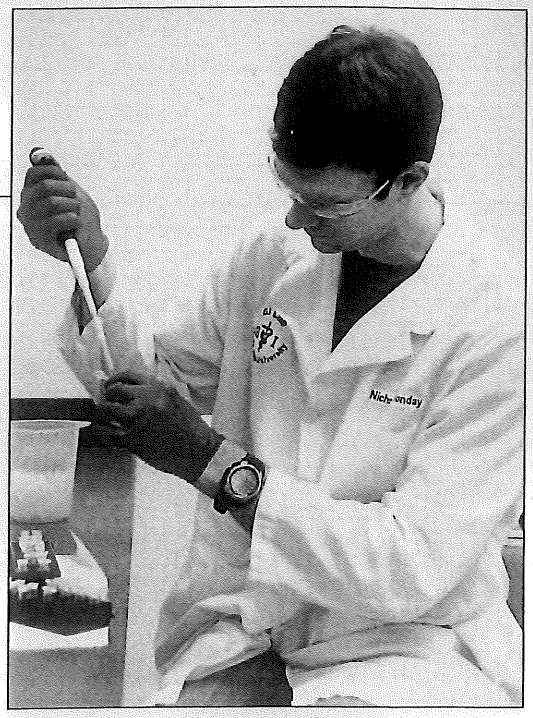
BY **P.J. GRIEKSPOOR**

NEXT door to the massive construction site and the four huge cranes that will help build the National Bio and Agro-Defense Facility on the Kansas State University campus stands the much-smaller Biosecurity Research Institute.

The BRI, a Biosecurity Level 3 lab, opened to research projects in 2008 and in the coming year will tackle a steady stream of projects, looking for ways to detect, prevent and treat the pathogens that make plants die, livestock and people sick, and food unsafe to eat.

"The BRI is the first facility in the world to offer this combination of programs. Typically, research of this kind is done inside government laboratories. We've brought it to a university. And because of that, we can do some things that government labs can't, including offer education to a wide range of people," says Stephen Higgs, director of the BRI.

As a result, Higgs says, the BRI is near full utilization, having doubled in capacity and brought in $180 million in revenue to the university since it opened for research in 2008.



VIRUS RESEARCH: Research assistant Nick Monday works with swine disease tissue samples at the new BSL-2 laboratory at K-State.

"We have a full pipeline for the remainder of this year to do continuous research," Higgs says.

The BRI has projects on classical swine fever, African swine fever, zoonotic pathogens such as avian flu, and vector-borne diseases such as Rift Valley fever, as well as ongoing research on foodborne pathogens.

Bob Rowland, a professor of diagnostic medicine and pathobiology in the K-State College of Veterinary Medicine, is one of the leaders of BRI research on classical and African swine fever. He says the concern about livestock pathogens and zoonotic diseases impacts national security.

"With the global interconnections of our modern world, it is a question of when, not if, these diseases will arrive on our shores," he says. "That makes knowing what they are and finding ways to prevent them, or treat and stop them, a matter of security for our country."

One of the ways that research benefits from a university model, he says, is that it brings many different intellectual thinkers to the table and helps broaden the approaches to problem-solving. Traditionally, he says, research has been reactive — an outbreak occurs, and scientists spring into action to figure out what it is and try to develop treatments and vaccines effective against it.

"We've gotten very good at chasing the train wrecks," he says. "Now we are thinking more about potential reservoirs where viruses may live. We need to be able to predict the outbreak."

That's why classical swine fever research continues even though there is an effective vaccine, and it has been eradicated in the domestic pig population in the U.S. for decades.

African swine fever a big risk

When it comes to African swine fever, the risk escalates, he says, because so far there is no vaccine.

The symptoms of African swine fever are very similar to those of classical swine fever, he says, but the viruses that cause each are very different.

African swine fever is vector-borne, spread by soft-bodied ticks, he says, and it can live inside a tick for two years even if the tick bites only one infected animal.

An even greater complication is that soft-bodied ticks feed quickly, unlike hard-shelled ticks that may latch onto a host and feed for days.

"They may latch on for 20 minutes, feed and drop off," he says. "So you may

Education major part of BRI mission

JOHN Webster is the education officer for the Biosecurity Research Institute at Kansas State University.

His job is twofold, he says. First, he serves as a manager to supervise training and ongoing continuing education for the people who work in the high-containment laboratory.

Second, he works to provide educational programs about high-containment laboratory work for people who come from outside the BRI or the university.

"We do education at community events, in elementary school classrooms, at community colleges. We try to educate anyone who wants to know about the BRI, our mission or about high-containment research."

Webster recently supervised a weeklong class for 12 participants from 12 different countries in a partnership program with the USDA's Animal and Plant Health Inspection Service.

"Some of the participants came from countries that are in the process of planning or building a high-containment laboratory; some were from countries with no access to such a lab, while others work in high-containment facilities."

Genetic engineering holds promise for disease eradication

THE newest face of biotechnology is not in rust-resistant wheat or herbicide-tolerant cotton, says Bob Rowland, professor of diagnostic medicine and pathobiology in the K-State College of Veterinary Medicine.

"The really cutting-edge biotechnology is the genetic engineering of animals to be immune to disease," he says.

That is not a futuristic theory, he adds. It is a reality that has already been done, and it holds the potential to wipe out one of the most costly pig diseases in history, porcine reproductive and respiratory syndrome.

Rowland worked with genetic researcher Randy Prather at the University of Missouri and teams of students at both universities to create pigs that are bred for immunity to PRRS.

The team published their research in the December issue of Nature Biotechnology in an article titled, "Gene-edited pigs are protected from porcine reproductive and respiratory syndrome virus."

Prather produced the pigs in his laboratory, editing their genetics to remove the CD 163 protein that the PRRS virus binds to when creating infection.

"He personally drove the pigs in his truck to the lab here at K-State, and it was my job to infect them with PRRS and monitor them for infection," Rowland says.

The pigs never became infected.

Rowland says the scientists may be able to apply the same concepts to other diseases. With the work currently made possible by BRI and the future arrival of NBAF, he sees numerous opportunities to continue research that benefits animal well-being, supports the industry and helps meet the global demand for animal protein.

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not realize that pig has been bitten. Your chances of finding a tick on the animal go down dramatically.

"Our focus now is on developing a really good surveillance program, keeping track of where pathogens are and using what we know about epidemiology and modeling to evaluate risk and develop biosecurity planning," he says. "The goal is being able to predict where an outbreak is most likely to occur and being ready to prevent it from spreading."

Risk-based surveillance is also ongoing in the transportation system, he says.

"On any given day, there are 200,000 pigs on the roads and highways across the United States," he says. "Pig production is a meta-population that begins in southern Canada and ends in northern Mexico. The old surveillance model looks at Farm A with the outbreak and moves out in concentric circles. The transportation reality tells us that we could have a case in North Dakota and one in North Carolina and another in Mexico, all on the same day."

Getting students involved

The newest development in the relationship between BRI researchers and mainstream K-State can be found in the BSL-2 laboratory that opened last October in the College of Veterinary Medicine.

Inside the new BSL-2 porcine virus laboratory, students work with the low-risk virus samples to cut the cost of research.

"Doing research in the BRI is very expensive because of the complexity of biocontainment facilities and the need to satisfy all of the regulations to ensure safe and secure research," says Rowland, who also so supervises the lower-risk lab. "That's why you reserve it for the high-risk pathogens that need the higher level of security. You can cut the cost and get a lot more research done in the BSL-2 environment and take advantage of student labor to help cut the cost."

Students are also trained and participate in part of the research done in the BRI, so at the same time you are training workers for the future, he says, because those students are getting education and incredible job experience to be ready to take jobs inside BSL-3 and BSL-4 laboratories after graduation.

Rowland says a lot of work is also done outside the lab, out in the real-world environment.

"When a farmer has an issue, we go to the farm and take samples to bring back to the lab for study," he says. "We have three big freezers that can store virus samples at minus 80 degrees. At that temperature, the viruses are stable and can be stored long term."

He says much of today's lab work is being done by computer, so the Level 2 lab has a big center where students can bring their computers and gather to work. There is also a conferencing center that allows communication with researchers at other universities, especially Iowa State, which Rowland calls the "pig genomic powerhouse of the U.S.," and the University of Missouri.

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POSTMASTER: Please send address corrections to: *Kansas Farmer*, 255 38th Avenue, Suite P, St. Charles, IL 60174-5410

CONTACT US

Editor: P.J. Griekspoor
pj.griekspoor@penton.com
6716 E. Bainbridge Road
Wichita, KS 67226
Phone 316-681-2100
Fax 316-681-2102

Contributing Editors:
Curt Arens, Tom J. Bechman, Tyler Harris, Bryce Knorr, Don McCabe, Fran O'Leary, Holly Spangler and John Vogel

Senior Editor:
Mindy Ward, 636-932-4664
mindy.ward@penton.com

Executive Director, Content and User Engagement:
Willie Vogt, 651-454-6994
willie.vogt@penton.com

Sales: Terry Butzirus, 402-489-9353

Subscription Questions: 800-441-1410; *usercare@penton.com*

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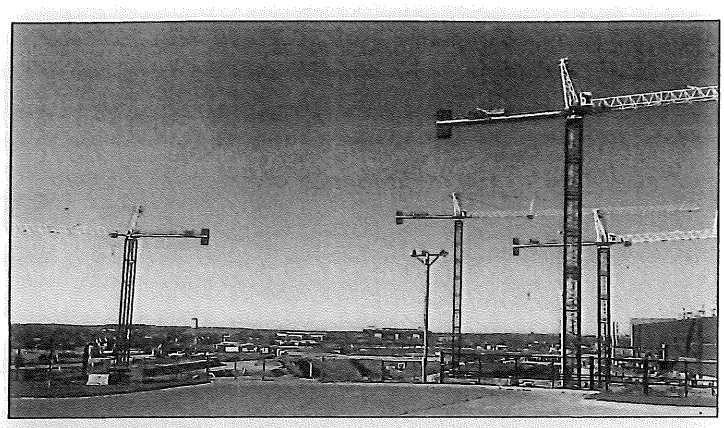

CRANES IN SKY: The four giant building cranes that tower into the sky at the future home of NBAF define the construction project as the most massive seen on the K-State campus. Construction will take five more years, and an additional two will be spent checking all systems and structures before research is allowed to begin.

Partnership key to building NBAF

BY **P.J. GRIEKSPOOR**

THE National Bio and Agro-Defense Facility in Manhattan is going up.

After years of planning and politics, the funding is in place, the excavation is done and the concrete footings — 60,000 cubic yards of them — are being poured.

Four enormous construction cranes rise into the sky, and trucks come and go from the site at the north end of the Kansas State University campus.

The physical work of building the behemoth structure will take five years. It will take another two years to commission the building, which will involve checking all the systems to make sure everything works. If everything stays on schedule, research will begin in 2022.

While the construction crews come and go, another less visible, but equally critical, building process is happening in the background.

Marty Vanier, a K-State employee who is "on loan" to the Department of Homeland Security, serves as director of partnership development with the NBAF Program Executive Office.

She works from an office on the K-State campus to help build what she calls a "collaborate ecosystem" of partners who will collaborate on research and help commercialize the work that comes out of the lab.

While the nation's Biosecurity Level 4 research work on animal diseases will continue to be done at Plum Island, N.Y., while NBAF is being built, work is also being started in Manhattan that will allow for a smooth transition, and some BSL-3 work that cannot be done at Plum Island because of physical limitations of the facility is being started at K-State.

That work includes projects on African swine fever and Rift Valley fever.

Vanier, who has been in the partnership development role for the past year, says DHS will be planning for permanent operation and staffing of the program office and expects to hire a permanent director for partnership development in about two years.

"My job for the last year has been in the outreach phase. I have been going places, meeting people and making friends for the lab in addition to working on plans for the structure of partnerships," Vanier says.

Some agreements have already been signed, including one with the KSU Institute for Commercialization and the Kansas City Life Sciences Institute.

The region between Manhattan and Columbia, Mo., is referred to as the Animal Health Corridor, and is home to the world's single-largest concentration of animal health and nutrition companies, creating a rich environment for mutually beneficial partnerships between private companies and the high-containment laboratory, she says.

"Sometimes a partnership involves financial support. Other times the contribution is expertise," she says.

There are a number of interrelated organizations and companies that can play a role in making NBAF successful, she says. What she is working on is finding those potential partners and coming up with a structure that can be used to help define partnerships and how they work.

The new NBAF laboratory will be much larger and more modern than the outdated Plum Island facility, and the amount of research it can support will be far greater.

Once NBAF is open for research, all the projects currently at Plum Island are expected to be transitioned to Manhattan, and the facility in New York will be decommissioned.