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College Receives Major Grant to Study Johne's Disease

The College of Agricultural Sciences has been awarded a four-year, \$4.8 million grant from the U.S. Department of Agriculture's Cooperative State Research, Education, and Extension Service to support phase two of a major international effort aimed at promoting animal biosecurity and mitigating losses from Johne's disease in livestock.

The Johne's Disease Integrated Program (JDIP)—a consortium of 170 scientists from more than 50 leading academic institutions, government agencies, and industry organizations from around the world—is led by Vivek Kapur, head of Penn State's Department of Veterinary and Biomedical Sciences.

The program's research emphases include epidemiology and transmission of Johne's disease; the development of diagnostic tests; understanding the biology of the pathogen and how it causes the disease; and studying how the body responds to the pathogen, with an eye toward vaccine development.

In addition, the program has a large outreach component designed to train veterinarians and produc-

ers so they can better manage, control, and prevent the disease.

Johne's disease (pronounced YO-knees) is a chronic, bacterial intestinal disease of cattle and other ruminants (sheep, deer, goats) that can cause weight loss, diarrhea, and decreased milk production. National estimates indicate that up to 70 percent of dairy herds and a smaller percentage of beef herds have cattle with Johne's disease. Although not scientifically proven, the bacteria that cause Johne's disease also may be associated with Crohn's disease in humans.

Annual economic losses to producers as a result of Johne's disease are estimated at more than \$14 million in Pennsylvania, up to \$500 million in the United States, and as much as \$1.5 billion worldwide. An objective of JDIP is to help reduce these losses by shortening the time between discovery research and its field application.

Kapur notes that the grant—which may be the largest competitive USDA grant Penn State ever has received—will enable the Johne's consortium to build on the accomplishments from the first three-year phase of the project.

"Our collaborative work has led to improvements in diagnostic tests, a better understanding of mechanisms of disease trans-

mission and pathogenesis, and the identification of new vaccine candidates," he explains. "Our consortium also has enabled the development of online training programs on Johne's disease for veterinarians and producers."

Improved sampling and testing strategies developed by JDIP are currently being incorporated into USDA's Voluntary Bovine Johne's Disease Control Program. Information generated by JDIP also has enhanced many state Johne's certification programs. The Pennsylvania Johne's Disease Herd Certification Program, sponsored by the state Department of Agriculture in cooperation with Penn State, is one of the nation's longest-running voluntary Johne's disease monitoring-and-control programs.

Robert Steele, dean of the College of Agricultural Sciences, says the new round of JDIP funding builds on the college's existing strengths. "Coordinating this Johne's disease program dovetails with the college's growing capacity in infectious-disease research," he says. "With our cooperative extension programs and participation in the state's animal diagnostic laboratory system, the college is well positioned to conduct and translate research that can enhance animal and human health."

—Chuck Gill

Extension Helps Landowners Navigate Gas-Leasing Maze

For the past few years, Penn State Cooperative Extension has offered workshops and information to help landowners navigate the legal and practical issues of leasing their land for natural gas exploration and extraction. But as Tom Murphy looked out over a standing-room-only crowd of about 1,500 at Tunkhannock High School this spring—all of whom came to learn about the potential pitfalls and profits of natural-gas leasing—he marveled.

The audience dwarfed the crowds that might turn out for the typical extension education workshop. And it was only the latest such seminar to address the issue. “So far, we’ve presented similar sessions for more than 14,000 people around the state,” says Murphy, an extension educator in Lycoming Coun-

ty. “After learning about landowner rights and the leasing process, some of these folks have negotiated leases that are collectively worth as much as \$200 million more than the offers they had received prior to attending a workshop.”

The pace of gas exploration in the state accelerated this year after joint research by Penn State and the State University of New York at Fredonia suggested that the Marcellus shale, a geologic formation that stretches across a large part of northern and western Pennsylvania and into neighboring states, may contain more than 500 trillion cubic feet of natural gas, at least 10 percent of which—up to \$1 trillion worth—could be recovered with new drilling technology. And that has gas companies, landowners, and rural communities scrambling to tap into this energy bonanza’s potential profits.

Earle Robbins, former Tioga County extension director who initiated the first extension gas-leasing workshops, notes that the front

of this activity moved from north-central to southwestern Pennsylvania in a flurry of activity by landmen (independent contractors or company employees who secure oil and gas leases), speculators, brokers, and energy companies, all trying to tie up large blocks of land with a company lease. Few regions in the state have not had natural-gas leasing and/or exploration take place.

“The problem is that landowners unfamiliar with industry terminology or practices are left feeling overwhelmed by the complex legal and financial decisions suddenly thrust upon them,” Robbins says. “Without timely and fact-based information, landowners are not likely to make decisions that maximize their benefits, reduce risk, and meet their ownership goals.”

Deep-well natural-gas exploration will present phenomenal opportunities for rural economic development, according to Ken Balliet, county extension director in Snyder, Montour, and Northumberland counties.

“Energy companies already are working together to deal with the logistics of supplying the materials and services they need to bring the trillions of cubic feet of gas under Pennsylvania to market,” Balliet says. “Truck drivers, welders, drillers, geologists, mechanics, and engineers are just part of the huge workforce needed. Landowners are the winners right now, but these companies will spend billions to get the gas out of the ground.”

But property owners need to be cautious, Balliet warns. “Some landowners have been approached to permanently sever mineral rights from their property for a few hundred dollars, not realizing what the impact might be to property values and their surface rights. In some cases, landowners have forfeited many of their surface rights dealing with such things as road, well, and pipeline placement.”

There are several pitfalls that landowners should avoid when negotiating a natural gas lease. “Price offered by the company is



PHOTO: COURTESY OF TOM MURPHY

just one consideration,” says Murphy. “Lease rates often will be low in an area when the first offers are made. You never should feel compelled to sign when first approached. Talk with neighbors and others to find out what is being offered.” He points out that lease offers that started at about \$15 per acre two years ago are now as high as \$2,500 per acre. And that does not include royalties on any gas extracted, which can be 15 percent or more.

“Also, know what you’re signing in a lease,” Murphy says. “Leases typically contain a lot of fine print with unfamiliar terms. Seek legal advice, and remember that it’s your land, so if there’s gas under it, that belongs to you as well. You need to partner with a company to explore for it, but it should be on terms that favor both parties. The bottom line is understand everything before you sign anything.”

Meanwhile, researchers and extension specialists in the College of Agricultural Sciences are gearing up to address other issues related to natural-gas exploration:

- How communities can keep some of the expected natural-gas revenues at home to create jobs and promote economic development
- How competing land uses can be reconciled to encourage sustainable growth and development
- How gas exploration can affect local tax revenues and property values
- How potential environmental impacts can be minimized to protect water quality and quantity, soils, forestland, and other natural resources
- How landowners signing a natural-gas lease can wisely manage their potential windfall

For more information, visit the Penn State Cooperative Extension Web site on gas and oil leasing at naturalgas.extension.psu.edu.

—Chuck Gill

A Whale of an Experience

Kate Swails didn’t know what to expect when she decided to tag along on a research vessel cruising the Gulf of Maine for three weeks.

The recent Penn State alumna, who majored in Environmental Resource Management (ERM), evaluates and grants scientific research permits in the National Oceanic and Atmospheric Administration’s National Marine Fisheries Service office. Joining 10 other scientists, she decided to see the research up close and personal.

“The researchers were looking for humpback, northern right, and pilot whales,” says Swails. “There are only a few more than 300 northern right whales left in existence.”

It took some time for her to get used to life on a boat. Thick fog along the coast made the trip cold and whale-spotting difficult. But she relished the opportunity to get close to the mammals. Once, the boat was surrounded by pilot whales. “They were right underneath us, and I could hear them breathing and splashing,” she says.

Her favorite memory was an evening when the fog finally lifted, and she realized the boat was in the middle of a large group of pilot whales just as the sun was setting. “It was so surreal and beautiful,” Swails says.

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The 2003 graduate said her major in the College of Agricultural Sciences expanded her knowledge about environmental management because she took science courses, such as chemistry and biology, in addition to environmental economics and environmental law. “I have to be familiar with policy, management, biology, and law to do my job,” she says. “Majoring in ERM gave me the interdisciplinary background I needed.”

—Bethany Fehlinger



PHOTO: COURTESY OF KATE SWAILS

Alumna Kate Swails, who evaluates and grants research permits for NOAA’s National Marine Fisheries Service, recently viewed whale studies up close and personal.



Let the Chips Fall

At Penn State, thousands of potato varieties from around the globe are put through extensive cross-breeding programs, genetic research, and intercollegiate collaborations. But once a year, the University's potato researchers switch from pipettes, computers, and other high-tech equipment to potato peelers, slicers, and a deep fryer. It's potato-chipping time.

For a few days, research technicians head for Building C at Penn State's Russell E. Larson Agricultural Research Center at Rock Springs to fry and rate potato chips. They test four potato varieties at a time, taking eight slices from the center of each to fry them in commercial fryers. Laying out 16 separate piles on a table, the researchers meticulously evaluate the chips with a 10-stage, light-to-dark visual rating chart that shows the chips' levels of darkness immediately after frying.

Barbara Christ, head of the plant pathology department who oversees the potato research program and annual chipping process (and serves as a hands-on member of the chipping crew), says there's plenty of tasting, but the potatoes aren't being rated for flavor. Up to 240 discrete varieties are being rated for appearance only, as researchers find out which spuds can be turned into pale-golden, crispy chips after four months in cold storage. From exotically colored imports to table-quality tubers, each is evaluated for chip-worthiness.

"We've tried some red and blue chips, but usually we're using white- and yellow-fleshed varieties," Christ says. And there are regional differences about what makes a good chip. Midwesterners prefer a lighter, milder chip, while easterners like a stronger-flavored, darker chip and the Northeast states and Canada favor salt-and-vinegar-flavored chips.

While many researchers and commercial outfits are growing and developing hundreds of potato varieties, Christ explains, not

many places actually give them the chip test. "We're actually one of a very few programs that does chip processing," she says. "The University of Maine and Penn State are the only two on the East Coast

facturing, with 24 companies turning out about \$57 million worth of potato chips annually, according to the state agriculture department. "Historically, a lot of chip companies originated in Pennsylvania,"



Discussing the fine points of potato-chip coloration, plant scientist Barbara Christ explains that Penn State testing helps bridge the gap between advanced research and the state's snack-food industry.

that do this much chip processing, and I think we do much more than most across the country. If someone has a variety from Idaho, they may ask us to put it in our chipping trials. Our reputation is built on the amount of testing and processing that we do."

There's a good reason why Penn State tests potatoes for their chipping traits. Pennsylvania is the nation's number one source of chipping potatoes, accounting for about one-quarter of the U.S. supply. Moreover, Pennsylvania ranks first among states in chip manu-

Christ says. "There were many one-room, mom-and-pop chip companies that would sell at certain times of the year."

Despite the relative success of the chip industry, the state has lost potato growers, in part due to land prices. Twenty years ago, Christ notes, York County was one of the largest producers, but development reduced available agricultural land, and many remaining growers began to specialize in higher-value crops.

"Another factor is that potatoes produced on the East Coast suffer with more climate-related foliar diseases and more insect problems, so our cost of production is higher," she adds. "Our soil types are so variable that quality out of a single field can fluctuate, whereas in Idaho, production tends to be more uniform."

As a result, overall potato production has declined in Pennsylvania, which ranks only eighteenth in total potato output (\$20.5 million in 2007), 70 percent of which is used for chipping. "When I arrived at Penn State in 1984, the state had 25,000 acres of potatoes," Christ says. "We're down to 11,000 acres now."

For remaining producers, Christ and her team evaluate varieties from university, USDA, and commercial sources from across the country and assemble an extensive report on clone performance and herbicide and fungicide trials. The information is made available to extension educators as well as to growers through the Pennsylvania Department of Agriculture's potato research board.

Helping growers overcome challenges and maintain their market is Christ's motivation for temporarily putting aside her lab's molecular work identifying genetic markers and sequencing genes to work with a deep fryer and piles of chips. In addition to being fun, it fills a valuable function.

"My grandfather grew potatoes, and there's a lot of basic research not understood by growers," she relates. "I've tried to take the time and effort to work with the growers so I could understand their needs and interests. By talking with local growers about how their potato varieties perform in chips, I can tell them in layman's terms what it takes to get where they want to go next season, and I can help them understand that some cross-breeding projects take 20 years. So our research has immediate and long-term impacts."

—Gary Abdullah



Only the Nose Knows

A member of the odor-assessment team bends over the machine, positions his nose in the cup, and signals the operator seated at a computer terminal a few feet away that he is ready. With a couple of keystrokes, she directs the device—an olfactometer about the size of an ATM in a convenience store—to release a carefully calibrated puff of air and odor.

The odor component in the sample—from treated municipal wastewater biosolids—is so diluted that it's not detectable to “the sniffer,” so the operator manipulates the machine to slightly increase the percentage of odor and emit another

A “sniffer” in the college’s Odor Assessment Laboratory takes part in a test to gauge the olfactory intensity of an agricultural material.

ment team takes his place, repeating the same battery of tests.

After that, they move on to testing another biosolids sample that has undergone a different treatment to diminish odor. So goes a typical day at Penn State’s Odor Assessment Laboratory in the Department of Agricultural and Biological Engineering.

On this afternoon, the lab, under the direction of Eileen Wheeler, professor of agricultural engineering, was evaluating samples of municipal wastewater biosolids for a private consulting firm and another Pennsylvania university. Researchers were studying whether innovative treatments can make the material less odorous and more socially acceptable for various land applications.

In addition to providing services for other educational institutions and business and industry, the lab mainly collaborates with researchers across Penn State studying how

ed by a \$330,000 USDA grant to study how dairy productivity is affected by changing the feed rations of cattle and investigate the resulting changes in odors and gases produced by the animal manure.

“As tensions on the urban-rural interface have grown, it has become more important to measure and reduce odors,” says Wheeler. “Researchers are working on strategies and products to diminish agricultural odors. We will never get rid of all odors coming from livestock farms, but we believe we can reduce them. And that has become vital now that situations such as housing developments bordering dairy farms have become common.”

The centerpiece of the odor lab is the olfactometer, a \$35,000 piece of equipment that is the “international gold standard” when it comes to odor evaluation, according to Robin Brandt, a lecturer in agricultural and biological engineering who manages the lab.

similar labs around the world,” Brandt says. “Day-to-day data collection and quality-assurance duties are the responsibility of senior research technologist Pat Topper, who also played a pivotal role in getting the odor lab up and running.”

But despite the wondrous technology, the human nose still plays the key role in odor detection and evaluation. The sniffers on Penn State’s odor-assessment team were selected only after Wheeler and Brandt established that their senses of smell were neither extremely sensitive nor exceptionally dull. And they have been trained to quantify what their noses tell them about odors. Team members—primarily graduate students and College of Agricultural Sciences staff—mostly tackle their sniffing chores with an air of cheerful resignation.

“Some people think that this is really unpleasant work, but I don’t think so,” says a petite, middle-aged female staff assistant who concedes

“The olfactometer allows us to compare our results to those from similar labs around the world.”

she is an old hand at dealing with agricultural odors, having grown up on a central Pennsylvania dairy farm. “I have sniffed only one truly disgusting odor, and that was a high concentration of swine manure. That was kind of overwhelming.”

There has been some debate about odor analysis, Wheeler concedes. “There is agreement that the human nose is the ultimate sensor, but in most cases it is not a very accurate sensor because people have such strong emotions wrapped around certain smells,” she says. “Working with the olfactometer and a trained odor-assessment team, we have removed the emotion from the process. Only humans can characterize an odor. But whether I like an odor or not is completely subjective.”

—Jeff Mulhollem



er puff of air. This time he “smells” it so the “odor detection threshold” of the sample is recorded. The process is repeated until the sniffer correctly recognizes odorous air puffs two times in a row, and then another member of the odor-assess-

to reduce gaseous emissions from animal agriculture, most with significant odorous components. Scientists are looking at solutions that range from manure additives to alternative livestock feeds.

The odor lab is partially fund-

Penn State is the only university in the Mid-Atlantic and Northeast regions to have an agricultural environmental odor laboratory with an olfactometer, he points out.

“The olfactometer allows us to compare our results to those from

New Curator Guides Expansion of Pasto Agricultural Museum

As Penn State's Pasto Agricultural Museum marks its thirtieth anniversary at this year's Ag Progress Days exposition, a new volunteer curator is helping guide the museum through a building project that, when completed, will more than double exhibit space.

Daryl Heasley of State College, professor emeritus of rural sociology who recently retired after almost 37 years of service to the College of Agricultural Sciences, began as volunteer curator in January 2008. He replaced Darwin Braund, a college alumnus and retired professor of dairy science at North Carolina State University who had been the volunteer curator for a decade.

The Pasto Agricultural Museum is known for having one of the nation's finest collections of dairy antiques.

Heasley is the third curator of the facility, located on the Ag Progress Days site at the Russell E. Larson Agricultural Research Center at Rock Spring, nine miles southwest of State College. The first was Jerome Pasto, associate dean emeritus in the college who stepped down as curator after 20 years in 1998.

"As a result of Jerry Pasto's foresight, his successors have had a solid basis for expansion and growth," Heasley says. "His vision to exhibit the advances in agricultural technology only through the period of animal and human power provided a unique foundation. With scant resources at his disposal, his dedication and determination provided the original building, collec-



tion, and the funds to ensure the preservation of our rich agricultural heritage.

"I see myself continuing what Jerry Pasto started and Darwin Braund expanded," adds Heasley, who has been a volunteer guide at the museum for several years. "I have great admiration for both previous curators, and I plan to build on the heritage they've provided by bringing a major educational focus to the museum."

Heasley, who grew up on a farm not far from Sandy Lake in Venango County, believes it is a quirk of fate that he ended up presiding over an agricultural museum. "Many of these antique implements we are displaying, I used way back when I was growing up on the farm," he says with a chuckle. "This is a good fit for me with my background and after teaching a vo-ag course at Slippery Rock Area High School for five years."

It is a challenge managing a museum with a part-time volunteer curator, Heasley points out, but the "common thread" running through

the decades of the Pasto facility operation is museum office manager Vinnie Scanlon. "She's the glue that has held this together," he says. "We really appreciate what she does for the museum. I am going to be relying on her experience and perspective, as well as those same qualities from Pasto and Braund. It is because of the dedication and expertise of all the volunteers and donors that the museum functions."

The new addition, which was partially finished as this went to press, is 52 feet wide by 100 feet long, adding 5,200 square feet of floor space to the existing 40-foot-by-80-foot museum. The project includes extensive renovations to the existing structure, allowing it to be heated and air-conditioned and better display the agricultural antiques in the collection. In addition, the museum will be available year-round once the building is completed.

"When it's finished, we'll be able to put about 90 percent of our holdings on display," says Heasley. "Right now, we are able to ex-

The three volunteer curators who have served at the Pasto Agricultural Museum over the years are (from left) Darwin Braund, Daryl Heasley, and founder Jerry Pasto.

hibit only about 40 percent of the collection."

The Pasto Agricultural Museum—known for having one of the nation's finest collections of dairy antiques, thanks largely to former curator Braund—has nearly 1,200 rare and unusual pieces used for farming and homemaking in the era before electricity and gasoline power reached most farms. The museum's collection spans over 6,000 years, but the focus is on Pennsylvania and the Northeast from the 1800s to the early 1940s, with links to modern agricultural methods.

To learn more, visit the museum's Web site at pasto.cas.psu.edu. To arrange a group tour, call 814-865-2541 or send e-mail to pastoagmuseum@psu.edu.

—Jeff Mulhollem