INDUSTRY NEWS

Research Update

►**Summaries** of current **beef cattle** research

PHOTO COURTESY OF NEW GENERATION FEEDS

►A patented animal feed technology improves the health, growth and reproductive functions of livestock. The technology was developed by Jim Drouillard, professor of animal sciences and industry at Kansas State University.

Patent issued for beneficial animal 'candy'

A U.S. patent has been granted to a Kansas State University-developed "candy" that stimulates the growth, health and reproductive functions of cattle, bulls and other livestock.

Jim Drouillard, professor of animal sciences and industry, discovered a specific combination of molasses, oilseeds and oilseed extracts that, when heated and evaporated, form a substance that improves absorption of specific omega-3 fatty acids.

"It's a free-choice type of supplement in a block form — sort of like a big, 250-pound (lb.) piece of [candy] for livestock," Drouillard said. "It's put in the pasture, and the animals consume it whenever they want. The product's physical characteristics restrict the animals to consuming less than a pound each day, making it a convenient and cost-effective way to deliver essential nutrients."

The substance contains desirable fats that elevate levels of specific omega-3 fatty acids in the bloodstream. The increases in omega-3 fatty acids can stimulate growth, improve immunity and enhance reproduction function and overall fertility in livestock that consume the supplement.

New Generation Feeds, a South Dakota-based company, has retained exclusive rights to the patented technology for use in its SmartLic brand of livestock supplements. The process is used in making the company's HorsLic supplement for equines and FlaxLic supplement for beef and dairy cattle.

The patent, "Product and process for elevating lipid blood levels in livestock," is issued to the Kansas State University Research Foundation, a nonprofit corporation responsible for managing technology transfer activities at the university.

Drouillard is continuing research on the combination by working to improve the fats' resistance to bacteria in the digestive system.

— Author: Greg Tammen, K-State Communications and Marketing

Switchgrass project a success

In 2007, University of Kentucky (UK) College of Agriculture forage specialists, East Kentucky Power Cooperative personnel and 20 farmers in northeastern Kentucky began a pilot project looking at the biomass potential of switchgrass, a warm-season forage native to Kentucky.

Several factors have limited the current biomass market, but Ray Smith, UK extension forage specialist, said the project was still a success.

"We learned a whole lot and found some useful applications for the forage until a consistent biomass market develops," said Smith, who was the primary investigator on the project.

The research project, directed by UK hay specialist Tom Keene and funded by the Kentucky Agricultural Development Fund, has yielded better recommendations for establishing switchgrass as forage, an economic spreadsheet farmers can utilize to determine if switchgrass would be a good option for their operation, documented environmental benefits of the crop and possibly a more cost-effective way to make the product easier to transport and handle.

Smith said half of the original group of farmers still have productive stands of switchgrass and are cutting it for hay or grazing cattle on it, as it thrives during the hot, dry months of summer when cool-season grasses struggle. He said the producers were extremely pleased with switchgrass' production and quality during the 2012 drought.

"One of the primary reasons why we selected switchgrass for this project was because it showed great promise as a dual-purpose crop," Smith said.

UK researchers found that producers could take an early cutting of switchgrass for hay and harvest it in late fall for a biomass crop without a significant yield loss, which is promising if a market develops. Former UK graduate student David Davis conducted a study in 2011 that showed when switchgrass is harvested at a leafy stage, it has acceptable digestibility and protein that growing steers need.

The pilot project also showed the forage's beneficial environmental enhancements. UK graduate student Laura Schwer found that switchgrass' deep root system can control erosion, improve soil quality and sequester carbon. The forage's dense canopy, abundant seeds and clear understory make it an excellent wildlife habitat for small mammals. The presence of small mammals is an indicator of overall ecosystem health.

Smith, along with UK agricultural economist Greg Halich, developed an interactive spreadsheet for farmers to compare their current production costs for hay and the production costs of switchgrass as a biomass if a market develops. They found that producers would need to receive $64 per ton of biomass to break even on the crop.

"Producers must be able to realize the economic benefits of switchgrass before they can justify moving land out of hay or crop production," Smith said. "This tool allows producers to determine whether switchgrass is more profitable than hay for their farming operation before they sign long-term biomass production contracts."

Throughout the study, UK researchers looked for several ways to mitigate transportation and handling costs for producers and the power company — two of the biggest limiting factors for using switchgrass as a biomass. In 2011, UK purchased two mobile briquetting units, so producers could turn switchgrass into briquettes on the farm. Putting switchgrass into a briquette makes it easier to transport compared to large, round bales. It also made mixing the switchgrass with coal much easier for the power company. Smith said briquetting units are expensive, however, and producers would likely have to purchase a unit as group or cooperative to keep production costs low.

He added that he has begun a different research project funded by the Natural

Resources Conservation Service to look at other opportunities for switchgrass beyond biomass production. That project will go through 2014. UK forage specialists are continuing to look at forage options for biomass production.

— Author: Katie Pratt, UK agricultural communications

The upside of Inflammation

Inflammation. The word typically has a negative connotation. Arthritis … infection … numerous maladies come to mind.

But a Kansas State University (K-State) researcher found that inflammation that occurs naturally in dairy cows the first few days after giving birth may play a surprisingly beneficial role in the complex process of going from late pregnancy to lactation. Their research on dairy cows may have implications for other species.

"We know that during the first several days after giving birth and going into the lactating phase, dairy cows naturally experience some degree of inflammation," said Barry Bradford, associate professor in K-State's Department of Animal Sciences and Industry. "We also know that many disorders, including metabolic diseases such as ketosis and fatty liver, occur during this time of transition."

He, along with a team of researchers from K-State, Iowa State University and Michigan State University, wondered if inflammation actually causes the metabolic problems.

Thinking that reducing inflammation during this period might be beneficial for the cow's transition from gestation to lactation, plus limit metabolic disease, Bradford and the team conducted a study. The objective was to determine if using an anti-inflammatory drug (sodium salicylate or SS) for the first seven days of lactation would prevent liver fat accumulation, improve the supply of glucose for lactation, and limit metabolic disease in dairy cows entering lactation. SS was delivered to the animals in a controlled way in their drinking water.

The team did not get the result they expected.

"Our findings suggest that mild inflammation may be a necessary part of a cow's adaptation to lactation," Bradford said.

Among the significant findings, the research showed that rather than preventing fatty liver by blocking the inflammation, liver fat content was actually increased in the first week of lactation. Similarly, anti-inflammatory treatment led to a dramatic drop in plasma glucose concentration in mature cows. Both of these responses are often associated with metabolic disease in early-lactation cows.

"The study improved our understanding of the re-prioritization process by suggesting that inflammatory pathways promote a temporary state of insulin resistance in dairy cows, resulting in conservation of glucose for use by the mammary gland," Bradford said.

The results of the study, which was funded by the USDA's National Institute of Food and Agriculture, indicate that inflammation-induced insulin resistance is in some cases an adaptive, rather than pathological, phenomenon. It may help clarify why the links between inflammation and metabolism have survived the evolution process, he said.

It's not just cattle that experience the shift in demands on the body.

"Many species experience these dramatic shifts," Bradford said. "The role of inflammation in this process has not been studied very much. We are missing some information about why our bodies are wired the way they are — even after evolutionary refinement of the immune system, there seems to be a role for inflammation in metabolic function."

The research team's findings have been published by the *American Journal of Physiology,* at: *http://bit.ly/1anXawz.*

"Our findings suggest that we want some degree of inflammation at this time because it helps the animal shift gears," Bradford said. "Rather than thinking of mild inflammation as a disease-inducing factor, we think there may be times during life where some inflammation is advantageous or necessary."

The research team plans to delve into the topic further and is seeking funding to find evidence of the phenomenon in other species.

— Author: Mary Lou Peter, K-State Research and Extension

'Chemometer' offers easy way to test for dangerous pollutants

Imagine being able to test air or water for the presence of toxic metals — and many other potentially dangerous pollutants — with a device as easy to use as a home pregnancy kit, and with on-the-spot results as simple to read as a United Way fundraising thermometer, and all for pennies on the dollar. 4¢ to be exact. John Volckens, Charles Henry and a team of fellow researchers imagined it. Then they built it.

The Colorado State University (CSU) researchers have engineered a new paper-based analytical device unlike others in the burgeoning class. Similar to a thermometer, the device accurately quantifies a pollutant of interest by the distance red fluid travels up a tiny test channel. That means there's no need for additional instruments to calibrate results.

If his team can get the innovation to market, Volckens says you'll be able to assess environmental health with a little device called the "chemometer," reducing the need for lengthy and expensive laboratory tests.

"This is an empowering technology," said Volckens, an associate professor in the CSU Department of Environmental and Radiological Health Services. "It's a piece of paper that does complex chemistry for you. It costs 200 times less than a laboratory test, the analysis takes 15 minutes at the site of interest, and to do the analysis you don't need more than your naked eye with minimal training."

The CSU team describes its invention in a paper recently published in the journal *Lab on a Chip,* published by the Royal Society of Chemistry. They write that their innovation offers new capabilities.

"Paper-based analytical devices represent a growing class of elegant, yet inexpensive, chemical sensor technologies designed for point-of-use applications," they write. "We describe here a simple technique to render PAD measurements more quantitative and straightforward using the distance of color development as a detection motif."

Collaborating with Volckens are Henry, professor in the Department of Chemistry; David Cate, a doctoral student in biomedical engineering; and Josephine Cunningham, an undergraduate student in chemistry. Another collaborator is Wijitar Dungchai, of King Mongkut's University of Technology in Thailand, who developed the device's chemistry as a visiting scholar in Henry's laboratory.

"The shared knowledge this type of technology can bring could be game-changing," Henry said. "We can test for all kinds of metals, all kinds of chemicals, all kinds of biomarkers for personal healthcare. This could have far-reaching impacts."

The team hopes its paper-based analytical device can be commercialized through a new spinoff company, Access Sensor Technologies LLC, which Volckens and Henry co-founded this spring to help bring lab-on-a-chip innovations to market.

Think the new device sounds like a more sophisticated version of a home pregnancy test or litmus paper from science class? That's right, Volckens said. Those technologies are the forerunners of today's deceptively simple paper-based analytical devices.

"There's some pretty cool, nerdy chemistry going on in this little channel," he enthused. "All we have to do is change the reagents, and we can test for virtually anything."

— Source: Colorado State University