INDUSTRY NEWS

Research Update

▶ **Summaries** of current **beef cattle** research

An odd lot

This month's collection of research items may appear to be an odd lot, but each in its own way applies fundamentally to the beef business. Predation seems to be increasing as a concern to livestock producers. The first item attributes a cost to the "worry" factor beyond the actual loss of animals. We've discussed mitochondrial DNA as inherited from the dam only (see "A Mother's Contribution" in the July 2004* Angus Journal*), so if mitochondria drive cell division, what does that mean to genetic inheritance? The study on nitric oxide may have application in forage growth and durability, as well as toxicity to livestock.

Predators can affect how livestock watch over their young

Livestock are likely to spend more time on the lookout for predators soon after the loss of a calf and, therefore, have less time to forage for their food, according to a new study. Consequently, predators such as wolves, mountain lions and coyotes can affect the economic solvency of livestock producers, according to an article in the May 2008 issue of *Rangeland Ecology and Management,* published by the Society for Range Management.

"Our results show that vigilance behavior in cattle is plastic," write Bryan Kluever, Stewart Breck, Larry Howery, Paul Krausman and David Bergman in their article "Vigilance in Cattle: The Influence of Predation, Social Interactions and Environmental Factors."

In the article, they outline their findings after observing cattle during peak foraging hours for two summers in northeast Arizona. During this time, the researchers watched how predators affected the scanning behavior, or vigilance, of cattle. They found that factors affecting vigilance and foraging behavior include lactation status, herd size and visual obstructions.

In the first three days after the loss of a calf, mother cows had higher vigilance rates but spent less time on foraging. However, within 10 days of the calf death, their vigilance and foraging times returned to earlier levels.

Cattle have lower vigilance rates than wild ungulates, the researchers say, likely because of the domestication process. However, they "react to predators in a similar fashion to wild ungulates," the authors write.

The type of predator also may affect vigilance levels, the researchers say. Cattle may be more wary of chasing or harassing predators than those who stalk or ambush their prey. "Understanding these differences could be important for livestock management practices," the researchers write.

To read the entire study, visit *www.allenpress.com/pdf/RAMA-61.3.pdf.*

Editor's Note: Rangeland Ecology & Management *is published six times a year by the Society for Range Management. The Journal provides a forum for the presentation and discussion of experimental data, concepts and philosophies pertaining to the study, management and use of global rangeland resources. For more information about the Journal and the Society visit* srmjournals.org *and* www.rangelands.org.

Cell fuel is 'brains' behind division

With the cost of diesel and gasoline getting nearer to the hourly minimum wage, too bad the fuel doesn't do more work — like deciding what route to take and pressing the gas pedal. While that concept isn't likely to work for vehicle fuel, a new study has found that it is, in fact, what goes on in the cells of yeast.

Mitochondria, the fuel of a cell, have been found to be the driver for cell division, according to Texas AgriLife Research biochemists. This discovery could play a big role in finding cures for many human diseases, they say.

The biochemists studied yeast cells and found that mitochondria, which generate 90% of the cell's energy, can be the deciding factor — the "brain power" — behind how fast cells divide.

The finding by Michael Polymenis and Mary Bryk and their research groups in Texas A&M University's (TAMU's) biochemistry and biophysics department was published in the April 25 open-access journal *Public Library of Science-Genetics.* The research was funded by the National Institutes of Health (NIH).

"The finding changes the traditional view of the mitochondrion from an energy depot at the service of its larger cellular host to a command center that directs cell division," Polymenis said. The researchers used regular baker's yeast because many of the yeast cell's processes are similar to those in human cells, Bryk said.

"From unicellular yeast to complex mammals, the process is the same," Bryk said. "The job of a cell is to divide and grow. Metabolism takes in 'food' and turns it into fuel and building blocks for DNA replication and gene expression."

But when these processes falter, diseases can result. Too much cell division too quickly, for example, is typical of cancerous cells, Polymenis pointed out. Conversely, poor metabolism — stemming from mitochondrial deficiencies — is at the root of damage to various organs such as the brain, heart, skeletal muscles and liver.

"All of the body processes that require a lot of energy are impacted by this," Polymenis added. "In fact, at least one in every 4,000 people worldwide suffers from mitochondrial deficiencies that result in problems with normal development, motor control, vision, hearing, or liver and kidney function."

On the other hand, there are times when speeding cell division might be useful as with wound healing and plant or crop production, Bryk noted.

"If we can understand the basic pathway that regulates cell division, we can think of ways to tweak the different steps in that path with therapeutics to help people who have problems with these high-energy organs," she said.

Polymenis said the research showed that when a yeast cell's mitochondria decided to "turn on the switch," the cell's nucleus, which carries most of the genetic material, received the message and cell division began.

"So now we need to connect that link,"

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Polymenis said. "We need to understand how and when the message is sent. If we know how the message is sent from the mitochondria, we might be able to control it."

— by Kathleen Phillips of TAMU, which provided this release.

Nitric oxide regulates plants as well as people

Nitric oxide has emerged as an important signaling molecule in plants as in mammals, including people. In studies of a tropical medicinal herb as a model plant, researchers have found that nitric oxide targets a number of proteins and enzymes in plants.

In collaborative work with the research group of Renu Deswal, a faculty member, and her doctoral student at the Botany Department, University of Delhi, India, Agricultural Research Service (ARS) scientist Autar Mattoo has identified 19 such targeted proteins and enzymes in *Kalanchoe pinnata,* also known as "miracle leaf." Mattoo is a plant physiologist with the ARS Sustainable Agricultural Systems Laboratory, Beltsville, Md.

The targeted proteins and enzymes are involved in regulating processes from seed germination and cell development to plant death. They also regulate many other important processes, including photosynthesis, sugar metabolism, disease tolerance and stress tolerance in plants.

The collaborative research suggests that the effects of nitric oxide, a sometimes toxic byproduct of nitrogen oxidation in soil, may have broader implications in plant processes than previously realized. Its modification of proteins, a process called

S-nitrosylation, is increasingly recognized as a ubiquitous regulatory reaction in plants and mammals.

Mattoo and Deswal have shown for the first time that nitric oxide inactivates Rubisco, a major enzyme involved in carbon dioxide fixation and photosynthesis in plants.

Kalanchoe represents plants that have a unique method of carbon dioxide fixation that is shared by succulent plants. Kalanchoe has diverse possible medicinal benefits, suggesting the presence of interesting processes at work. Mattoo hopes to do similar studies with major crops grown in different production systems, with the goal of improving both crop yields and quality, including nutritional benefits.

Other scientists have studied nitric oxide targets in the most common model plant, Arabidopsis. Mattoo and collaborators found that Kalanchoe had some nitric oxide targets in common with Arabidopsis, such as Rubisco and drought-protective proteins. They also found new protein targets in Kalanchoe that have not been reported previously.

A paper discussing these results is available online at the *FEBS Journal* web site at *www.febsjournal.org.* The Journal is published on the behalf of the Federation of European Biochemical Societies (FEBS).

— by Don Comis of the ARS News Service, which provided this release.

***Editor's Note:** *If you don't have a July 2004 issue handy, "A Mother's Contribution" is available via a back issue search at* www.angusjournal.com/aj_backissues.html. *You may search by keyword (mitochondrial DNA) or month published (July 2004).*