INDUSTRY NEWS

# Research Update

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

## New finding helps explain how toxin harms farm animals

A new category of fats in mammalian cells discovered by Agricultural Research Service (ARS) scientists and colleagues may help explain how a harmful toxin called fumonisin causes disease in farm animals.

The discovery could open up a new research area for exploring ways to reduce the toxic effects of fumonisin, which is found in corn that has been infected with a fungus called *Fusarium.* Fumonisin is known to cause a host of diseases, such as equine leukoencephalomalacia, which is a brain disease in horses, and porcine pulmonary edema, a lung disease in swine.

In previous work, these scientists found that fumonisin inhibits the formation of a group of fats known as sphingolipids and disrupts the metabolism of sphingolipids and other fats. It is now known that this disruption of fat metabolism is the cause of the animal diseases and also kidney and liver toxicity and cancer in rodent animal models. In the earlier studies, this group showed that inhibition increases the levels of several well-known sphingolipid metabolites and an unidentified sphingolipid, which was coined "the mystery peak."

ARS toxicologist Ronald Riley at the ARS Richard B. Russell Research Center in Athens, Ga., and colleagues at Health Canada in Ottawa, Emory University in Atlanta, Ga., and the Georgia Institute of Technology in Atlanta identified the "mystery" compound. The research was published recently in *The Journal of Biological Chemistry.*

Riley and his colleagues found that the first enzyme that makes the backbone — sphinganine — common to all sphingolipids normally uses serine as a substrate. However, the mystery compound was being produced because the enzyme was using the amino acid "alanine" instead.

This is important because the oxygen atom that is found on serine is critical in the formation of more complex sphingolipids. Thus, this new sphingoid base was called 1-deoxysphinganine and serves as the backbone for a new category of sphingolipids (1-deoxydihydroceramides) in mammalian cells and tissues.

This new sphingoid base accumulates in cells and tissues after fumonisin exposure. Riley and his colleagues showed that the amount of 1-deoxysphinganine rises when levels of serine fall relative to alanine. Thus, these compounds are an underappreciated category of bioactive sphingolipids that might play important roles in cell regulation and disease.

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*— by Sharon Durham, ARS News Service, 301-504-1611, sharon.durham@ars.usda.gov*

## A better understanding of a major threat to wheat

The pathogen that causes the world's most common wheat disease is a moving target, but scientists are now better equipped to keep track of it, thanks to some genetic sleuthing by ARS scientists.

Up to 60 resistance genes have been known to combat *Puccinia triticina,* the fungus that causes wheat leaf rust. But the pathogen is so genetically diverse and quick to adapt that most wheat resistance genes prove ineffective within a few years.

The stakes are high. Leaf rust is the world's most widely distributed wheat disease. In Kansas alone, wheat producers lost 14% of their crop — some 50 million bushels — to a leaf rust epidemic in 2007. Emerging strains of *P. triticina* are an increasing threat to soft red winter wheat in the southeastern United States, and to hard red winter wheat and hard red spring wheat in the Great Plains, says James Kolmer, a plant pathologist at the ARS Cereal Disease Laboratory in St. Paul, Minn.

Kolmer recently completed a comprehensive genetic analysis of emerging strains of *P. triticina* collected in a recent survey of North America's major wheat-producing areas, probing the strains with DNA markers specifically developed for the leaf rust fungus and for virulence capable of overcoming wheat leaf rust resistance genes.

Kolmer found that the strains of *P. triticina* infecting wheat in North America fall into five genetically distinct groups, with two widely distributed groups accounting for 90% of the total population. The five groups also differ in their ability to overcome a number of resistance genes, an indication that different groups of *P. triticina* develop virulence traits at different rates.

The work, to be published in the journal *Phytopathology,* will help researchers identify the origins of emerging strains of *P. triticina,* unravel clues about migration patterns, monitor shifts in virulence and figure out why some resistance genes are more effective and long-lasting than others.

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*— by Dennis O'Brien, ARS News Service, 301-504-1624, dennis.obrien@ars.usda.gov*

## Watermelons tapped for ethanol

With their sweet, refreshing juices and succulent interior, watermelons are a favorite summertime treat, especially around July 4. But now this Independence Day favorite could become even more of a patriotic commodity.

ARS studies in Lane, Okla., have shown that simple sugars in watermelon juice can be made into ethanol. In 2007, growers harvested 4 billion pounds (lb.) of watermelon for fresh and cut-fruit markets. Around 800 million lb. — or 20% of the total — were left in fields because of external blemishes or deformities.

Now, instead of being plowed under, such melons could get an economic "new lease on life" as ethanol. Normally, this biofuel is produced from cane crops like corn, sorghum or sugarcane as a cleaner-burning alternative to gasoline. The watermelon work reflects a national push by ARS to diversify America's portfolio of biofuel crops that can diminish the reliance on petroleum, especially from foreign suppliers.

Chemist Wayne Fish's ethanol studies at the ARS South Central Agricultural Research Laboratory in Lane complement ongoing research there to commercially extract lycopene and citrulline from the crop. Both are valued nutraceutical compounds thought to promote cardiovascular and other health benefits.

In publication-pending studies, Fish showed ethanol can be fermented from the glucose, fructose and sucrose in waste-stream juices — what's left after lycopene and citrulline are extracted. Making ethanol offers the potential benefits of helping to defray sewage treatment costs associated with nutraceutical extraction, and

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providing watermelon growers with a new market for their crop.

On average, a 20-lb. watermelon will yield about 1.4 lb. of sugar from the flesh and rind, from which about 7/10 of a pound of ethanol can be derived. To extract all the possible sugars, Fish is seeking to degrade the rind with chemical and enzyme treatments. He's also evaluating different combinations of temperatures, yeasts, antifoaming agents and pH levels to optimize the system.

Lane scientists also are examining annual ryegrass, sorghum and other crops that could be rotated with watermelons to furnish processing plants with a year-round supply of nutraceuticals or ethanol.

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## Ag prices

**Prices received are up.** The preliminary *All Farm Products Index of Prices Received by Farmers* in May, at 131% (where 1990-1992 = 100), increased 2 points (1.6%) from April. The *Crop Index* is up 2 points (1.3%), but the *Livestock Index* was unchanged. Producers received higher prices for broilers, soybeans, corn and onions and lower prices for eggs, lettuce, tomatoes and milk.

In addition to prices, the overall index is also affected by the seasonal change based on a three-year average mix of commodities producers sell. Increased monthly marketings of sweet corn, broilers, grapes and cantaloupes offset decreased marketings of cattle, milk, corn and apples.

The preliminary *All-Farm Products Index* is down 21 points (14%) from May 2008. The *Food Commodities Index,* at 128, increased 1 point (0.8%) from last month, but decreased 20 points (14%) from May 2008.

**Prices paid are down.** The May *Index of Prices Paid for Commodities and Services, Interest, Taxes, and Farm Wage Rates* (PPITW) is 176% of the 1990-1992 average. The index is down 1 point (0.6%) from April and 8 points (4.3%) below May 2008. Lower prices in May for potash and phosphate, feeder pigs, mixed fertilizer and complete feeds more than offset higher prices for nitrogen, feedgrains, gasoline and LP gas.

**Prices received by farmers are up.** The May *All Farm Products Index* is 131% of its 1990-1992 base, up 1.6% from the April index, but 14% below the May 2008 index.

The May *All Crop Index* is 153, up 1.3% from April but 12% below May 2008. Index increases for feedgrains and hay, oil-bearing crops, fruits and nuts, and foodgrains more than offset the index decreases for commercial vegetables, cotton and potatoes and dry beans.

The May *Feedgrains and Hay Index* is 177, up 5.4% from last month, but 22% below a year ago. The corn price, at $4.08 per bushel, is up 23¢ from last month, but $1.19 below May 2008. The all-hay price, at $131 per ton, is up $2.00 from April but down $37.00 from last May. Sorghum grain, at $6.14 per hundredweight (cwt.), is 57¢ above April but $3.18 below May last year.

The May *Livestock and Products Index,* at 112, is unchanged from last month but down 16% from May 2008. Compared with a year ago, prices are higher for broilers. Prices are down from last year for milk, cattle, hogs, eggs, turkeys and calves.

The May *Meat Animals Index,* at 109, is down 0.9% from last month and 11% lower than last year. The May hog price, at $44.20 per cwt., is up 10¢ from April, but $11.10 lower than a year ago. The May beef cattle price of $82.80 per cwt. is down 70¢ from last month and $8.50 lower than May 2008.

The May *Dairy Products Index,* at 90, is down 1.1% from a month ago and 36% lower than May last year. The May all-milk price of $11.70 per cwt. is down 20¢ from last month and $6.60 from May 2008. The fluid grade and the manufacturing grade milk prices are down 20¢ from the previous month.

*— Released May 29, 2009, by the National Agricultural Statistics Service (NASS), Agricultural Statistics Board, U.S. Department of Agriculture.*

**Table 1: Index summary table**

| | 2008 | | 2009 | |
|---|---|---|---|---|
| **Index 1990-1992=100** | **April** | **May** | **April** | **May** |
| Prices received | 146 | 152 | 129 | 131 |
| Prices Paid | 179 | 184 | 177 | 176 |
| Ratio[1] | 82 | 83 | 73 | 74 |

[1]Ratio of index of prices received by farmers to index of prices paid by farmers.