

Agriculture

Mare Reproductive Loss Syndrome

In the equine industry, 2001 may be remembered as the Year of Lost Foals. Mare Reproductive Loss Syndrome hit Central Kentucky hard—an estimated 30 percent of thoroughbred foals died, and the state lost around \$336 million from these deaths in all breeds of horses.

A multi-talented team of UK scientists moved quickly to find out how and why this happened. Roberta Dwyer and David Powell (veterinary sciences) rapidly developed and led an epidemiological

survey that associated Eastern Tent Caterpillars with MRLS. Bruce Webb (entomology), Karen McDowell and Mike Donahue (veterinary science), Neil Williams (UK Livestock Disease Diagnostic Center), and Merlin Lindeman (animal sciences) then pooled their expertise to show that the caterpillars caused the disease. A series of studies over the next five years revealed that when horses inadvertently eat the caterpillars, their hairs become embedded in the lining of the horse's alimentary tract. Once that protective barrier is breached, bacteria invade the mare's placenta and fetal tissue—ultimately causing the loss of the fetus.

Research led by Dan Potter in entomology led to several new and effective options for farm managers to control Eastern Tent Caterpillars. For example, UK tested a new formulation of a compound called abamectin, developed by the J.J. Mauget Company, which manufactures insecticides, fungicides, fertilizers, and antibiotics for tree care, and found it effective for control of tent caterpillars. The insecticide is sent into a tree's leaves and roots through small, shallow drilled holes.

"The product, Abacide 2, showed 100 percent control of the caterpillars in trials done by UK researchers," says Potter. Abamectin is the first effective non-spray caterpillar insecticide on the market where the active ingredient has low toxicity to people and livestock.



Better Animal Health in the Commonwealth

Healthier animals in Kentucky has been the goal of UK's Department of Animal and Food Sciences from its beginning, says chair Bob Harmon, and there are two starting points for this work. "Through basic research, we develop scientific data that can be applied to solve common problems on farms in Kentucky and nationally, and our work is also directed by discussions with our extension faculty, who work with farmers on a daily basis."

Beef cattle research has included studies of nutrient use and efficiency at the cellular, tissue and organ levels, physiology of digestion, animal metabolism, and grazing systems to enhance

profitable production of high-quality beef. Swine nutritionists have helped define the safety of genetically modified feeds and identified diets to reduce environmental impact and odors. Studies of copper needs in dairy cattle have contributed to the definition of copper requirements and to healthier dairy cows. Studies on foal and mare nutrition have helped Kentucky's renowned equine industry produce quality foals. And poultry research has focused on reducing excretion of nutrients and enhancing meat and eggs.

Recently, UK researchers have partnered with a global leader in the animal feed industry—Alltech—to meet the common goals of improving animal health and performance by adding nutritional value to animal feed, and increasing animal health. “In 2004, Alltech, located in Nicholasville, Kentucky, was looking for a research site to help solve emerging challenges to animal agriculture, so they came to us,” Harmon says. “And the Alltech-UK Nutrition Research Alliance began.”

He adds that the department has several internationally recognized nutritionists who recently chaired committees for the National Research Council to create publications that establish the nutrient requirements for dairy cattle, swine and horses.

“These publications are the gold standard for animal nutrition,” Harmon says.

Erosion-Free Farming

A sloping field that has been conventionally tilled can lose the equivalent of 50 tons of topsoil per acre after a heavy rain. This doesn't just hurt the farmland—it costs farmers time and money, and much of that topsoil ends up dirtying Kentucky's waterways.

That's why UK agricultural experts and Kentucky farmers have been studying the benefits of no-till farming since the mid-1960s and working to develop more ecologically friendly tillage methods.

“No-till is the practice of leaving cover crops or the residues of the previous crop to protect the surface of the soil, like a mulch,” says Lloyd Murdock, a professor of plant and soil sciences at UK. “No-till prevents soil erosion, improves the quality of the soil, and reduces the cost of farming by eliminating many tillage trips over the field.” He adds that this revolutionary method assures a sustainable soil base for good food and crop production for as long as the soils are cropped.

Murdock estimates that about 75 percent of Kentucky's suitable farming acres face some degree of erosion risk—that's 11.4 million acres. “The mulch fights erosion and creates an environment that conserves water in the soil for the benefit of the crop,” Murdock says. No-till methods are used for corn, soybeans and wheat.

New Plant-Based Natural Products

The College of Agriculture and its partners in pharmacy and medicine have developed important new technologies from extensive studies of plant biochemistry and drug development. This work has led to the founding of companies whose products have direct agricultural and medicinal applications. This area of research activity is called UK's Natural Products program.

Natural products research at UK's Kentucky Tobacco Research and Development Center (KTRDC) may mean good news for Kentucky farmers. The center is working to discover new products in plants, and utilize plants as novel manufacturing systems for commercial production.

“Around one-fourth of our medicinal drugs are derived from plants. We also use plants as sources of natural spices, food, fibers, and oils,” explains Maelor Davies, KTRDC director, who has led the center in the direction of natural products research since coming to UK in 1996. “We're supporting scientists who are looking at native Kentucky plants and their

potential as sources of valuable new materials.”

This work at the KTRDC and efforts in other UK centers and colleges have led to several natural products faculty startups.

ParaTechs, the culmination of research by Bruce Webb (entomology), seeks to use insect molecular biology to identify genes from insect parasites and pathogens that can be utilized for insect control and development of natural products.

Oraceuticals, founded by Brad Huang and Jeffrey Ebersole (Center for Oral Health Research), and Cindy Burklow, uses natural products, particularly those derived from Kentucky native flora, which possess anti-inflammatory and antimicrobial properties, to prevent or manage oral infections

Yaupon Therapeutics, based on research by Linda Dwoskin and Peter Crooks (pharmaceutical sciences), develops small-molecule pharmaceuticals. The researchers have had success with lobeline, an alkaloid from lobelia, a Kentucky native plant, which blocks the desire for methamphetamine.

14 of all
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