

New Bolton research probes dairy mysteries

BY JACK HUBLEY
KENNETT SQUARE — Traveling through the undulating Chester County farm country, this place leaps out at you like a castle in a desert. New Bolton Center, with its 1,000-acre campus and 70 buildings, reminds you that there's more to Kennett Square than mushrooms.

New Bolton is the University of Pennsylvania School of Veterinary

Medicine's large animal facility. And though the school aims to turn out top-flight veterinary students, its mission goes far beyond that of education, says New Bolton's associate dean, Dick McFeely.

Strategically located within the state's intensively farmed southeastern region, the center services animal agriculture with its hospital and lab facilities. And

though the center has become a focal point for the treatment of equine ailments, McFeely points out that more than 3,600 house calls were logged last year for treating food animals.

Generating new knowledge through research is New Bolton's third mission. And, with financial assistance from the U.S. and Pennsylvania

Departments of Agriculture, the National Institutes of Health, as well as corporate and foundation sponsorship, New Bolton researchers continue to seek answers to some of dairy's most compelling questions.

"We're trying to look at optimizing production," says McFeely, adding that veterinary medicine has an important role to play in combating subclinical

disease and its accompanying loss in production.

Much of the research conducted by the center's 70 scientists is aimed at plugging profit leaks in dairy production. And in its third Dairy Month issue, "Lancaster Farming" takes an inside look at New Bolton's ongoing research in the areas leukemia, nutrition, reproduction and medicine.



Dr. Robert Whitlock exams test tubes containing incubating cultures of Johne's disease bacteria.

Johne's Disease

The year was 1895 when Doctors Johne and Frothingham discovered the cause of the disease that would bear the former scientist's name.

And 90 years later, an effective weapon to combat an organism known as *Mycobacterium paratuberculosis* has yet to be found, as researchers continue to grapple with Johne's disease.

The trouble starts when bacteria enter the cow's intestinal tract and begin to multiply. The host responds by manufacturing more disease fighting cells in the intestine. This thickens the intestine walls and reduces the animal's ability to absorb nutrients.

As a result, the animal loses weight even though food consumption remains constant. Weight loss and diarrhea are the most common symptoms of Johne's, with a swelling under the jaw (bottle jaw) and watery diarrhea showing up in the advanced stages.

Calves during their first few weeks of life are most susceptible to infection, says Dr. Robert Whitlock. Be even after infection, animals may not develop symptoms for two to eight years.

For all practical purposes, no cure exists, although Whitlock points out that some success has been recorded using an experimental drug used to treat human leprosy. No meat or milk from animals treated with the drug can be sold, however, which relegates the treatment to high-priced livestock used only for collecting embryos.

Diagnosing Johne's can be difficult, since the symptoms are characteristic of other ailments such as leukemia, parasites and liver abscesses, notes Dr. Whitlock. Because of this, little data was available on just how pervasive the Johne's problem was in Pennsylvania.

To answer this question, technicians sampled more than 1,400 cattle at the Taylor Packing Company in Wyalusing, during a one-year period beginning in October 1983.

Based on the results of this study, New Bolton researchers estimate that 42,000 of the state's 700,000 dairy cows are Johne's victims.

Since animals testing positive for the disease averaged 112 pounds lighter than others, economic losses due to weight loss at slaughter can be considered substantial, emphasizes Whitlock. Using a live weight beef price of 50 cents per pound—or about \$55 per animal—Dr. Whitlock estimates that Johne's is costing the state's cattlemen and dairymen between one and three million dollars annually.

"We now have very good evidence that Johne's is relatively common in the state, and it causes a significant economic loss that needs to be addressed," Whitlock concludes.

Ongoing economic studies may quantify milk production and genetic potential losses, as well.

Because of the problems associated with diagnosis, research is also underway to develop a definitive diagnostic test. Though fecal culture testing has proven accurate, 14 to 16 weeks are required due to the slow-growing nature of the Johne's organism. The long lead time can create quite a bottleneck at the laboratory, and Whitlock points out that the Pa. Department of Agriculture's laboratory in Summerdale is currently booking Johne's testing four to six months in advance.

Though tissue tests have proven accurate, surgical removal of tissue samples is required. Another alternative, skin testing, has proven to be of little value.

The use of serological tests is currently being explored at New Bolton Center, and Dr. Whitlock notes that some of these research findings should be available this summer.



Drs. Bill Chalupa (foreground) and Jim Ferguson evaluate a dairy ration.

Nutrition and Reproduction

In terms of input versus production, a dairy cow is operating at only 25 to 30 percent efficiency, says professor of nutrition Dr. Bill Chalupa.

Studies in the nutrition section are directed at developing feeding and management strategies to maximize production and reproduction efficiency, he says.

Research in progress at New Bolton involves:

- Dietary buffers — The goal is to maintain the proper acid-base balance to increase milk production and fertility.
- Dietary fat — Studies have shown that adding fat to the diet can increase milk and fat production, as well as improve reproductive efficiency.
- Growth hormone — Experiments with growth hormone have yielded the largest milk production responses ever obtained.
- Estrus detection — This remains one of the dairy farmers biggest problems.
- Dietary protein — There's more to feeding than simply providing enough protein. Proper amino acid balance is essential.

Dr. Chalupa lauds farmers for their ability to increase forage quality, but also cautions that protein levels can get out of hand.

"Now it's not uncommon to find alfalfa haylage at 20 to 25 percent crude protein," says Chalupa, "and one has to recognize that this protein is very degradable in the rumen. So you don't want to add a highly degradable protein source like soybean meal," he emphasizes.

Options for the farmer to consider, says Chalupa, include distillers dried grains, dried brewers grains and corn gluten meal.

Researcher Jim Ferguson agrees that farmers can overdo a good thing.

"As crude protein increases, we increase milk yield," says Ferguson, "but we also increase the number of days open and the number of services per conception."

Ferguson notes that studies in progress at New Bolton include a look at two diets, one containing 16.5 percent protein and a second with a protein content of 21.5 percent.

"Protein is the dairyman's most expensive feed ingredient," emphasizes Ferguson, adding that New Bolton is committed to devising feeding strategies that make the most efficient use of the farmer's investment.



Suffering from botulism, this foal is a patient in New Bolton's intensive care unit. Dr. Tom Divers checks intravenous solutions.

Neonatal Intensive care

Until recently, the high cost of intensive care could only be justified in the realm of human medicine.

Enter the high-stakes game of embryo transfer, and intensive care suddenly becomes a veterinary reality.

Three years ago the medical staff at New Bolton responded to this need by establishing neonatal intensive care for calves, and the results have been impressive.

According to Dr. Thomas Divers, in the past two years, 38 calves have been treated on an intensive care basis, and 29 have recovered. Of the 26 "patients" treated for calf diarrhea—the most common ailment, says Divers—22 have recovered. And four of the six calves treated for pneumonia have recovered, he notes.

Research in the area of neonatal care has centered around better methods of feeding, since nutrition is one of the most critical aspects of treatment. Most calves must be fed intravenously, Divers points out.

And, in the process of saving valuable animals, researchers are refining their diagnostic and therapeutic techniques.

Milk Fever

If the disease known as milk fever is caused by a deficiency in blood calcium, then the obvious solution is to add calcium to the cow, right?

Well, yes...and no.

Direct intravenous injection of Ca can, indeed, lead to dramatic results, with some prostrate animals able to stand up soon after receiving treatment.

But Dr. Ned Moser feels that preventive medicine makes more sense. And he points out that research at New Bolton may lead to the right prescription.

"Milk fever is a metabolic disorder in older cows associated with the time when the cow calves and starts to make milk," Moser explains. But the older animal's metabolism cannot keep up with the increased demand for calcium. As a result, blood calcium, phosphorus and magnesium levels all begin to slide, he says.

Victims of milk fever become unsteady and eventually go down. And the condition is usually fatal if left untreated, Moser points out.

Two ways to prevent this scenario, Moser says, are to increase the cow's ability to utilize Ca in the diet, and to increase the use of skeletal Ca during the dry period.

"Don't just put the dry cow out and forget about her," cautions Moser. "She's a resting player on the bench." And Dr. Moser feels that a vitamin D analog—a syn-