



Researchers say that dogs are known carriers of *Neospora*. They shed environmentally resistant forms of the parasite in their feces. Cattle become infected when they consume the feces. [PHOTO BY ANGIE DENTON]

Neospora caninum

Research reveals costs of this internal parasite.

Story by
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Internal parasites can greatly affect the growth performance of cattle, but they can also cause reproductive problems and abortions in infected animals. *Neospora caninum* is a parasitic protozoan that affects a variety of large and small animal species, causing what's known as neosporosis. Researchers say neosporosis has been named as a major reproductive disease affecting cattle during the past 15 years.

No one knows exactly how *Neospora* evolved, but researchers have discovered two ways the parasite is spread. According to Les

Choromanski, a veterinarian for Intervet Inc., De Soto, Kan., the first mode is a horizontal transmission, caused by canines shedding the parasite. Researchers say that dogs were discovered to be carriers of *Neospora* three years ago. They are capable of shedding environmentally resistant forms of the parasite, known as oocysts, in their feces. Other animals become infected when they consume the oocysts. In turn, dogs may become infected when they consume the carcass of an infected animal.

Choromanski says the second mode of transmission is a vertical mode. "Cows infected once are infected for life, and then that cow is

capable of spreading or transmitting the *Neospora* organism to her fetus and infecting the fetus."

Choromanski adds that the parasite will not spread from cow to cow, only from cow to offspring. Most infected cattle do not become sick and will display no clinical signs of the disease.

"In an adult cow, there is no sneezing or coughing, no temperature spike. Nothing, except for abortions. This is the most prominent clinical sign," Choromanski says. "However, the performance of those animals is also affected." *Neospora caninum* parasites have affected gains of beef steers in the range of 0.37 pounds (lb.) per day, he adds.

Cheryl Waldner, assistant professor at the Western College of Veterinary Medicine, University of Saskatchewan, Canada, says that abortions caused by *Neospora* infection, or neosporosis, were probably historically diagnosed as toxoplasmosis, because the appearances of the organisms are very similar. Researchers say neosporosis was first described as a cause of bovine abortion in New Mexico in 1987.

"The disease has probably been around a lot longer than that, but for a long time, laboratories were perhaps missing the *Neospora* and thinking that it was perhaps toxoplasma," Waldner says.

Choromanski adds that even though toxoplasmosis and neosporosis infections look similar, their modes of transmission are different. Toxoplasmosis is spread by cats from one animal to the next and is infectious to humans. Neosporosis, as far as researchers know, is not harmful to humans.

Neospora and abortion rates

Waldner began researching *Neospora* infections in cow-calf herds in Canada after she witnessed ongoing abortion outbreaks for which she

couldn't find a cause. "I became aware of the dairy research identifying *Neospora* as an important problem and decided to take a look and see if it might be part of some unexplained losses that we'd been encountering."

The first study she did evaluated stored blood samples from cow-calf herds with fairly detailed reproductive records. She tried to determine if there was an association between the results of the stored blood samples and what they had seen retrospectively in those herds over time in terms of abortion and pregnancy rates.

"Over the lifetime of the animal, cows that are positive for *Neospora* ... are somewhere between four to eight times more likely (depending on when you look and how you look) to abort than cows that are negative," Waldner says.

She has also done a cross-sectional study looking at the association between neosporosis and pregnancy outcomes in cull cows at auction markets. They also have studied cross-sectional samples on community pastures looking at the association of *Neospora* status and pregnancy outcomes. Waldner says that several of these studies involved 2,000-3,000 animals each.

"When you compare the pregnant cows to the open cows, and the positives to the negatives, and look at the relationships between them, the positive cows are usually twice as likely to be open in the fall as the negative cows," Waldner says.

A devastating case

One of the most devastating cases of neosporosis that Waldner has researched was in a large cow-calf operation in Alberta, Canada, in 1997. She says that more than 30% of the mature cows and 50% of the bred heifers aborted.

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Controlling neosporosis

There is no treatment for neosporosis, and options for control are limited by researchers' understanding of the disease. Cheryl Waldner, assistant professor, Western College of Veterinary Medicine, University of Saskatchewan, Canada, says there are a few simple steps producers can take to help control the parasite in their herds.

- Dogs and other potential sources could become infected by eating fetal tissue from *Neospora*-positive cows. Aborted fetuses and dead calves should be disposed of properly so animals can't consume them and spread the parasite.
- Where possible, cattle feed should be protected from contamination by dog feces by using raised feeders for grains and loose minerals.
- If producers suspect a problem, they should contact their local veterinarian for potential control measures. These may include testing the herd and culling infected herd replacements and cows that are open or that aborted.



A new vaccine

During the past six years, Les Choromanski, veterinarian for Intervet Inc., De Soto, Kan., has been working on the first vaccine for neosporosis. It was recently approved by the U.S. Department of Agriculture (USDA) for use in the United States. NeoGuard™ is intended to be injected into pregnant cows within the first trimester of pregnancy. A second dose is injected three or four weeks later. The vaccine must be given to infected cows every year at pregnancy.

"Those pesky parasites are residing most likely in the brain and spinal cord of the infected cow and waiting for the opportunity to start multiplying and penetrating the placenta. So you have to upgrade the immune system every year the cow becomes pregnant in order to prevent the penetration of *Neospora* and infection of the fetus," Choromanski says.

Choromanski says that in the research trials they have done with the vaccine they had from a 50% to a 100% reduction rate in abortions. For more information on the vaccine, contact your local veterinarian.

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Les Choromanski, veterinarian for Intervet Inc., says once a cow is infected with *Neospora*, she can only transmit the parasite to her fetus; she can't infect other cows. "Cows infected once are infected for life," Choromanski says. [PHOTO BY STEPHANIE VELDMAN]



Researchers blood-tested all of the cows and heifers and discovered that 80% of the mature cows and 86% of the heifers were positive for *Neospora* infection. "Positive cows were six to 11 times more likely to have aborted than the negative cows," Waldner says.

Even though not all cows that are positive for the *Neospora* parasite will lose their calves, cows that are positive are as much

as six times more likely to abort during their lifetime than cows that are negative, Waldner says. Positive cows are also slightly more likely to be open at the end of fall pregnancy testing.

Waldner says they haven't actually put any dollar figures on losses due to neosporosis, but says that producers can do the math on their individual herds.

"Most people are probably shooting for a 92% to 96% pregnancy rate in the fall, so about 4% to 8% of the cows are expected to be open," Waldner says. "If you double that probability for those animals being open — about 8% to 16% — there is a big cost to the operation."

Even though neosporosis can be devastating to a herd if several cows abort, Waldner says she wouldn't recommend massive culling of positive cows with currently available information. She says the cow-calf operation in Alberta decided against culling all of the positive cows because they had put a lot of time and effort into putting together their genetics program.

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"They had their own breeding program within the herd," Waldner says. "They did start off with a very good herd, and had very low open rates the years before this happened. To completely start over again didn't seem like an option for these folks.

"In the end, they culled all of the cows that actually aborted. There were a large number of positive cows they kept that did deliver a live calf. Unfortunately, the vast majority of those live calves that were delivered were also infected. So, they, too, have an increased lifetime risk of aborting or being open," she adds.

Feedlot performance of infected calves

Additional research on *Neospora* is being conducted at Texas A&M University on feedlot steers. Kerry Barling, a veterinarian at Texas A&M, worked with Ranch to Rail calves in 1998. The Texas A&M Ranch to Rail is a steer feedout program providing an information system to allow producers to learn more about their calf crops and the factors that influence value beyond weaning. Barling took blood samples to determine the seroprevalence of the calves going into the feedlot. Testing the seroprevalence of the calves showed if they were positive (seropositive) or negative (seronegative) for the antibody that fights neosporosis.

Barling wanted to know the seroprevalence of beef cows across the state

of Texas, but says sampling the cows would be almost impossible logistically. However, because the disease is transmitted *in utero* to the calf, he says, sampling a cross section of beef calves would be indicative of the seroprevalence in the cow herd. "If a cow is infected and she carries her calf to term, there is more than an 80% chance that the calf would be infected."

Barling says that of the roughly 1,000 calves he sampled the first year, 13% of the calves were seropositive.

The next step in Barling's research was to determine if there were any correlations between a seropositive calf and feedlot performance.

"We found that seropositive calves did in fact gain 0.11 pounds per day less than seronegative calves," Barling says. "This equates to a significantly lighter calf at slaughter and a significantly lighter carcass."

Barling says that when they started placing dollar values on the performance, a seropositive calf made \$17.71 less than a seronegative calf.

Feed efficiency impairments

Since then, Barling has performed some smaller trials looking at average daily gain (ADG), feed efficiency and feed intake of seropositive calves compared to negative calves.

He discovered that the titers, or concentrations of antibodies, changed over time in the seropositive calves. Every 28 days he would take a blood sample, and sometimes the seropositive calves would test positive for neosporosis and sometimes they would test negative. The seronegative calves always tested negative.

"We found that with the association of a higher antibody level, there was a significant impairment in ADG (0.37 lb. per day) and feed efficiency in these calves, but not feed intake. In fact, it took almost 2.2 pounds of extra feed to produce 1 pound of gain in a positive calf than it did in a negative calf," Barling says.

He adds that they don't know why it impairs the feed conversion yet. He has several theories, such as recrudescence, where at certain times the infection is dormant, but at other times the organisms that cause the infection will reproduce rapidly. But, Barling says nothing has been scientifically proven.

"What we do know is that we have documented impairment in ADG. We have been able to verify and validate that reduction," Barling says. "We've been able to quantify that there is a transitory impairment in feed efficiency following a positive titer."

Economic losses

"We performed an economic analysis of what this might cost the Texas cow-calf industry," Barling says, adding that it was reflective of the commercial industry, not the seedstock industry.

Using data for Texas beef cow-calf

herds and potential reproductive losses associated with *Neospora* infections and the prevalence data found in the Ranch to Rail herds, Barling says they estimated the parasite could cost Texas cow-calf producers as much as \$24 million a year. Add to that the feedlot performance losses of about \$13 million, he says, and roughly \$37 million could be lost each year due to neosporosis.

How much is out there?

Barling says that he has not done any research on the prevalence of *Neospora* through the rest of the United States, but he believes the disease is widespread.

"I think the infection can be found across the country," Barling says. "We did a little bit of an epidemiologic study with that first year's calf data and found that within the state (of Texas), areas that had

high stocking rates, high coyote numbers and/or high gray fox numbers tended to have a higher prevalence of *Neospora*."

He adds that dogs are known to be definitive hosts of *Neospora*, but there is speculation that other canines, such as coyotes and foxes, could also be hosts. However, there is no scientific evidence yet.

