

# Control of Anaplasmosis in Missouri

**A**naplasmosis in cattle is an infectious disease caused by a bacteria known as *Anaplasma marginale*. The disease is common in Missouri. Clinical cases can occur at any time of the year, but the majority of cases are seen in late summer and fall. The economic impact of the disease to the state is unknown, but nationwide it is estimated to exceed \$300 million a year.<sup>1</sup> Economic losses are due to reduced production, treatment costs, death loss and abortion.

*Anaplasma marginale* causes disease by infecting red blood cells. The immune system recognizes the infected cells as abnormal and removes them, thereby creating anemia. The severity of disease is related to the number of infected red blood cells and subsequent red blood cell loss. In mild cases, animals may exhibit symptoms such as elevated temperature, depression and pale mucous membranes. In severe cases, animals may be jaundiced, the most obvious symptom of which is a yellow tinge to the mucous membranes around the eyes; exhibit severe depression or nervousness; and eventually die. In herds that are not closely monitored, the first sign of Anaplasmosis may be dead animals.

Adult animals are more significantly affected by Anaplasmosis than younger animals. Younger animals are more tolerant of infection, and their symptoms are often subtle or may go unnoticed altogether. It is believed that young animals are more tolerant because they regenerate red blood cells faster than adults.<sup>2</sup>

## Transmission

Transmission of *Anaplasma marginale* from infected to uninfected animals occurs in one of three ways: mechanically, biologically or transplacentally.

### **Mechanical transmission**

In mechanical transmission, the organism is transferred by blood-contaminated mouthparts of biting flies or by blood-contaminated equipment. Horse flies are capable of transmitting the organism and may remain mechanically infective for up to two hours after feeding on an infected animal.<sup>3</sup> Blood-contaminated equipment, such as used vaccination needles, can also transfer *A. marginale* from an infected animal to uninfected animals.<sup>4</sup>

### **Biological transmission**

Biological transmission occurs through ticks. Ticks are reported to be more efficient than horse flies at transmitting *A. marginale*,<sup>5</sup> although not all strains can infect ticks.<sup>6</sup> Once a tick acquires the organism through a blood meal, the organism infects the tick's gut cells and completes part of its life cycle. Over time, other tissues within the tick, including salivary glands, become infected. When a tick feeds on cattle, it transmits the organism through its saliva. Ticks can develop persistent infections and, with their intermittent feeding, can transmit the organism to multiple animals within the herd and nearby herds.

### **Transplacental transmission**

Transplacental transmission occurs when the organism is transmitted from dam to fetus. This transmission appears to occur during the second or third trimester of pregnancy. In one study, 10 percent of calves born to infected cows were infected at birth;<sup>7</sup> in another, 16 percent were born infected.<sup>8</sup>

## Disease phases

### **Incubation**

The incubation period of a disease is the time from pathogen exposure to the appearance of symptoms. The incubation period for Anaplasmosis ranges from seven to 60 days with an average of 28 days. The length of this period is determined in part by the initial infectious dose, with higher doses leading to shorter incubation periods.

### **Clinical**

The clinical phase begins when about 1 percent of an animal's red blood cells have been infected. The percentage of cells infected doubles every day once the 1 percent threshold has been reached. Clinical signs begin to appear when 15 percent of the red blood cells are infected. The disease progresses rapidly until either the immune system responds or treatment occurs, or both. Clinical signs are related to the number of infected red blood cells, and animals may exhibit a combination of the following symptoms: fever, depression, poor appetite, constipation, jaundice, nervousness, abortion in pregnant animals, and death.

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Revised by  
**Craig Payne**, Director, Veterinary Extension and Continuing Education

## Recovery

The recovery phase begins with the appearance of immature red blood cells. This phase can last for a few weeks or several months. Some animals do not fully recover and are culled because of poor productivity.

## Carrier

In the carrier phase, animals that have recovered from Anaplasmosis become persistent carriers of the organism. The benefit of the carrier state is that the animal has life-long immunity and rarely shows clinical disease again, but it does serve as a reservoir of the organism within the herd.<sup>9</sup> Because of the latter, elimination of carrier animals through either culling or chemosterilization has been attempted.

Chemosterilization involves the use of antimicrobials. Until recently, it was believed chemosterilization could be achieved with repeated administration of injectable oxytetracycline, but new studies show this method to be ineffective.<sup>10,11</sup> The long-term feeding of chlortetracycline has been proposed as an option,<sup>12</sup> but this strategy is not 100 percent effective and requires feeding chlortetracycline in an unapproved manner, which is unlawful.

Whether through culling or chemosterilization, creation of an Anaplasmosis-free herd in a region where the disease is common could have negative consequences. At some point, the organism would likely be reintroduced in the herd and cause a more severe disease event because all animals would be susceptible to reinfection. Therefore, the decision to eliminate carriers should be made with input from the herd veterinarian.

## Treatment

Long-acting injectable oxytetracycline is the antimicrobial most often used for treating Anaplasmosis. However, oxytetracycline is not labelled for this use and so must be prescribed by the herd veterinarian. The recommended dose is 10 milligrams (mg) per pound of body weight every 72 hours for a total of three to four treatments. Oxytetracycline is bacteriostatic, meaning it stops development of the organism but does not necessarily kill it. Therefore, the animal's immune system must be capable of responding to a disease challenge, and its body must be able to produce enough red blood cells to recover. Administering the antibiotic early in the disease process increases the odds that an animal will recover.

## Control

The strategies commonly employed to control Anaplasmosis are minimizing transmission, use of feed antimicrobials, and vaccination.

### Minimizing transmission

To minimize transmission, control of arthropod vectors such as ticks and horse flies is recommended when feasible.

Several sprays, pour-ons and fly tag products are approved for tick control, but control of biting flies can be more difficult and may require the use of alternative methods.

Procedures to prevent transmission through equipment must also be in place. Procedures to consider include changing vaccination needles and cleaning or disinfecting blood-contaminated equipment (such as that used for dehorning, castration and tagging) between animals.

Finally, eliminating carrier animals from the herd and testing new animals may be warranted in some cases. The benefits versus risk of an Anaplasmosis-free herd in a region where the disease is common, along with the costs associated with testing and eliminating carrier animals, would need to be considered.

### Feeding antimicrobials

Chlortetracycline (CTC) is the only antimicrobial approved for control of Anaplasmosis. Typically, it is fed during the arthropod vector season, which in Missouri can range from March to November, depending on spring and fall temperatures. Some veterinarians have determined that feeding year-round is necessary because of risk factors associated with particular herds or locations.

The Food and Drug Administration (FDA) has approved CTC for the control of Anaplasmosis in cattle as follows:

- Beef cattle over 700 pounds — 0.5 mg per pound of body weight daily
- Beef cattle under 700 pounds — 350 mg daily
- Beef cattle and nonlactating dairy cattle — 0.5–2 mg per pound of body weight daily

The first and second approvals are for medicated feeds that are to be hand-fed daily. Most of the commercial trace mineral supplements sold for control of Anaplasmosis use the first approval. The third approval is used when a block or trace mineral supplement is approved by the FDA to be fed free-choice for control of Anaplasmosis. Only a few products have this approval. It is unlawful to use medicated feeds in an unapproved manner, so be sure to read and follow the feeding directions on the label.

Even when CTC is fed to control Anaplasmosis, clinical cases may still occur. There are three possible reasons these cases occur.

- Intake of medicated feedstuffs can vary due to individual animal differences, feedstuff quality and/or environmental influences. Therefore, some animals may not receive sufficient amounts of CTC to control the disease.
- Some strains of *A. marginale* are less susceptible to tetracycline than other strains.<sup>7</sup> The presence of a less-susceptible strain combined with low intake of medicated feed would increase the risk of a disease event.
- Continuous feeding of CTC could inadvertently chemosterilize a percentage of the herd, thus increasing the likelihood of disease events. How often such chemosterilization occurs is unknown, but some veterinarians have recommended feeding

CTC intermittently as opposed to continuously to minimize the risk of chemosterilization.<sup>13</sup>

## Vaccination

No commercially licensed vaccine for Anaplasmosis is currently available in the U.S. However, Missouri veterinarians can order an experimental vaccine from University Products LLC. This vaccine has been proven safe for use in animals, but no research has been done to demonstrate its effectiveness. It is being used by a few veterinarians in the state, and the general feeling is that it reduces the number and severity of disease events in herds in which Anaplasmosis has been problematic in the past.

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