Control of Anaplasmosis in Missouri  
Craig Payne, DVM, MS 
Director, Veterinary Extension & Continuing Education

Introduction:

Anaplasmosis in cattle is an infectious disease caused by a rickettsial parasite known as Anaplasma marginale. The disease is endemic in Missouri and clinical cases may occur at any time of the year. However, 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 dollars annually. (1) Economic losses are due to reduced production, treatment costs, death loss and abortion.

Anaplasma marginale causes disease by infecting red blood cells. The infected cells are recognized as abnormal by the immune system and removed, thereby creating anemia. The severity of disease is related to the level of parasitemia and 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 icteric (yellowing of mucous membranes around the eyes, etc.), exhibit severe depression or nervousness, and eventually die. In herds that are not closely monitored, the first sign of Anaplasmosis may be dead animals.

The most significant impact of Anaplasmosis occurs in adults. Younger animals are more tolerant of infection, and symptoms are often subtle or may go unnoticed altogether. It is believed young animals are more tolerant because they regenerate red blood cells faster than adult animals. (2)

Transmission:

Transmission of Anaplasma marginale from infected to uninfected animals occurs in one of three ways. First is mechanical transmission in which the organism is transferred via blood-contaminated mouthparts of biting flies or blood-contaminated equipment. It has been demonstrated that horse flies are capable of transmitting the organism and may remain mechanically infective for up to 2 hours after feeding on an infected animal. (3) Blood contaminated equipment can also play a significant role. In one study, researchers were successful at transferring A. marginale from an infected calf to uninfected calves when using the same needle for vaccinations. (4)

Biological transmission is another method. This occurs through ticks, which are recognized for their ability to amplify and efficiently transmit A. marginale (5). Once ticks acquire the organism through a blood meal, the organism infects gut cells and completes part of its life cycle. Overtime, other tissues within the tick become infected, including salivary glands. When the tick feeds on cattle, the organism is transmitted through saliva. It is has been shown that ticks develop persistent infections and with their intermittent feeding can transmit the organism to multiple animals within a herd or adjacent herds (6). Not all strains of Anaplasmosis are capable of infecting ticks, however. (6)

Trans-placental transmission is the final method. One study showed approximately 10% of calves born to infected cows were infected at birth (7). Another study showed approximately 16% of the calves were infected at birth. (8) The transmission from dam to fetus appears to occur during the second or third trimester of pregnancy and contributes to the epidemiology of the disease.
Phases of disease:

*Incubation period* - this is the length of time between exposure and appearance of symptoms. The incubation period for Anaplasmosis ranges from 7 – 60 days with an average of 28 days. The length of time is in part determined by the initial infectious dose with higher doses leading to a shorter incubation period.

*Clinical phase* - the clinical phase begins when approximately 1% of the red blood cells have been parasitized. The percentage of cells affected doubles every day once the 1% threshold is reached and clinical signs begin to appear when 15% of the red blood cells are affected. The disease progresses rapidly until the immune system responds and/or treatment occurs. Once again, clinical signs are related to the severity of the parasitemia and animals may exhibit a combination of the following symptoms: fever, depression, poor appetite, constipation, icterus, nervousness, death. In addition, pregnant animals that survive will often abort the fetus.

*Recovery phase* - 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 phase* - animals that recover from Anaplasmosis become persistent carriers of the organism. The benefit of the carrier state is that an animal has life-long immunity and rarely shows clinical disease again but they do serve as a reservoir of the organism within herds (9). Because of this, some recommend eliminating carrier animals through culling or chemosterilization. The latter involves the use of antimicrobials. Up until recently, it was believed chemosterilization could be achieved with repeated administration of injectable oxytetracycline. However, new studies show that repeated injections are not effective (10, 11). Possibly a better strategy is long term feeding of chlortetracycline. (12) The challenge with this strategy is that it is not 100% effective and requires feeding chlortetracycline in an unapproved manner, which is not permissible. In addition, there may be negative consequences associated with creating an Anaplasmosis free herd in an endemic region. At some point, the organism will likely be re-introduced in the herd and the disease event will be more severe since all animals are susceptible to re-infection. The decision to eliminate carriers should be made with input from the herd veterinarian.

Treatment:

Long acting injectable oxytetracycline is the antimicrobial used most often for treating Anaplasmosis. The recommended dose is 10 mg per pound of body weight every 72 hours for a total of three to four treatments. Oxytetracycline is bacteriostatic and only arrests development of the organism. Therefore, the animal must be capable of eliciting an immune response and producing enough red blood cells to recover. Administering the antibiotic early in the disease process increases the odds that an animal can respond to the disease challenge. Keep in mind, use of oxytetracycline for treatment of Anaplasmosis is considered extra-label drug use and must be prescribed by the herd veterinarian.
Control:

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

Minimizing 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 biting fly control can be more difficult and may require the use of alternative methods. Procedures to prevent transmission through equipment must also be in place. Consider changing needles between animals. Also, clean/disinfect blood-contaminated equipment, such as dehorning, castration and tagging equipment. Finally, eliminating carrier animals from the herd and testing new introductions may be warranted in some cases. Once again, the benefits versus risk of an Anaplasmosis free herd in an endemic region would need to be considered along with the cost associated with testing and eliminating carrier animals.

Feeding antimicrobials – chlortetracycline 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 the year. Some veterinarians have determined it is necessary to feed year round because of risk factors associated with particular herds or locations.

The following are the three approvals for chlortetracycline when using it to control Anaplasmosis:

- 0.5 mg/lb of body weight daily; Beef cattle (over 700 pounds)
- 350 mg/head/day; Beef cattle (under 700 pounds)
- 0.5 – 2.0 mg/lb of body weight daily; Beef cattle and non-lactating dairy cattle

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 Food and Drug Administration to be fed free choice for control of Anaplasmosis. Only a few products have this approval. Taking a medicated feed that is approved to be hand fed daily and offering it free choice is not permissible so be sure to read and follow the feeding directions on the label.

Even though chlortetracycline is often fed to control Anaplasmosis, clinical cases may still occur. There are three possible reasons for this. First 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 disease.

Another reason may be due to susceptibility differences among strains of A marginale. It has been demonstrated some strains are less susceptible to tetracycline than other strains. (7) This, in conjunction with low intake of medicated feed would increase the risk of a disease event.

Finally, there is the possibility that continuous feeding of chlortetracycline could inadvertently chemosterilize a percentage of the herd increasing the likelihood of disease events. How often this occurs is unknown, but some have recommended feeding chlortetracycline intermittently as opposed to continuously to minimize the risk of clearing carrier animals. (13)

Vaccination - currently, there is not a commercially licensed vaccine available for Anaplasmosis in the U.S. However, Missouri veterinarians can order an experimental vaccine from University Products LLC.
The vaccine has been proven safe for use in animals but no research has been done to demonstrate effectiveness. The vaccine 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 where Anaplasmosis has been problematic in the past.

References