

Anaplasmosis in Beef Cattle

Dee Whittier, D.V.M., M.S., Extension Veterinary Specialist, Virginia Tech
Nancy Currin, D.V.M., Veterinary Extension Publication Specialist, Virginia Tech
John F. Currin, D.V.M., Extension Veterinary Specialist, Virginia Tech

Anaplasmosis is an infectious disease of cattle caused by several species of the blood parasite *Anaplasma*. *A. marginale* is the most common pathogen of cattle. (Smith, B.P.) Sheep and goats are much less commonly affected. Anaplasmosis is also called “yellow bag” or “yellow fever” as affected animals can develop a jaundiced appearance. Anaplasmosis is seen worldwide and has been reported in at least 40 states in the U.S. (Smith, B.P.) It is a common disease in the southern U.S. The highest incidence of anaplasmosis in Virginia seems to occur throughout the Piedmont area of Central Virginia. It is an important disease in Virginia as it tends to cause outbreaks in a herd, which can lead to the death of adult cattle. Other economic losses include abortions, decreased weight gain, bull infertility, and treatment costs. (Stokka and Faulkner)

Transmission

A. marginale can be transmitted two different ways. First, it can be transmitted mechanically when red blood cells infected with *A. marginale* are inoculated into susceptible cattle. This can occur through needles, dehorning, ear taggers, castrating knives or other surgical instruments, and tattoo instruments. Mechanical transmission can also occur through the mouthparts of biting insects, such as biting flies. Face flies, houseflies, and other non-biting insects do not transmit the disease. Horn flies, although they bite, typically do not go from animal to animal so they are not thought to spread *Anaplasma*. Mechanical transmission of infected red blood cells must occur within a few minutes of the blood leaving the infected animal, as the blood parasite does not survive more than a few minutes outside the animal.

Second, *Anaplasma* can be transmitted through its biological vector. The parasite receives nourishment from, and may even multiply in, the biological vector. The biological vector for anaplasmosis is the *dermacentor*, or wood, ticks. Once in the tick, the parasite can remain active throughout the lifecycle of the tick and can be transmitted several months later.

Once susceptible cattle are infected with *Anaplasma*, the organism multiplies in the bloodstream and attaches to the animal’s red blood cells. The animal’s immune system destroys the infected red blood cells in an attempt to fight off the infection. Unfortunately, uninfected blood cells are also destroyed. When the number of blood cells being destroyed exceeds the number of blood cells that the body can produce, the animal becomes anemic. It takes 3 to 6 weeks for clinical signs to appear after the animal is infected. (Smith, B.P., SR6011)

Outbreaks

Although many outbreaks of anaplasmosis occur in the spring and summer, they can occur at any time of the year. The many ways it can be transmitted and the potential for carrier animals makes the source of an outbreak confusing. If an outbreak occurs in spring or summer, it suggests that the source of the infection is from insect vectors. If the outbreak occurs 3 to 6 weeks after cattle are processed, that suggests *Anaplasma* was transferred from an infected animal to a susceptible one during processing. If an outbreak occurs at other times, new arrivals or increased stress should be considered as the source of the disease. When any outbreak occurs, it suggests that carrier animals are present either in your herd, or a neighboring herd, as carrier animals are an efficient source of infection. (Eriks *et al.*) Carrier animals carry *Anaplasma* in their bodies, but do not show clinical signs and are able to infect other animals. Later, clinically ill animals can continue to spread the disease.

Clinical Signs

Anaplasmosis is unusual because the clinical signs are most severe in adult animals. Calves less than a year old that are infected with *A. marginale* usually do not show clinical signs of the disease, but will become carriers. Carrier animals have immunity against anaplasmosis, so even if they are infected later in life, they will generally not get sick. Cattle 1 to 3 years old will show

increasingly more severe clinical signs. Recovered animals will also become carriers. Newly infected adult cattle over 3 years will show the most severe clinical signs, and 30 percent to 50 percent will die if they are not treated early.

Unless cattle are being watched carefully, dead cows are frequently the first thing noticed with an anaplasmosis outbreak. If cattle are carefully observed, weakness may be the first clinical sign that is noticed with anaplasmosis. Infected cattle will fall behind the rest of the herd and will not eat or drink. Cows with light skin will initially look pale around the eyes and muzzle, but later this can change to a yellowish color (jaundice). This jaundice is due to the destruction of the blood cells and their contents being released into the blood stream. Weight loss is rapid. Cattle can become extremely aggressive if they are oxygen deprived due to the severe anemia. Oxygen deprivation can also result in abortions in pregnant cows. Constipation, high fever, and labored breathing can also be seen. The most critical period is the first 4 to 9 days after clinical signs appear. (Richey and Palmer; Richey, 1992) Cows that survive this period have an increased chance of survival.

Treatment

Treatment of anaplasmosis is most effective if given in the early stage of the disease. A single dose of long-acting oxytetracycline (ex. LA-200[®]) is administered subcutaneously at 9 mg per pound of body weight. Blood transfusions are occasionally used. Animals in later stages of the disease may be so anemic that the stress of handling them will kill them. There is also evidence that antibiotics at this stage are not effective. (Richey, 1999) Therefore, for very weakened or belligerent cattle, antibiotic treatment is not recommended. Contact your veterinarian if you suspect anaplasmosis on your farm. This will allow a positive diagnosis of anaplasmosis to be made and the best course of treatment implemented.

All affected animals should be provided with easy access to food and water and a low-stress environment. It may take surviving animals up to 3 months to completely recover from the disease. Animals treated with a single dose of antibiotics and those not treated at all will both become carrier animals. Carrier animals can be cleared of anaplasmosis with repeated injections of long-acting oxytetracycline or prolonged feeding of chlortetracycline. (see Table 1)

General Control Programs

Control programs for anaplasmosis will be different depending on the prevalence of the disease in the area. The prevalence can be categorized as follows:

- Heavily infected area
- Moderately infected area
- Non-infected area

Heavily Infected Area

In some areas of the country, anaplasmosis is so widespread that there are advantages to having a 100 percent carrier status on the farm. This will prevent death loss of adult cattle as they will not be susceptible to the disease. This is often achieved naturally as anaplasmosis is so widespread that all of the cattle have been exposed at a young age when they do not develop clinical signs of the disease. There is some risk that an animal would not be exposed and would therefore be susceptible to disease as an adult.

To prevent animals from not being immune, animals over 6 months of age and new arrivals may be vaccinated for anaplasmosis so they also become carrier animals, or chlortetracycline can be fed in the mineral mix (see Table 1, Prevention of Clinical Disease Only), which will not prevent infection but will prevent losses from disease. Vaccinating will not prevent susceptible cattle from becoming infected either, but will reduce the clinical signs of the disease. Vaccination requires a first injection and a booster 4 weeks later. Both injections must be completed 2 weeks before the vector season, and the manufacturer recommends an annual booster vaccine.

The disadvantage of this control program is there are federal regulations governing the interstate movement of anaplasmosis carrier animals. Vaccinated animals will test positive for anaplasmosis, and they cannot be distinguished from animals with reactions due to infection. For owners of purebred herds or others who sell cattle, animals to be sold must be negative for anaplasmosis, but protected from disease.

Chlortetracycline can be added in the mineral mix year-round to prevent the disease (see Table 1, Prevention of Clinical Disease only). However, cattle can still be infected and test positive for anaplasmosis. These carrier animals can be cleared of the infection with an antibiotic regime (see Table 1, Carrier Elimination) but many

will test positive for several months after the treatment, so they must be tested +/- treated several months before being sold. To reduce the chance of cattle to be sold becoming carriers, a higher dosage of chlortetracycline can be given in the feed during the vector season (see Table 1, Prevention of Disease and Infection). Additionally, you should take care when processing cattle to avoid exposing the animals to be sold.

Moderately Infected Area

In a moderately infected area, there are two different strategies available. The first is to keep your herd negative for anaplasmosis but protect them from disease by feeding chlortetracycline in the mineral mix year-round, mixing it in the feed, or oxytetracycline injections during the vector season. (see Table 1) Generally in Virginia, the goal of anaplasmosis control programs is to eliminate it from the herd. One method of prevention is to control insect vectors. While not all insects can be prevented, reducing the number will help reduce the chance of a herd outbreak. Periodic spraying, dust bags, and back rubbers are all feasible methods of decreasing the number of insects. Pasture management can be helpful. Have animals graze areas where insect numbers are the lowest (hillside pastures) in the spring and summer, and then in the fall and winter move them to areas where the spring and summer insect numbers were the highest (pastures next to creeks or ponds) when the insects are no longer present.

When processing cattle, take care to disinfect equipment after each animal. A quick rinse in a bucket of disinfectant is all that is needed. Bleach or Nolvasan diluted to 3 ounces per gallon of water can be used. In a moderately infected area, it is best to change needles between cattle. You cannot disinfect needles as that will inactivate the vaccines you are giving. If carrier animals are identified, they should be cleared of infection with an antibiotic regime. (see Table 1) The policy of testing bulls for anaplasmosis for BCIA sales is in effect in Virginia. This has been adopted to prevent infected bulls from carrying the disease to non-infected herds. Bulls coming from Central Virginia, where the disease is prevalent, should be tested before introduction to herds in clear areas.

The second strategy is to vaccinate all animals over 6 months of age for anaplasmosis. This will protect cattle from developing the disease as they become adults, but you will face the same the same challenges as someone selling cattle from a heavily infected area.

Noninfected Area

In a noninfected area, careful monitoring is recommended. Watch for signs that anaplasmosis is present. A veterinarian should examine cows that have died from unknown causes. Often the first thing noticed in an outbreak is a dead cow. Unfortunately, often several cows die unnecessarily before a diagnosis is made. The above recommendations regarding insect control and processing precautions should be followed.

Control Programs for an Outbreak

If anaplasmosis is present on your farm, consistent management and treatment programs are necessary to prevent a devastating outbreak. Working closely with your veterinarian to institute treatment and prevention programs is essential. During an outbreak, sick animals should be treated as discussed above, and should be isolated from the rest of the herd. It is best to move the healthy animals, if possible, so additional stress is not placed on the sick animals. All cattle should be tested for anaplasmosis.

High number of infected cattle. If there is a high number of infected cattle, several options are available:

1. The cattle can be separated into two herds (noninfected and infected). The disadvantage of this program is that because the two herds are likely to be in close proximity, cross infection is possible. This also requires intense management and record keeping.
2. Live with anaplasmosis and vaccinate negative cattle 6 months and older that will be staying on the farm. This presents a problem when trying to sell cattle, as many animals, even young ones, will be positive for *Anaplasma*. Animals can be cleared of anaplasmosis with an antibiotic regime, but many will test positive for several months after the treatment, which is problematic when trying to sell them. Occasionally, this antibiotic regime must be repeated for clearance of anaplasmosis. (Smith, *et al.*) Also, some carrier animals will spontaneously clear the infection and become susceptible to clinical infection, so retesting carrier animals periodically is necessary.
3. The whole herd can be cleared of anaplasmosis (see Table 1). The disadvantages of this program are the treatment costs, and continued prevention and monitoring programs are necessary because adult cattle

will be susceptible to the disease. Prophylactic antibiotics can be given during the vector season or year-round to protect susceptible animals from disease. (see Table 1)

Low number of infected cattle. If there is a low number of infected cattle, all carrier animals should be cleared of the infection. Again, animals may be given prophylactic antibiotics. (see Table 1)

There are advantages and disadvantages to all of the control programs listed above. The strategies chosen during an outbreak will not only depend on the number of cattle infected during the outbreak, but also the prevalence of anaplasmosis in your area. As stated earlier, in Virginia, it is most likely that you would want your herd anaplasmosis free. The advantages of an anaplasmosis-free herd are the ability to sell animals that are negative for anaplasmosis and adult cattle will not be infected by carrier animals in the herd. Once you have an anaplasmosis-free herd, careful management and monitoring will be necessary. All outside additions to the herd should be from “free” herds or tested for anaplasmosis. The previously described management programs for insect control and processing techniques should be instituted. In addition, you can give antibiotics by injection or in the mineral/feed mix to prevent cattle from developing severe clinical signs of the disease. Your veterinarian will have up-to-date information about the prevalence of anaplasmosis in your area and can help you decide if antibiotic protection is necessary, either during the vector season or year-round. To maintain an anaplasmosis-free status, at least 20 percent of the herd must be tested negative each year. (Zaugg)

Summary

Anaplasmosis is an infectious disease of cattle that causes anemia, abortions, and death. Adult cattle have the most severe symptoms of the disease. Virginia farmers should be concerned about anaplasmosis, as it can present significant economic loss. If you have anaplasmosis on your farm, work closely with your veterinarian to develop the best management program based on the number of animals affected and the prevalence of anaplasmosis in your area. If anaplasmosis has not been a problem on your farm, management programs and monitoring will help your herd continue to be anaplasmosis free.

References

1. Smith, B.P. Diseases of the hematopoietic and hemolymphatic systems: *Large Animal Internal Medicine*, 3rd ed. St. Louis, Mosby 2002, pp.1049-1051.
2. Stokka, G., and Faulkner, R., Van Boening, J. *Anaplasmosis*, Kansas State University, January 2000.
3. Eriks, I.S., Stiller, D., and Palmer, G.H. Impact of persistent *Anaplasma marginale* rickettsemia on tick infection and transmission, *Journal of Clinical Microbiology* 31:2091-2096, 1993.
4. Richey, E.J., and Palmer, G. *Southern Regional Beef Management Handbook* (SR6011), College of Veterinary Medicine, University of Florida.
5. Richey, E.J. Bovine Anaplasmosis, *American Association of Bovine Practitioners, Proceedings No. 24*, 1992.
6. Richey E.J. *Bovine Anaplasmosis*, College of Veterinary Medicine, University of Florida, 1999.
7. Smith R.D., Hungerford L.L., Armstrong C.T. Epidemiologic investigation and control of an epizootic of anaplasmosis in cattle in winter. *Journal of the American Veterinary Medical Association* 1989 Aug 15; 195(4):476-80.
8. Zaugg, J.L. Anaplasmosis in Cattle, *Beef Cattle Handbook*, Department of Veterinary Services, University of Idaho.

Table 1. Antibiotic Treatment Regimens for Anaplasmosis Management. (Richey and Palmer)

Use & Drug	Route	Dose (mg/lb. BW)	Frequency of Treatment
Prevention of Clinical Disease Only			
Chlortetracycline	Oral	0.10-0.25	Daily year-round
Note: This dosage prevents clinical disease but animals may still be infected and a source of infection to other cattle		Note: These are typical levels achieved by supplementation in a mineral mix.	
Prevention of Disease and Infection			
Chlortetracycline			
	Oral	0.50	Daily during vector season; this oral dose requires mixing with feed, i.e. “force feeding”
Oxytetracycline (200mg/ml)	Subcutaneous	9.0 (4.5ml/100 lb BW of 200mg/ml injectable)	Every 28 days during vector season
Carrier Elimination			
Chlortetracycline	Oral	0.50	Daily for 120 days; this oral dose requires mixing with feed
Chlortetracycline	Oral	5.0	Daily for 60 days; this oral dose requires mixing with feed
Oxytetracycline (200 mg/ml)	Subcutaneous	9.0 (4.5 ml/100lb BW of 200mg/ml injectable)	4 doses at 3-day intervals
Treatment of Sick Animals			
Oxytetracycline (200 mg/ml)	Subcutaneous	9.0 (4.5 ml/100 lb BW of 200mg/ml injectable)	One treatment
Prolonged Protection During Outbreaks			
Oxytetracycline (200mg/ml)	Subcutaneous	9.0 (4.5 ml/100lb BW of 200mg/ml injectable)	Every 28 days during vector season
Chlortetracycline	Oral	0.50	Daily for 60 days; oral dose requires mixing with feed
Note: Vaccine is used to stimulate prolonged resistance; however, until the resistance is established, oxytetracycline injections should be used along with each dose of vaccine to temporarily reduce the <i>A. marginale</i> challenge. The current anaplasmosis vaccine is not approved countrywide. Special permission from the state veterinarian is required to import the vaccine.			
Key: Subcutaneous = under the skin; IM = intramuscular			