

Anaplasmosis in Beef Cattle

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Anaplasmosis is a disease caused by *Anaplasma marginale*, an organism that invades cattle red blood cells (RBCs), resulting in severe anemia, weight loss, fever, abortion, and death in adult cattle. Anaplasmosis is considered a “tick-borne” disease because ticks transmit the organism when feeding on cattle. However, spread of this disease can be by any method that moves fresh blood from infected to susceptible cattle. In addition to ticks, the *Anaplasma* organism may be spread by biting insects (mosquitoes, horse flies, stable flies) or blood-contaminated tools such as dehorning, ear taggers, castration tools, and implant guns used without disinfection between animals. A very common method of transmission is using the same hypodermic needle on multiple animals when administering vaccines to the herd. Transmission may also be from cow to calf during gestation.

Once infected, there is a four to eight week incubation period before the animal develops symptoms. Infected RBCs (Figure 1) are removed from circulation by the immune system, leaving an abnormally low number of RBCs in the bloodstream, a condition known as “anemia.” Without adequate RBCs, major organs are deprived of the oxygen needed to function properly. When 40 to 50 percent of RBCs are removed, symptoms of disease begin to develop. Infected cattle will show signs of weakness, lagging behind the herd, staggering, and rapid breathing, sometimes with foam coming from the mouth. Affected cattle have a fever, quit eating, and tend to rapidly lose weight. Most become very aggressive due to lack of oxygen to the brain. Mucous membranes will appear pale early in the course of disease and progressively turn yellow in color due to jaundice. (Figure 2). Death can be sudden in cattle showing signs of disease, especially with exercise or stress. In many instances, cattle are

found dead with no prior symptoms. Multiple adult animals in a herd may die within a short time span (one to two weeks). In Kentucky, the disease affects adult cattle in the fall of the year with nearly all cases occurring from late August through the first two weeks of November.

Not all cattle will show signs of disease when infected. Younger cattle, especially less than six months old, rarely develop anemia due to their rapid and active production of new RBCs. Anaplasmosis in animals from six months to two years of age may be misdiagnosed as pneumonia because symptoms of both conditions include fever and increased respiratory rate. Older animals (two years and older) are at highest risk for disease and death, but some individuals are able to mount an effective immune response quickly without obvious signs of sickness.

If an animal (regardless of age) is infected with *Anaplasma marginale* and survives, that animal will become a “carrier” of the organism for life. As carriers, they are never “sick” due to anaplasmosis again but serve as reservoirs of infection for other, naïve (uninfected) animals.

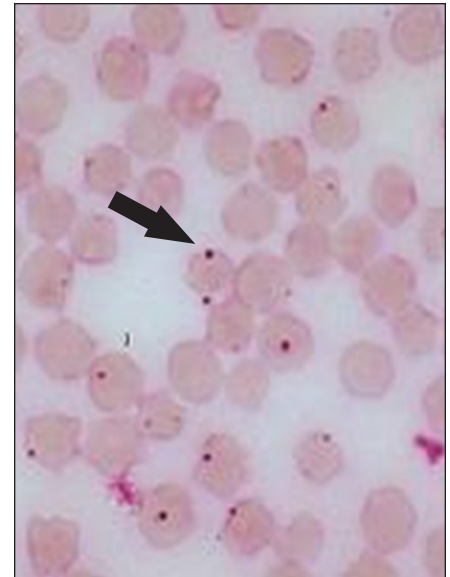


Figure 1. *Anaplasma marginale* organisms (small purple dots-see arrow) in the red blood cells (larger pink circles). Photo: UKVDL

Bulls that survive the infection may be infertile for up to a year, and pregnant cows frequently abort during recovery from infection. Recovery takes at least two to three months to rebuild RBCs and regain lost weight.



Figure 2. Jaundice (yellow color to tissues) is a typical finding in cases of Anaplasmosis at necropsy. Photo: UKVDL

Treatment Options

Treatment with the antibiotic class of tetracyclines is essential for survival if showing overt symptoms of disease. The recommended dose is “extra-label” and must be given under veterinary direction. A single injection of long-acting oxytetracycline (for example, LA-200[®], LA-300[®]) at 22 mg/kg of body weight (BW) or 10 mg/lb BW in the muscle or under the skin will often stop the progression of anemia by slowing replication of the *Anaplasma* organism, allowing the immune system to take over and save the animal. However, be aware that severely affected cattle may die due to stress when walked to the barn or going through the working chute for treatment. When anaplasmosis is diagnosed in a herd, it is likely that other adult herd mates are in the incubation phase of the illness. For this reason, it is recommended to treat all adult cattle in the herd with injectable oxytetracycline then introduce chlortetracycline (CTC) at the control dose (0.5-2 mg CTC/lb BW/head/day) in the feed or as a free choice CTC-medicated mineral to control active infection.

Control of Active Infection

Preventing infection with *Anaplasma marginale* is very difficult due to the large number of infected herds and the ease with which the organism is transmitted. The term “control” is used when infection already exists. The goal of a control program is to minimize the severe symptoms of disease and production losses when the herd is first exposed to the *Anaplasma* organism and as it spreads within the herd. The disease will finally reach a point of “endemic stability,” meaning nearly all of the animals in the herd have been exposed to the disease and have developed protective immunity to its effects.

Feeding chlortetracycline (CTC) at the control dose of 0.5 mg to 2 mg/lb BW per head per day to beef cattle over 700 pounds throughout the vector or fly season (May through November) is one effective control option. Recent research has found it is equally effective to “pulse feed” CTC compared to offering CTC continuously for control of the disease. To pulse feed CTC, offer it for 30 days, take a 30-day break, then offer CTC again

for the next 30 days and so on. In order to obtain CTC, a producer must have a written Veterinary Feed Directive (VFD) from a licensed veterinarian to present to the feed store before purchase of the product. FDA states that “once a veterinarian has determined that anaplasmosis infection exists within a herd, whether or not clinical signs are apparent yet, he/she may write a VFD to direct the use of CTC for controlling the progression of the disease in that herd.” FDA leaves decisions regarding herd infection status and length of time to feed CTC to the discretion of the veterinarian. A VFD order can be issued for a maximum of 180 days of feeding. If needed for a longer period of time, a new VFD order must be written. On the actual VFD form for CTC, the options are limited depending on how the drug will be offered. For example, if a free choice medicated mineral is desired, the veterinarian must select the #5 option (Figure 3) and one of the four FDA-approved concentrations. Alternatively, hand feeding CTC (for example, Aureomycin[®]) daily in feed to deliver 0.5 mg/lb BW/head/day will also control active infection (Figure 3, option #4). Using CTC or any feed additive in a manner not stated on the label is illegal and strictly prohibited for producers, veterinarians, and nutritionists. Remember, feeding CTC is ineffective if the animals are not consuming sufficient amounts, so intake should be monitored. Even when feeding CTC throughout the vector season, some individual animals may still become infected and die if they do not eat enough. Conversely, carriers that eat a consistent, high dose of at least 2 mg CTC/lb BW/day over a prolonged period of time (greater than 60 days) may completely clear the *Anaplasma* organism, a process known as “chemosterilization.” Cleared carriers lose their protective immunity and are susceptible to re-infection and sickness/death in subsequent years. Attempting to clear the organism or eradicate the disease is not necessary except for high value seedstock that require a negative test result for international movement.

Vaccination is another potential control method, especially if feeding CTC is not an option. Kentucky is among the states approved by the USDA for sale of the anaplasmosis vaccine marketed by

Figure 3.
Example VFD Form for Feeding CTC

4. Beef Cattle (over 700 lb):
Control of active infection of anaplasmosis caused by *Anaplasma marginale* susceptible to chlortetracycline

Drug Concentration:

_____ g/ton
(to provide 0.5 mg/lb
body weight/day)

Duration of Feeding: _____ days

5. Beef and Non-lactating Dairy Cattle: As an aid in control of active infection of anaplasmosis caused by *Anaplasma marginale* susceptible to chlortetracycline when delivered in a free-choice feed.

Drug Concentration:

8000 g/ton
(to provide 0.5 to 2.0 mg/lb
body weight/day)
Must use a FDA-approved
proprietary formulation.

6000 g/ton
(to provide 0.5 to 2.0 mg/lb
body weight/day)
Must use a FDA-approved
proprietary formulation or
formulation in 21 CFR 558.128(e)(6).

5000 g/ton
(to provide 0.5 to 2.0 mg/lb
body weight/day)
Must use a FDA-approved
proprietary formulation.

700 g/ton
(to provide 0.5 to 2.0 mg/lb
body weight/day)
Must use a FDA-approved
proprietary formulation.

Duration of Feeding: _____ days

University Products LLC of Baton Rouge, LA. Vaccination should keep animals from experiencing severe sickness and death but does not prevent infection and still allows development of the carrier state. The vaccine can be used safely during an outbreak and has been used in cows in all stages of pregnancy with no problems reported. The recommendation is a two-dose regimen given four weeks apart with annual re-vaccination required. Immunity should develop within seven to ten days of the second dose, according to the manufacturer.

Vaccination should ideally begin with yearlings. More information may be found at: <http://www.anaplasmosis.com/home.html>.

A third option is to determine the disease status of the herd and segregate them according to test results prior to implementing control measures. Animals that test positive on the Anaplasmosis cELISA blood test will not need vaccination nor CTC therapy since “positive” means they already have protective antibodies. Vaccine or CTC therapy can then be targeted for use in only the individuals who test negative for antibodies. Remember, any newly purchased cattle from areas of the U.S. without anaplasmosis are at high risk for disease. New cattle additions should be tested to determine antibody status and, if negative, treated with CTC or vaccinated prior to joining the herd. Consult your veterinarian for further information about testing and disease control recommendations for your area.

Diagnosis

If an animal is found dead and no more than 24 hours (12 hours preferred) have passed since the time of death, the animal can be submitted to a veterinary diagnostic laboratory for postmortem evaluation, or a veterinarian may perform the evaluation in the field to determine the cause of death. If an animal is alive and showing signs consistent with anaplasmosis, it is best to submit two tubes of blood, one collected in a purple top tube for whole blood analysis and one in

a red top tube for serum testing. Whole blood is needed for a “complete blood count (CBC) with differential” in order to assess the degree of anemia and to possibly identify the organism within the RBCs. Serum, the straw-colored fluid remaining after blood is allowed to clot, is used for the Anaplasmosis cELISA antibody detection test. A positive result indicates that the animal is infected with the organism and that antibodies are being produced against it. Be aware that a negative result using the serum test may be incorrect (a “false negative”) early in the disease process. This serum test can be run on the same blood sample submitted for the bovine pregnancy test. Samples should be collected and transported to the laboratory as soon as possible (overnight ship with cold packs). Please visit the UK Veterinary Diagnostic Laboratory website (www.vdl.uky.edu) for additional information.

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