Anaplasmosis, an infectious disease primarily of adult cattle, is caused by a rickettsia organism called *Anaplasma marginale*. The organism is transmitted from infected animals to healthy animals by insects or by surgical instruments or hypodermic needles contaminated with infected blood. The infectious organism invades and destroys red blood cells, causing anemia, weakness, and sometimes death. Infected cattle may recover but become carriers that serve as a reservoir of the disease. In the United States, anaplasmosis is considered the second most important disease affecting the cattle industry. The disease is endemic in many areas in Nevada and is a major problem in the southern states. Cattle affected by the disease are being reported in northern states due to the transport of carrier animals into areas that historically have been free of anaplasmosis.

**SYMPTOMS**

Anaplasmosis is most commonly diagnosed when a seriously ill or dead adult animal is discovered. This usually occurs in mid to late summer. Affected individuals are anemic, weak, off feed, and lose weight rapidly. Jaundice, or yellowing of the skin, is common but is only observed when the eyes, mouth, and other membranes are examined closely. Difficult respiration, fever of 105 degrees F or higher, dehydration, and constipation are common. Milk production of lactating cows declines dramatically. Affected animals are often excitable or belligerent. Death often occurs within 24 to 48 hours of the onset of symptoms and may be the first indication that anything is wrong in a herd. Abortion after recovery from clinical disease is common.

In an infected herd, recovery from undiagnosed infection and development of a carrier state is actually more common than death. Many carriers were never known to have been sick. Infected carriers may be more susceptible to other conditions such as parasitism, severe winter weather stress, or malnutrition. In these cases, anaplasmosis may be a contributing factor but is not the immediate cause of death.

Animals less than 1 ½ or 2 years of age seldom show symptoms, although they may become infected and serve as a reservoir of infection for other herd members. They can regenerate red blood cells rapidly, replacing those destroyed by the infection. Younger animals may be off feed and moderately anemic, but usually recover rather quickly. Anaplasmosis is not a major cause of disease in feedlot cattle. It occasionally affects confined dairy cows, but is much more common in adult beef cattle.

**ECONOMIC EFFECTS ON CATTLE HERDS**

Losses in breeding herds can be severe, although it is more common to have only a few individuals show symptoms. Mortality may be high, however, especially if there is a massive exposure in a herd that has not previously been exposed to anaplasmosis. It is not unusual to find several infected carrier individuals in a herd even though there has never been any evidence of disease. Losses depend on the degree of exposure, how the infection was introduced into the herd, and possible immunity from previous exposure to the infectious agent.

Death losses of 20 or 30 percent may occur, although a mortality rate of 5 to 10 percent in newly infected herds is more common. In chronically infected herds,
losses of 1 to 2 percent each year is common if control or eradication procedures are not instituted.

Several states require that cattle be tested for anaplasmosis before importation is allowed. Infected herds are not eligible to export cattle to those states. A strict interpretation of disease control regulations for both interstate and intrastate movement of cattle precludes sale of cattle from herds known to be infected with anaplasmosis.

DIAGNOSIS

Post mortem examination of cattle that die of anaplasmosis reveals icterus (jaundice), anemia, pale tissues, an enlarged spleen, swollen liver, and an enlarged gall bladder. Hemoglobin in the urine is not found in cattle that die of anaplasmosis, as in cases with leptospirosis, bacillary hemoglobinuria, and several other infectious diseases of cattle.

Animals that recover develop antibodies to the Anaplasma organism. This immunity can be detected by a card or complement fixation test. Blood tests are used to confirm a diagnosis of anaplasmosis and to detect infected carriers. Antibody levels decline after infection is eliminated, so that the success of herd treatment and eradication programs can be monitored over time.

TRANSMISSION

Anaplasmosis is spread from infected to susceptible cattle by ticks and biting insects or through careless use of instruments such as dehorning, castrating, tattooing, or ear tagging equipment. Biting insects spread the disease by transmitting infected blood from infected to susceptible animals. Insects such as biting (tabanid) flies must feed on an infected animal and then a susceptible animal within a few minutes in order for transmission to occur.

Several species of ticks are important vectors or carriers of anaplasmosis. After the tick feeds on an infected animal, the infectious organism localizes and multiplies in the cells lining the gut of the tick. The organism can then be transmitted to succeeding generations of ticks. By this method, the infectious organism can survive outside of infected cattle for long periods of time. When future generations of infected ticks feed on susceptible cattle, the disease is transmitted. Tick control is an important aspect for control of anaplasmosis. Fortunately, the ticks that transmit anaplasmosis do not survive well in most northern states. Total eradication of anaplasmosis from cattle in a herd or area can be accomplished without fear of reinfection, since these ticks do not exist in states such as Iowa.

Large biting flies, horn flies, and other insects can be mechanical vectors of the disease. Face flies and other nonbiting insects do not transmit anaplasmosis.

Deer can become infected with anaplasmosis and serve as a reservoir of infection for cattle. However, surveys show that the prevalence in deer is low. In most cases, outbreaks of disease are due to purchase of infected but inapparent carrier cattle. The disease may not manifest itself for several years, depending on vector transmission by biting flies, other insects, or accidental transmission by man. Transmission from infected to nearby susceptible herds by biting flies or other vectors also is possible.

TREATMENT

The anaplasmosis organism is susceptible to oxytetracycline (Terramycin\textsuperscript{R}) or chlortetracycline (Aureomycin\textsuperscript{R}) antibiotics. Cattle showing clinical signs usually respond to high dosages of oxytetracycline given by injection. In some cases, however, 60 to 70 percent of the red blood cells in cows with clinical disease are infected. These cattle may die in spite of treatment because the tetracyclines only prevent spread of the organism once it is inside the cell. Early recognition and treatment is important.

When clinical disease is diagnosed, immediate treatment of affected individuals with high dosages (10 mg oxytetracycline per
pound of body weight or more for 3 to 5 days) is recommended (This dosage requires a prescription by a veterinarian that can only be written under the provisions of a valid veterinary, client, patient relationship). Blood transfusion of cattle with severe anemia may be helpful if practical under field conditions. Supportive treatment with fluids and electrolytes is helpful. Affected individuals should be isolated from other cattle.

When diagnosed in an individual in the herd, it is advisable to immediately treat the entire herd with tetracyclines to prevent spread of the infection and possible development of other cases of disease. This can be done either by injection of all cattle or by feeding a tetracycline until killing frost occurs. Many veterinarians treat all exposed cattle with a high dosage of injectable, long-acting oxytetracycline, repeat this process in three days, and then re-treat every 28 days during the rest of the insect vector season. In many herds, feeding oxytetracycline at the rate of 0.1 to 0.25 mg per pound per day or chlortetracycline at 0.5 mg per pound per day throughout the vector season is a more practical approach.

**PREVENTION AND CONTROL**

Prevention and control methods should be based on factors such as geographic locations, exposure to possible infected cattle, purebred versus commercial herds, and management goals. Complete eradication from the herd in northern climates where the cattle tick is not prevalent should be the goal of cattle producers. If this is not done, carriers will remain in the herd and serve as a source of infection that can cause losses at any time in the future. Cooperation of neighbors with infected herds may be necessary, as transmission between herds on nearby pastures occurs. A specific plan for control and eradication of anaplasmosis should be worked out with the herd veterinarian.

Vaccines are available for anaplasmosis. In southern states where exposure to infected ticks cannot be avoided, vaccination of exposed, susceptible, or infected herds is often advisable. In the northern states, this is not commonly recommended since the disease can be eliminated. It is important to remember that anaplasmosis vaccines do not eliminate the infection from a herd. They only prevent the development of clinical disease. Vaccinated cattle that are carriers of anaplasmosis will remain carriers, even though they will not develop the disease themselves.

The first anaplasmosis vaccines occasionally caused a problem with a reaction of baby calves to their own red blood cells. This syndrome is referred to as neonatal iso-erythrolysis. It is rare with the newer, improved anaplasmosis vaccines.

For an effective vaccination program, the herd owner should follow these recommendations:

1. Administer the initial vaccination the first year by giving 2 doses 4 weeks apart and scheduled so that the second dose is given at least 2 weeks before the vector season begins.
2. Administer a booster 2 weeks or more before the next vector season.
3. After the first booster, administer additional boosters at least every other year to provide adequate protection.
4. Bulls should receive annual boosters.
5. The newer vaccines do provide protection from a variety of strains of the organism.

Infected herds should be isolated if possible. This prevents spread to other herds and protects the herd from reinfection once disease is eliminated. Once eradicated, make sure all cattle are tested for anaplasmosis prior to addition to the herd, including herd bulls.

In northern states, infected but unidentified carriers can be identified by a blood test of all cattle in the herd. It is best to do this two or three months after the last killing frost. Animals at this time that react to the anaplasmosis test are probably infected.
carriers and should be treated with tetracyclines. Testing and treating in the late fall or early winter precludes possible further spread by insect vectors. Reactor cattle can be isolated from the rest of the herd and treated with tetracyclines.

It may be more convenient to treat all cattle in infected herds, rather than just those identified as carriers. The carrier state can be successfully eliminated by one of two methods:

1. Put all cattle on a dosage of 5 mg of oxytetracycline or chlortetracycline per pound of body weight daily for 30 days. At this dosage rate, a 1,200 pound cow needs 6 grams daily of the drug. This will eliminate carriers, but it is important that bunk space is adequate so that all cattle get the required dosage daily.

2. Inject all cattle with 9 mg per pound of body weight of long-acting oxytetracycline (LA-200®). This treatment must be repeated every third day for four treatments. Some veterinarians feel that three treatments are adequate, but published research trials suggest that four treatments should be used. This procedure often is used in small herds.

In infected herds, anaplasmosis can be controlled in exposed cattle during the vector season by feeding tetracyclines. Add the medication to a small amount of grain or by incorporation in a salt/mineral mixture. Intake of the tetracycline should be approximately 0.1 mg per pound per day. Intake of the salt/mineral mixture and concentration of the tetracycline in the mixture must be carefully calculated and monitored.

It is not necessary to provide a tetracycline in the salt/mineral mixture of all cattle in the northern states. The infrequent occurrence of anaplasmosis and the ability to control the disease by herd treatment during the winter months precludes this as a standard recommendation for cattle producers. However, if the disease has occurred in the herd or neighboring cattle are known to be infected, preventive treatment may be advisable. Over reliance on vaccination rather than elimination of anaplasmosis from the herd is discouraged.

**Mechanical transmission of anaplasmosis by instruments contaminated with blood is possible.** Castration, dehorning, tattooing, and other instruments should be disinfected between uses on each animal. The likelihood of transmission of anaplasmosis by injection with hypodermic needles is unknown. Disinfection or changing needles between all animals is often difficult or impractical. In known infected herds, this may be advisable. In all situations, keep needles sharp and clean. It is advisable to change needles every 10 to 20 head to reduce the likelihood of transmission.