

General Session

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Anaplasmosis - Diagnosis, Treatment and Vaccination

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An introduction to the subject assigned for discussion should include a brief review of the transmission and pathogenesis of anaplasmosis.

Anaplasmosis may be defined as an infectious and transmissible disease of cattle characterized by progressive anemia associated with the presence of intraerythrocytic inclusion bodies termed anaplasma. The disease appears in acute and chronic or "carrier" forms. The causative agent is generally classified as a rickettsia and is transmitted by biological or mechanical means. Several species of ticks are biological vectors of the organism. Ticks may be responsible for anaplasmosis being introduced into previously disease-free areas if transported on infected animals.

Mechanical vectors include those insects which feed on blood and have penetrating mouth parts which will inject infective organisms into susceptible cattle. The horsefly is by far the most efficient insect vector of the disease. Transfer of organisms by these flies must take place within a few minutes (less than five) after feeding on an infected host. Horseflies and perhaps other flies are known to travel very short distances when feeding. The transfer of infection therefore is not likely to occur over a distance greater than one mile. Mosquitos, horn flies, stable flies and face flies should be considered as spreaders of anaplasmosis.

The most efficient transmitter of the disease is man. As veterinarians we must exercise special precautions to avoid passage of the organism by means of intravenous and vaccinating needles or dehorning and castration instruments. Investigation of one outbreak of the disease reportedly followed the pregnancy examination of several dairy cows.

When an infective dose of blood is injected into a susceptible animal, a prepatent (incubation) period of 15 to 45 days follows. This period of incubation has been known to vary upward to three months. The ter-

mination of the incubation period is marked by the presence of serum antibody or the appearance of marginal bodies within the erythrocyte. Following the initial appearance of the marginal body, the number of red cells which becomes parasitized will double every 24 hours for up to 10 or 11 days. At this time the animal will die from anemia or gradually improve as new red blood cells are produced. Convalescence usually requires 30 to 60 days.

Diagnosis

The diagnosis of anaplasmosis requires careful consideration of the history, clinical signs and necropsy findings. Confirming tests are available if serum and/or blood is submitted to the laboratory.

Animals of all ages are susceptible to the disease but the severity of the infection is directly related to age. In animals under one year of age, anaplasmosis is usually a subclinical infection; in one- to two-year-old cattle, a clinical entity of moderate intensity; two- to three-year-olds develop an acute infection; three years and over may develop a peracute syndrome. The disease is severe and often fatal in older cattle. Practitioners report that deaths occur most frequently in bulls.

A temperature elevation to 105°F or 106°F is the first recorded sign of infection. Slow gait, lowered feed consumption and milk production and/or complete anorexia is noted in the closely observed dairy animal. Other clinical findings are associated with the loss of red blood cells. Anemia is clearly observed in the skin, nose, udder, and mucous membranes of the eye, vulva and mouth. These signs are not consistently evident until 40% to 50% of the red blood cells are lost. The blood becomes extremely thin and watery at this point in the disease process. Gastrointestinal atony, depression, weakness, muscle tremors, dehydration and a rapid pounding pulse are commonly observed. Some animals may become

restless and hyperexcitable. Abortion is common in animals infected in late pregnancy. Temporary infertility in bulls has been reported. Icterus develops when anemia is severe and remains for two or three days. Icterus is considered a late sign of the disease or a convalescent sign of the disease. Additional stress at this time is likely to result in death.

The prognosis in acute anaplasmosis is modified by the age of the animal, stress factors such as lactation or advanced pregnancy, the degree of cardiac embarrassment, the stage in which the disease is treated and the response of the bone marrow.

The mortality rate will vary from very few if any in young calves up to 50% to 60% or more in mature and aged cattle.

Necropsy Findings

In our area, deaths from anaplasmosis occur most frequently during hot and humid weather. As a consequence, significant pathologic changes are not observed due to the advanced postmortem decomposition that is present in the carcass. A necropsy examination will often lend support to a diagnosis of anaplasmosis, or aid in a differential diagnosis. The usual findings are those associated with an acute anemia. All body tissues are pale and icterus is frequently noted. The blood is thin and watery. An enlarged, pale and flabby heart will have scattered hemorrhages over the surface. The liver is enlarged, has rounded edges and may be yellowish in color. The gall bladder is distended with dark, thick bile. The spleen may be two to three times normal size, swollen and soft. A dark pulp will protrude from the cut surface. The entire length of the digestive tract has a small amount of dry, firm content. The urine has a dark amber color. Tissue specimens collected at necropsy and sent to a laboratory for examination will seldom yield information of diagnostic value.

Differential Diagnosis

In the midwest, leptospirosis may present a picture which resembles anaplasmosis. The age of the animal and grossly normal urine are differentiating signs. The greatly enlarged spleen may be suggestive of anthrax. In the western states a *Clostridium hemolyticum* infection is diagnosed on the presence of hemoglobinuria.

Laboratory Diagnosis

Citrated and whole blood samples may be submitted to the laboratory for diagnostic assistance. Immediate delivery to the laboratory will insure a satisfactory specimen. Hematocrit determinations and erythrocyte counts may be made and several slides prepared for microscopic examination.

Red Blood Cell Examination

Typical anaplasma bodies appear as round, dark blue stained masses located near the outer margin of the red blood cell. In the acute case of anaplasmosis the bodies are seen for a period of 10 to 20 days in

peripheral erythrocytes. Identification of the anaplasma body is seldom possible in the carrier animal.

Detection of anaplasma antibody is determined by various laboratory test procedures. Approved laboratories may conduct the anaplasmosis card test or the microtiter complement fixation procedure. Either of these methods will detect reactor or carrier animals with a high degree of accuracy when conducted on good quality serum. As with all serologic tests, hemolysis and/or contamination of the sample will render the results difficult to interpret. When delays in shipment or weather extremes are anticipated, allow the samples to stand at room temperature for several hours and collect the serum for submission to the laboratory. Serum samples must be collected at least 48 hours before conducting the card test. Serum samples stored frozen or refrigerated for no longer than three weeks are satisfactory for testing. The card test utilized in the field is conducted on plasma and should be tested within two hours after collection.

Red Blood Cell Examination
Approximate Values

	Normal	Anaplasmosis
Total Red Cell Count	6 to 7 million per cu/mm	1½ to 3 million
Packed Cell Volume	35 to 40%	10 to 20%
Hemoglobin	12 gms/100 ml blood	5 to 6 gms
Blood Smear	-----	< > 50% of red cells may contain marginal bodies in acute cases

Treatment

The successful treatment of anaplasmosis requires early recognition of clinical signs and therapy administered in a manner to avoid the stress of prolonged restraint.

One of the tetracyclines is the drug of choice in treating a cow with anaplasmosis. Intramuscular or intravenous injections of 5-mg/lbs. may be repeated if necessary. Blood transfusions at the rate of 2,000 ml. to 4,000 ml. per day for two or three days are beneficial in the quiet, gentle animal. Several gallons of water via stomach tube will help to alleviate the dehydration.

The chronic or carrier animal may be treated with a tetracycline at the rate of 5-mg/lbs. per day in feed for 45 days. A second method utilizes a tetracycline administered IM or IV using 10-mg/lbs. for 10 days. To prevent an outbreak of anaplasmosis, 0.5 to 1 mg/lbs. per day in feed for the duration of the vector season is reported to be effective. Always be aware of current FDA regulations concerning the use of antibiotics in food producing animals.

Isolation of infected animals and the use of an approved spray to control vectors is indicated.

The recovered animal remains as a reservoir of

infection. When the carrier state is eliminated by treatment, the recovered animal is rendered susceptible to infection.

Vaccination

The use of a vaccine has proved to be a valuable aid in reducing losses from anaplasmosis. Anaplaz[®], produced by Fort Dodge Laboratories is the most frequently used vaccine to aid in the prevention of clinical signs of anaplasmosis. While the carrier state may occur in vaccinated cattle following exposure to infection, clinical illness and death losses are absent or minimal. The vaccine has been used in combination with tetracycline therapy to provide both immediate and long term resistance to infection.

Strict adherence to product label directions is of utmost importance. Initially, cattle must be vaccinated twice at not less than four week intervals. The first injection serves as a sensitizing dose, the second injection is the immunizing dose. Ideally, the series should be completed at least two weeks

prior to the beginning of the vector season. Animals vaccinated in this manner will develop a positive titer to the complement fixation and card test that may persist for one to four months or longer. Annual 2 cc. booster injections should be given when indicated.

In 1968 neonatal isoerythrolysis was first recognized in calves. The disease was associated with the use of Fort Dodge Anaplaz[®] vaccine for immunizing cattle against anaplasmosis. There are several reasons for the syndrome occurring in other species. Reports have been received of the disease appearing in herds that have never been vaccinated for anaplasmosis. Circumstantial evidence indicates there is a risk involved in the use of the vaccine. When an anaplasmosis control program is being outlined that includes the use of vaccine, every aspect of the benefits versus the hazards should be completely discussed and understood. Adverse vaccine reactions should never come as a complete surprise or disappointment to the veterinarian and his client.

Clostridial Infections of Cattle

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I. Clostridia General

- A. 1. Anaerobes; 2. Gram positive rods; and 3. Spore formers.
- B. Grouping: Invasive group: 1. *C. chauvoei*, 2. *C. septicum*, 3. *C. sordellii*, 4. *C. novyi*, 5. *C. perfringens* (man). Non-Invasive group: 1. *C. perfringens* (man & animals), 2. *C. tetani*, 3. *C. hemolyticum*, 4. *C. botulinum*.

II. Clostridium chauvoei: (feseri) "Blackleg"

- A. Pathogenesis:
1. Younger cattle predominantly
 2. Taken in orally - crosses intestinal barrier
 3. Spores lodge in liver and muscle
 4. Area of necrosis formed usually by trauma (Anaerobiasis)
 5. Toxemia and death
 6. Possible wound infection
 7. Usually moderate morbidity
- B. Signs:
1. Incubation period of 2-5 days
 2. High temperatures of 104-106°
 3. Muscular stiffness often with S.Q. crepitation
 4. Sudden death
- C. Post Mortem Lesions:
1. Lesions of muscles are usually found in heavily muscled areas such as thigh, shoulder, back and neck

2. Also found in tongue, diaphragm and myocardium
3. Lesions are dark, dry and contain gas.
4. S.Q. crepitation is present - caution is needed with this lesion

D. Diagnosis:

1. History-Signs-Lesions-Lab confirmation

Prevention & Treatment:

1. Early Penicillin - large doses
2. Formalized bacterins

III. Clostridium septicum: (Malignant edema)

A. Signs:

1. Incubation period of 2-4 days
2. High temperature, depression, edema around wound with subsequent gravitation
3. Death in 12-48 hours - high mortality - low morbidity

B. Pathogenesis:

1. Cattle of any age
2. Wound contaminant - fecal and soil contaminant
3. Spores are introduced into wound, which is anaerobic in some of its parts - Organism vegetates, grows, produces a very powerful and lethal toxin

C. Post Mortem Lesions:

1. Edema, necrosis and hemorrhage in and around