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South Dakota State University Agricultural
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3-1-1937

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Recommended Citation

Taylor, J. B., "Hemorrhagic Septicemia" (1937). *Bulletins*. Paper 307.
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Hemorrhagic Septicemia

by
J. B. Taylor



Agricultural Experiment Station
South Dakota State College of Agriculture
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Brookings

Hemorrhagic Septicemia

By J. B. Taylor

Introduction—The raising of livestock is one of South Dakota's most important industries. This bulletin is intended primarily as a help in prevention, diagnosis and control of Hemorrhagic Septicemia in livestock. When possible, it is always advisable to obtain the services of a competent veterinarian in the diagnosis and treatment of animal diseases.

Hemorrhagic Septicemia, also known as Pasteurellosis, is a term applied to infection of various species of animals by strains of micro-organisms belonging to the Hemorrhagic Septicemia group. The disease is characterized by blood stream infection, hemorrhages on the various organs, serous surfaces and mucous membranes of the animal body.

This disease was first described in Europe by Bollinger in 1878. The caustive organism was discovered by Kitt in 1885. The disease is now found in all parts of the world. Bacteria which resemble the organisms of Hemorrhagic Septicemia have been found in the soil, on plants and in water. The organism may also be found on the mucous membranes of the respiratory tract of healthy animals. The organisms become virulent enough to cause an outbreak of the disease, or else the animals infected become lowered in resistance through improper feeding. Fatigue from long journey's parasitic infestation and lowered resistance by some primary infection may also predispose to subsequent infection from Hemorrhagic Septicemia. The disease is not readily spread from one species of animal to another even tho the animals of different species are in the same pasture. The disease occurs mainly in bovines, (cattle and buffalo) sheep, swine and fowls are also susceptible. In horses the disease is comparatively rare, man is immune to infection with *Pasteurella* organisms of domestic animals. Outbreaks of the disease among domestic rabbits is quite common and the disease is known as rabbit septicemia. The organisms of the *Pasteurella* group are short rods which stain deeply on the ends with the aniline dyes and for this reason are called bipolar. This bipolar characteristic is not retained after prolonged cultivation on artificial media, but is present when the organisms are obtained directly from the tissues and blood of infected animals. The organisms of this group exhibit only weak powers of resistance to heat, drying, sunlight and disinfectants. However the organism may live for three months in damp soil. Freezing does not seem to have any effect on them.

Infection may be carried on the feet or bodies of animals, by flying or biting insects. The soil and water may be contaminated by the feces and urine from infected animals, or by those animals which have recovered from infection and are acting as carriers. The respiratory and digestive tracts are the main portal of entry of the infecting organisms although wounds and abrasions of the skin and mucous membrane may act as portals of entry. Outbreaks of this disease in animals frequently stop before many animals succumb, whether this is due to lack of susceptibility or to active immunity acquired by previous exposure to the organisms is undetermined.

Hemorrhagic Septicemia in Cattle—The organism that causes Hemorrhagic Septicemia in cattle is known as *Pasteurella Bovisepticus*. The disease develops rapidly and lasts from one day to a week but in the

acute cases death comes on in 18 to 24 hours. There is elevation of the temperature which ranges from 104 degrees F. to 107 degrees F. There is weakness of the heart, debility, loss of appetite and sometimes diarrhea. swellings appear under the skin on the head and throat, these swellings are soft and pit on pressure as they contain a jelly like material tinged with blood.

These swellings can be differentiated from those of blackleg by the fact that there is no crackling noise when pressure is applied, there is no odor like rancid butter emanating from the swellings when cut into as there is in blackleg. In anthrax the blood in the swellings is black and tar like and loses its ability to coagulate, while in Hemorrhagic Septicemia the blood is generally a bright red. The tongue is often swollen and the animal drools and slobbers. If pneumonia or congestion of the lungs is present, there is difficulty in breathing and sometimes coughing.

Trembling of the muscles is frequently present and small hemorrhages may be seen under the mucous membranes of the nose and discharges of blood stained mucus. There is inflammation of the eyelids with flow of tears. If the intestinal tract is involved there are colicky pains and diarrhea which may become bloody, the intestines are studded with hemorrhages and the lining of intestinal wall may slough. False membranes composed of fibrinous exudate develop in the throat. There are hemorrhages in the fatty tissues around the kidneys, heart and diaphragm. The heart sac may be filled with excess of bloody fluid. The lymph glands throughout the body are enlarged and reddened. The spleen remains about normal in appearance.

If croupous pneumonia is present, the lungs are dark red in color and their fibrinous tissues thickened from a collection of bloody serum in their meshes. The animal may stand with the forelegs far apart in order to breathe more freely if pneumonia is present. Staggering gait from extreme weakness is sometimes noticed. If the symptoms subside before death the disease assumes a chronic form in which there is chronic pneumonia with emaciation and swelling of the joints, principally the knee joints.

Bovine pneumonia should not be confused with Hemorrhagic Septicemia. In true hemorrhagic septicemia there are generally gastro intestinal symptoms, gastro intestinal lesions, oedematous swellings under the skin and the causative bipolar organism can be found in the blood.

Hemorrhagic Septicemia in Sheep—The organism that causes Hemorrhagic Septicemia in sheep is known as *Pasteurella Ovisepitica*. Improper feeding and housing, changes in weather causing chilling and fatigue from shipping are predisposing factors which lower the animal vitality and make them susceptible to the infection.

The causative organism may come in contact with susceptible sheep or it may exist in the upper air passages of normal sheep and under favorable conditions may become active and produce the disease. Sheep which are infected appear dull, heads hang, ears droop, the animal refuses to feed and appears gaunt. The temperature is elevated, there is rapid labored breathing, coughing, sneezing, and mucopurulent discharge from the eyes and nose. In the acute form the symptoms become more pronounced and animals die in 24 hours. In the chronic form there is chronic nasal discharge, chronic pneumonia, lameness due to arthritis of a leg joint, and animals live from several days to several weeks.

When the disease first appears losses are considerable, but after a few days the disease seems to stop of its own accord and even quite a few of the sick ones recover. The disease in sheep seems to be self-limiting and subsides without treatment. In the acute form there are hemorrhages under the skin along the back in the lumbar region and along the ribs. Hemorrhages on the surface of the heart, quantities of clear straw-colored fluid in the pleural and pericardial cavities.

The lymph glands are swollen and reddened with hemorrhages. The mucous membrane of the stomach and duodenum is often hemorrhagic and the mucous membrane of the whole respiratory tract is red. In the chronic form hemorrhages are less marked and the disease is more localized in the chest. Pneumonia is present and various lobes of the lung may be solidified. The lungs are red to gray and adhesions between the lungs and heart or lungs and pleura by means of fibrin with fibrinous pleurisy. Later there may be arthritis with effusion and swelling of one or more joints. The lungs may become gangrenous and necrotic. Hemorrhages may also be present in other diseases of sheep. A positive diagnosis can only be made by finding the causative organism in the blood.

The best treatment is to isolate the sick throughout the infection. The sheep should be placed under the best conditions and they should have a light diet, alfalfa, plenty of water, bran and oats. No medicines are of value. The disease is self-limiting and there is not much need of vaccination.

Hemorrhagic Septicemia of Swine—Hemorrhagic Septicemia of swine, often called Swine Plague, is a specific infectious disease of swine caused by the organism known as *Pasteurella Suisepitica*. It is not widely prevalent and not as fatal a disease as cholera. Unsanitary, wet sleeping quarters, wet muddy pens, exposed and improper feeding are predisposing factors in making the animals more susceptible to the infection. Swine Plague may appear in hogs suffering from hog cholera or may appear as an independent disease or in association with necrotic enteritis.

Pasteurella suisepitica is often found in the mucous membranes of the respiratory tract and widely distributed in nature. Its power to produce disease may vary with the condition of animals exposed or increased virulence of the organism. The infection may enter through the respiratory and intestinal or the two types may exist together. From either of these forms the organism may enter the blood and produce a septicemia.

When septicemia is present there are petechial hemorrhages in the skin, mucous and serous membranes, enlarged hemorrhagic lymph glands and enlarged spleen. In the pulmonary form there is catarrhal pneumonia, congestion, red and gray hepatization of the lungs and later necrosis. The lung has a marbled or mottled appearance. The bronchial and mediastinal lymph glands are enlarged and hemorrhagic and there is fibrinous pleurisy with or without adhesions.

In the intestinal form there is inflammation and hemorrhages with sticky tenacious exudate and the mesenteric glands are enlarged and hemorrhagic. The period of incubation of this disease is short and there is high temperature (105 degrees F.) loss of appetite, weakness and inability to move about. There is redness of the skin due to hyperemia when septicemia is present. In the Pulmonary form there is pneumonia, short, dry, spasmodic cough, difficult breathing, temperature of 105 degrees F. and the animals may sit on their haunches like a dog.

There is a mucopurulent nasal discharge, lack of appetite and constipation. There is acute hemorrhagic swelling of the lymph glands and gelatinous serious infiltration of subcutaneous connective tissues of the throat and neck. In the intestinal form there are digestive disturbances, diarrhea, emaciation, weakness and death in a few days to a few weeks.

The diagnosis is difficult as this disease may be confused with hog cholera. Isolation of the organism from the blood is necessary.

The treatment consists of sanitation, disinfection of the houses and pens, isolation of the sick, feeding of easily digested food and reduction of the amount of food. The use of bacterins have given variable results.

Hemorrhagic Septicemia of Fowls—Hemorrhagic Septicemia of fowls or fowl cholera is an acute, sub-acute and chronic septicemia disease of fowls, characterized by general infection, sudden death, high mortality and in some cases by profuse diarrhea.

The disease was described by veterinarians as early as the eighteenth century. In 1880 Pasteur isolated the causative organism, known as *Pasteurella Avissepticus*, from the heart blood of chickens. He grew it on artificial media and studied its pathogenic characteristics. Pasteur carried out his first experiments on attenuation of bacterial cultures and immunization with organisms of fowl cholera, *Pasteurella Avissepticus* is not a resistant organism and is rapidly destroyed by ordinary disinfectants. However, it may live in soil, manure and in carcasses of dead fowls for several months.

Fowls may act as carriers of the disease by serving as reservoirs of infection from previous attacks. Feed and water which are contaminated with the organism as well as insects which may harbor the infection are capable of spreading it. The digestive and respiratory tracts are ports of entry for the infective organisms.

The disease is highly infectious for chickens, geese, turkeys, pigeons, pheasants and wild birds. In geese the disease is known as goose septicemia, which is a virulent infection with high mortality.

In the acute stage of fowl cholera the birds die so rapidly that no symptoms are noticed and birds are found dead under the roosts or in the nest boxes. Fat fowls seem more susceptible to the disease. In the less acute type there is greenish-yellow diarrhea. The birds become listless and sleepy, the feathers are ruffled and there is disinclination to move about. There is loss of appetite, increased thirst, respiration is increased and there is a rattling noise in the upper air passages as the fowl breathes, due to an accumulation of mucus in the upper air passages. The temperature is increased and there is edema and swelling of the wattles and the vent is smeared with profuse diarrhea. The chronic type is observed in birds which have survived an acute outbreak. In the chronic form of infection there is loss of weight, depression, paleness of the comb and wattles, lameness, swelling and ulceration in a joint may occur and the bird may linger several weeks before death.

In the acute form the comb and wattles are dark in color, there is mucus in the mouth and nasal passages and the abdominal organs are congested and darker in color than normal. There are hemorrhages on the heart, abdominal membranes and in the subcutaneous tissues and abdominal fat. Excess fluid in the pericardial sac often containing yellow fibrin. The liver is darker or lighter than normal and spotted with small white foci. There are hemorrhages and inflammation in the intestines

and the bowel is filled with blood tinged mucus. The lungs show congestion of pneumonia and there are cheesy deposits in the membranes of the air sacs and about the intestines. In the chronic form yellowish, gray, dry, caseous foci are present in the lungs, liver and intestinal mucous membrane. The mortality ranges from a few up to 50 per cent or more. The diagnosis can be further verified by finding the causative organism, *Pasteurella Avisepticus* on Bacteriological examination of the heart blood.

The following methods of prevention and control should be followed:

All dead and ailing fowls should be immediately removed and destroyed by burning. Clean and disinfect poultry houses and utensils, plow under soil in yards. All feed and watering troughs should be so placed as to prevent contamination by infected droppings. Concentrates in the ration should be reduced one half. Isolation, although difficult as the disease spreads so readily. Birds which have been recently purchased should not be added to a flock until isolated for observation for a period of two weeks. Healthy birds from flocks known to have had the infection should not be sold to those owning flocks as the disease may be disseminated by carriers.

Medical treatments of various kinds have not proven satisfactory. Vaccination has given variable results and the conclusion found by most investigators is that it is not very satisfactory.

Hemorrhagic Septicemia in Horses—This disease is so rare that it needs but slight mention. The causative organism is the *Pasteurella equisepticus* and has all the characteristics of the other *Pasteurellas*. This organism is found associated with streptococcus equi and the filterable virus of equine influenza and equine lobar pneumonia. It has been isolated in culture from the pneumonic lung in inflamed lymph glands.

Prevention of Hemorrhagic Septicemia—The following methods of prevention should be carried out. Isolation of newly purchased animals for a quarantine period of two weeks before introducing into herds or flocks. Houses and pastures where the disease has been known to exist should be abandoned for one or more seasons. If this is not possible all sheds, stables and yards should be thoroughly cleaned and disinfected with compound cresol U.S.P. using 4 ounces to each gallon of water.

Yards should be plowed under or disinfected with copper sulphate 5 ounces to each gallon of water. Manure should be removed and spread on field not used by livestock and plowed under. In open fields and pastures the germs are destroyed by sunlight.

Good feeding should be practiced. If outbreaks occur isolation of sick animals and removal of healthy animals to new stables or pastures should be practiced.

Dead animals should be buried or better, destroyed by burning. All animals should be buried deep enough so that the uppermost part of the animal is at least 4 feet below the surface of the ground. For burning two trenches seven feet long can be dug crosswise. They should be 15 inches wide and 18 inches deep at the intersection becoming shallower towards the ends. The earth removed is piled into the angles formed by the trenches. This forms a resting place for iron bars or old automobile chassis for support of the carcass. The trenches are filled with wood mixed with straw and moistened with kerosene or fuel oil. More fuel may

be piled on top. It is best to bury the carcass where it is found, if possible, as ground may be contaminated by removal. If this is not possible it can be removed by a stone boat.

There are no medicinal drugs which are of much value in the treatment of Hemorrhagic Septicemia. Since the time of Pasteur numerous attempts by investigators to produce immunity against Hemorrhagic Septicemia in various species of animals has not been highly successful. Sanitation, isolation and quarantine have given the most satisfactory results. Killed, avirulent and attenuated cultures, aggressins and serums used to immunize and treat the various species of animals against Hemorrhagic Septicemia have brought variable results. In experiments and field trials they have sometimes given hope of success but have subsequently failed to fulfill.

For a number of years the author has been doing experimental work on Hemorrhagic Septicemia in laboratory animals. Bacterins have been prepared by various methods in the laboratory as well as aggressins and bacterins prepared elsewhere have been tried as immunizing agents without much success. The results of this work have been published in the American Veterinary Medical Journal.

If the various biological products are to be used, because of the required time to produce immunity the aggressins and bacterins should be used at least 10 days before exposure of animals to infection. In herds where infection is present, the aggressin should not be used as there is a period after injection when the animal is more susceptible to infection. Serum is best used in infected herds or when animals are likely to be immediately exposed to infection. Bacterins may also be used in conjunction with serum in infected herds or those subjected to immediate exposure to infection.

There is no danger from the use of the various biological products as the organisms contained in them are dead, and animals vaccinated will not spread the disease, or become infected themselves. Von Hutyra in 1928 published an article on the value of various immunizing procedures. He urges caution in drawing conclusions from field experience and states that because an outbreak of Hemorrhagic Septicemia is always apt to terminate of its own accord, good results are frequently merely simulated, and for this reason alone prudence is indicated in the evaluation of so-called immunizing substances.

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