Shipping Fever, or Hemorrhagic Septicemia

BY C. D. STEIN [1]

THE AUTHOR calls this the most serious of a group of cattle maladies that are commonly associated with the hardships and hazards of shipping—that is, the handling, neglect, or exposure of animals in transit or shortly afterward. It is an infectious disease which often terminates in death. The losses from shipping fever can be greatly reduced by careful management in shipping. Vaccination with bacterins at least 10 days before shipping or injection of antiserum may reduce losses.

SHIPPING FEVER, or stockyard fever, is an infectious disease of cattle usually attended with a high mortality. Its medical name, "hemorrhagic septicemia," was given it because it is a septicemia, or poisoning, of the blood (and hence often runs a short, fatal course), and hemorrhages in the body tissues and organs of animals dead from the disease are usually an outstanding characteristic.

The disease occurs in cattle in all parts of the United States. The losses appear to be greatest among young animals, especially those that are thin and poorly nourished. A large number of outbreaks of hemorrhagic septicemia in cattle are associated with the shipment of animals from one point to another by rail or truck and their passage through public stockyards. The vitality of an animal is lowered by the hardships of transit, and its resistance to infection is decreased. The disease is therefore a serious problem to both shippers and receivers of cattle. In some years very considerable losses occur, whereas in other years they may be slight.

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It is generally believed that weather conditions influence the prevalence of the disease, since cattle appear to suffer from it most in the fall, winter, and early spring during particularly changeable or inclement weather. After prolonged travel under such weather conditions, for example, they may arrive on the farm of the purchaser in a run-down condition, though they had appeared perfectly healthy when purchased in the stockyards. Overcrowding, irregularity in feeding and watering, hard driving, lack of rest and proper shelter, and the general excitement associated with shipping are other devitalizing factors that may play a part in reducing normal vigor and increasing the susceptibility to shipping fever.

CAUSE

The primary cause of hemorrhagic septicemia in cattle has not been definitely determined, and there is a difference of opinion both among practicing veterinarians and among research workers.

According to the older school of thought, the principal causative factor is the germ *Pasteurella boviseptica.* The organism has been found in the air passages of normal animals, and organisms closely resembling it are widely distributed in nature. The theory is that such organisms become virulent under certain conditions and that animals harboring them readily develop so-called shipping fever when their natural resistance is lowered.

According to the newer school of thought, the hemorrhagic septicemia organism probably plays a secondary role, like that of diphtheroids, streptococci, and *Bacillus coli* organisms, and there is another primary infective agent concerned in the production of the disease. The nature of this agent is not known, but it is thought by some to be a virus. When cattle are received after a hard railroad journey many of them may manifest symptoms of the disease, and local stock that come in contact with the affected animals very often become infected. Just what part the contamination of yards, buildings, and equipment by affected cattle plays in setting up the disease in noninfected animals is not known, but undoubtedly this is a source of danger. It is worthy of note that the coexistence of two factors (a virus and a bacterium) as necessary causative agents in certain infectious diseases has been recognized in recent years, notably in the case of swine influenza.

SYMPTOMS AND LESIONS

Shipping fever in cattle usually develops very rapidly and lasts from 2 to 8 days or longer. Affected animals first show an elevation of body temperature, ranging from 104° to 107° F., accompanied by loss of appetite, mucopurulent discharge from the nose, an occasional hacking cough, swollen, watery eyes, general depression, gaunt appearance, stiffened gait, and sometimes diarrhea (fig. 1). Within 3 to 5 days after the first symptoms appear, affected animals may develop pneumonia and die in 48 to 72 hours; or the disease may assume a chronic course, and the sick animals may linger on for

several weeks. In mild attacks, affected animals may recover in a week or two.

During the course of the disease other symptoms may occur. Swelling may appear beneath the skin of the head, throat, or dewlap. These enlargements are somewhat soft and pit on pressure. The tongue is often extensively swollen, and the animal drools and slobbers because of the irritation to its tongue and throat. There may be difficulty in breathing, depending on the degree of involvement of the air passages and the lungs. Muscular trembling may be evident. There may be a blood-stained discharge from the nostrils, and strings of mucus may hang from the mouth. Examination of the nostrils often reveals the presence of many small hemorrhages, or blood spots, just beneath their lining membranes.

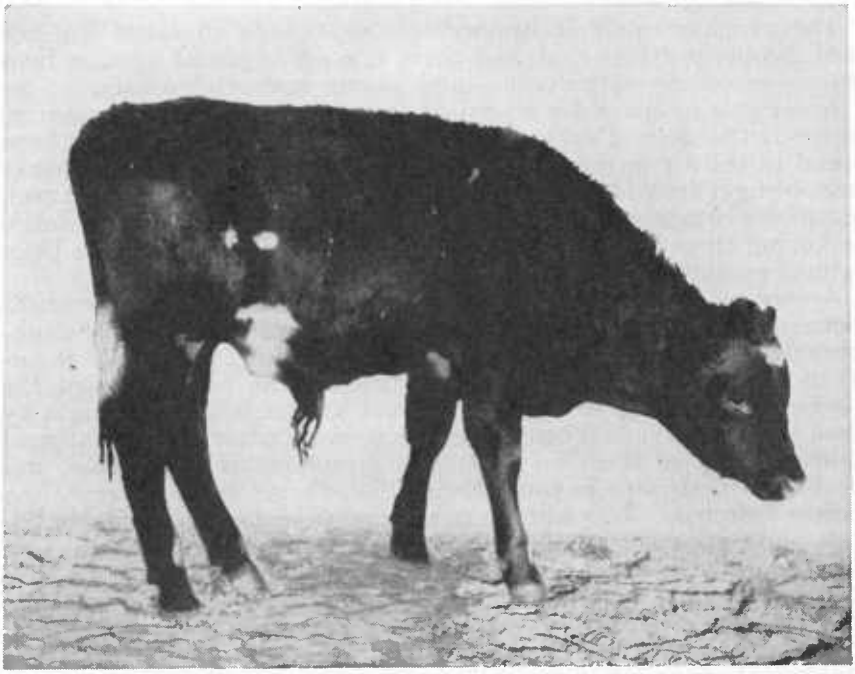

FIGURE 1.—A steer affected with hemorrhagic septicemia, showing typical attitude of dejection.

There is an intestinal form of the disease in which the changes are found chiefly in the abdominal cavity. This form may develop after the disease has appeared in the lungs. The stomach, intestines, and kidneys and the lymph glands belonging to them become studded with hemorrhages of various sizes, and the intestines become intensely inflamed. Diarrhea sets in, and shreds of mucus and bloody droppings are passed. The intestinal form is rare; most cases show severe involvement of the lungs and the symptoms of croupous pneumonia. The animals may stand with their forelegs wide apart in order to breathe more freely. They lose flesh very rapidly, their abdomens

become "tucked up," and the eyes quickly become sunken. A staggering gait, caused by extreme weakness, is sometimes noticed.

On post mortem examination the following anatomical changes may be observed in the carcass of an animal dead of hemorrhagic septicemia: Swellings of doughy consistency, containing jellylike material tinged with blood, may be found under the skin. If these swellings occur in the region of the shoulder or flank, they are sometimes mistaken for those of blackleg. The lymph glands are enlarged and hemorrhagic (injected with blood). The mucous membranes lining the nose, throat, and air passages of the lungs are inflamed and may contain blood-stained mucus. Hemorrhages may be observed in the fat tissue around the kidneys and in the serous membranes of the internal organs.

When the disease is chiefly in the chest, the lungs are darkened in color, and their fibrous tissues are much thickened owing to the collection of bloody serum in their meshes. There may be solidification of one or more lobes (pneumonia). The diaphragm, heart sac, and heart walls show numerous bloody points and larger collections of blood.

In the intestinal form, hemorrhages of the intestines are present, and there is sloughing of the lining of the intestinal wall, as a result of which the intestinal contents are wrapped in a covering of bloody mucus.

In acute forms of the disease the animals may die suddenly, and in such cases the changes are not very marked although bacteriological examination of the body fluids may demonstrate the presence of hemorrhagic septicemia organisms.

DIAGNOSIS

It is often difficult to diagnose hemorrhagic septicemia because of its similarity to certain other disease conditions encountered in cattle. Owing to its acute course, high fever, and rapid termination, the disease may be mistaken for anthrax, malignant edema, or blackleg. While certain characteristic features of these diseases may aid in making a tentative diagnosis, a bacteriologic examination which includes both cultural tests and inoculation of laboratory animals is sometimes necessary to detect the nature of the disease and especially to differentiate it from others.

Other conditions in cattle, such as coccidiosis, cornstalk disease, lead poisoning, sweetclover poisoning, and other forms of vegetable poisoning, may be mistaken for hemorrhagic septicemia. In an outbreak of suspected hemorrhagic septicemia, diagnosis, treatment, and methods of control should be left to an experienced veterinarian.

CONTROL AND PREVENTION

In considering measures for the control and prevention of this disease, it is important to remember that hemorrhagic septicemia is the most serious of a group of cattle maladies that commonly result from mishandling, neglect, or exposure of animals in transit or

shortly after their arrival at their destination. Hence the elimination of predisposing factors, such as overdriving, overcrowding, overfeeding, and lack of rest, water, feed, and proper shelter during transit, is stressed. Suggestions for reduction of losses due to hemorrhagic septicemia and other diseases of cattle incident to shipping will be found in the following recommendations from United States Department of Agriculture Leaflet 38, Maintaining the Health of Livestock in Transit:[2]

Avoid hard driving and allow ample time for rest before loading. On arrival at the pens, the animals should not be allowed to fill up on water, but should first have rest and be fed some native grass or nonlegume hay.

Avoid overcrowding cattle in the cars. In cold weather, bed the car well. In very severe weather, in northern latitudes, it may be well to line the side walls of the car with heavy paper, especially if the cattle are young or unthrifty.

Give feed and water at proper intervals en route. When unloaded for feed, water, and rest, the cattle should have plenty of time to become well rested.

Under the 28-hour law 5 hours' rest is the minimum specified time, and the railroads ordinarily allow that period, exclusive of the time of unloading and reloading. It is better, however, to give stocker and feeder cattle special care, allowing at least 8 hours for feed, water, and rest. * * * Cows in an advanced stage of pregnancy, commonly termed "springers," should receive particular attention.

The common practice of withholding water from animals until they are very thirsty so that later they will take a heavy fill is harmful. It tends to upset the digestive system so seriously that the animals are slow in resuming normal feeding and gain in weight. It is therefore recommended that this damaging practice be discontinued through general agreement among livestock owners and handlers.

In the case of stocker and feeder cattle that pass through the public market, the same attention should be given to the shipments back to the country that has been outlined for the shipments to market. Following the arrival of cattle at their final destination in the country, they should receive special attention and care to help them over the period of lowered vitality resulting from the hardships of travel.

Feeder cattle on arrival should be given a fill of dry roughage, such as timothy hay, prairie hay, or corn stover. After having access to this roughage a few hours, they should have water, but not all they will drink. By the end of the first day, give free access to dry roughage and water.

Most feeder cattle are raised on grasses different from those found in the fattening areas. Therefore, if they are to be pasture fed, let them become accustomed to the new grasses gradually, giving them at first only a few hours' grazing each day, especially if the grass is still green.

If feeder cattle are intended for dry-lot feeding with no pasture available, give them access to cornstalk fields or feed them on corn fodder and hay for from 10 days to 2 weeks before starting them on the fattening rations.

If the cattle arrive in cold weather, especially if it is wet and stormy, provide adequate dry shelter. Severe exposure to cold and dampness combined, during the period of low vitality, is liable to have very serious results. If there is any sign of sickness, segregate diseased animals and keep them quiet.

The use of biological products to prevent hemorrhagic septicemia or to control outbreaks has been successful in many instances, but unsatisfactory results have followed in some outbreaks.

The biological products used are either preventive (bacterin and aggressin) or curative (antiserum). Bacterins or aggressins increase the animal's resistance against hemorrhagic septicemia infection. They produce an active immunity of long duration, usually several

[2] MILLER, A. W. MAINTAINING THE HEALTH OF LIVESTOCK IN TRANSIT. U. S. Dept. Agr. Leaflet 38, 8 pp., illus. 1931. (Revised.)

months to a year. It is believed that a high degree of immunity is established in 10 days to 2 weeks after vaccination with either bacterin or aggressin.

For best results feeder and stocker cattle should be treated with bacterin or aggressin at least 10 days before shipment, as the use of these products on animals in transit or a few days after they reach their destination appears to be of little or no value, according to experimental work by the Bureau of Animal Industry and other agencies.[3]

On the other hand, the administration of antihemorrhagic septicemia immune serum, which contains great numbers of immune bodies, produces an immediate increase in resistance to the disease. This is, however, a passive immunity of short duration, lasting only a few weeks.

Since antihemorrhagic septicemia serum furnishes quick protection and also has some curative value, its use in preference to bacterin or aggressin is indicated for treatment of cattle in transit or within a few days after they arrive at their destination, particularly if some of the animals in the shipment show symptoms of the disease.

Anaphylaxis (shock or severe reactions) may sometimes follow the administration of antiserum or bacterins. To avoid this, only homologous serum (that is, serum obtained from bovine species) should be used, and bacterins should preferably be composed of a bacterial suspension in normal (0.8 percent) saline solution free from toxic broth or other foreign protein.

The advisability of using biological products and their administration should be left to a competent veterinarian.

Tests conducted by the Bureau of Animal Industry have shown that both laboratory animals and cattle can be immunized under experimental conditions against hemorrhagic septicemia by either aggressin or bacterin. Cattle, sheep, and laboratory animals can also be immunized by treatment with weakened (attenuated) cultures.

During these experiments, animals vaccinated with aggressin and subsequently exposed to artificial infection remained well. Animals treated with aggressin developed immunity to artificial exposure in as short a period as 4 days, while those treated with bacterin required 9 days to develop immunity. Cattle were found to be resistant to infection 15 months after vaccination with aggressin.

In most cases medicinal treatment of a fully established case of shipping fever is of little value. In visibly sick animals, especially during the early stages of the disease, the administration of large doses of antihemorrhagic septicemia serum (one or two injections of 50 cubic centimeters or more) frequently assists in bringing about

[3] To ascertain the value of vaccination in reducing losses from hemorrhagic septicemia in animals in transit, the Bureau of Animal Industry, in cooperation with traders and livestock exchanges, conducted experimental work in the control of hemorrhagic septicemia at certain stockyards in 1924 and 1925. During 1924, 151,475 feeder and stocker cattle were vaccinated by veterinary inspectors. During 1925, in an experiment in which 4,439 animals were handled, 2,234 were vaccinated with aggressin and 2,205 were shipped to their destination without treatment, as controls. The results of these experiments based on incomplete reports received from owners of treated and untreated cattle indicate that the administration of bacterin or aggressin confers little if any immunity on animals in transit, many of which apparently have the disease in the incubative stage. In fact, some of the evidence tends to show that losses were greater in the animals treated with aggressin than in those untreated.

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recovery. All apparently well animals should be removed from sick ones and placed in separate, noninfected quarters. If new cases develop among them a few days after their removal, the remaining healthy ones should be removed again to another locality. In that way the unaffected animals can be kept out of danger of further contamination.

The administration of sodium bicarbonate has been reported by some stockmen and veterinarians as being of considerable value in both the treatment and the prevention of this disease. During 1934, 1935, and 1936, sodium bicarbonate administered in the form of a drench, on the feed, or in drinking water at the rate of 1 ounce to each 100 pounds of body weight, was given once a day for 14 days by stockmen and stockyard officials to several thousand cattle. Some of the animals were treated in the stockyards and others after arrival on the home premises following shipment. A large number of untreated animals in both groups were held as controls. Reports received by the Bureau on the results of this treatment showed little difference between the treated and untreated animals in their resistance to shipping fever.

Since hemorrhagic septicemia is an infectious disease, the carcasses of animals that have died of it should be burned or buried. Premises are usually contaminated by infected cattle that have recently passed through some of the larger markets. All stables, sheds, or yards that have contained infected animals should be disinfected. The interior of the stables, especially the mangers and gutters, should be washed with a disinfectant, such as compound cresol solution, 4 ounces to a gallon of water, or carbolic acid, 6 ounces to a gallon of water. For dairy barns, however, where the odor of these disinfectants would be objectionable, milk of lime or some other nonodorous disinfectant may be preferred. The yards may be disinfected by the application of a solution made of 5 ounces of copper sulfate to a gallon of water. The best way to apply disinfectant solutions is with a spray pump such as is used in spraying orchard trees. All refuse and waste material from the stable and barnyard should be removed to a place not accessible to cattle or sheep. The manure should be spread on fields and plowed under. A plentiful supply of light and air should be provided for the contaminated stables. Open fields or pastures are cleansed rapidly by the action of sunlight.