

HEMORRHAGIC SEPTICEMIA

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Definition [top](#)

Classical hemorrhagic septicemia is a particular form of pasteurellosis caused by *Pasteurella multocida* and manifested by an acute and highly fatal septicemia mainly in susceptible cattle and water buffaloes.

The name hemorrhagic septicemia is used rather loosely in some countries to include pneumonic pasteurellosis (shipping or transport fever), a disease caused mainly by *P. haemolytica*, although various serotypes of *P. multocida* are occasionally involved. Although the morbidity of pneumonic pasteurellosis of cattle can be high, the mortality rate is much less than that of hemorrhagic septicemia.

Etiology [top](#)

Hemorrhagic septicemia is caused by two serotypes of *P. multocida*; namely, B:2 and E:2. The letter denotes the capsular antigen as determined originally by the

indirect hemagglutination test of Carter (5), and the numeral 2 stands for the somatic or O antigen as determined by the agar gel diffusion precipitin test developed by Heddelston and associates (17). This somatic antigen 2 is the equivalent to the 6 in the classification of Namioka and associates. In a new classification, *Pasteurella multocida* strains causing most pasteurella infections, including hemorrhagic septicemia, are called *P. multocida* subspecies *multocida*.

Host Range [top](#)

Cattle and water buffaloes are the principal hosts of hemorrhagic septicemia, and it is widely considered that buffaloes are the more susceptible. The disease is thought to be endemic in one large herd of North American range bison; however, epidemics appear to be rare. In the United States, the disease has been confirmed only in American bison in 1912, 1922, and 1965. The *P. multocida* isolant from the 1922 outbreak, a serotype B:2, is maintained in the USDA culture collection as a reference strain. Although outbreaks of hemorrhagic septicemia have been reported in sheep and swine, it is not a frequent or significant disease. Cases have been reported in deer, elephants and yaks. There is as yet no evidence of a reservoir of infection outside the principal hosts: cattle, water buffaloes, and bison.

Geographic Distribution [top](#)

Hemorrhagic septicemia in epidemic form is a disease mainly of cattle and water buffaloes either maintained separately or together. Radical changes in weather, including the advent of monsoons, debility caused by seasonal levels of low nutrition, and the pressure of work (draft animals) are related to the explosive occurrences of the disease in certain parts of the world. Southeast Asia, where such conditions often coincide, is the area of highest incidence. The disease occurs in the Middle East and Africa where the environmental circumstances and predisposing conditions are not as clearly defined as in Southeast Asia. As in Asia, the disease is frequently associated with the rainy season and poor physical condition.

Hemorrhagic septicemia was recognized in Japan as a specific disease of cattle caused by particular strains of *Pasteurelia* as early as 1923. Since 1926, the disease has been controlled, and the last recorded case in cattle in Japan occurred in 1952.

The B:2 serotype has been recovered from hemorrhagic septicemia in countries of Southern Europe, the Middle East, and Southeast Asia, including China. This same serotype has been reported from Egypt and the Sudan. The E:2 serotype has been

recovered from hemorrhagic septicemia occurring in Egypt, the Sudan, the Republic of South Africa, and several other African countries. There is no report of either serotype being recovered from Australia, New Zealand, and countries of South and Central America.

There is no evidence that the disease has spread from carrier bison in the Western United States to neighboring cattle. Given the conditions in which hemorrhagic septicemia occurs in endemic areas (e.g., primitive husbandry practices, low country plains, and well-defined dry and wet seasons), it seems unlikely that the disease will reach epidemic proportions in the United States.

Transmission [top](#)

The disease is spread by direct and indirect contact (fomites). The source of the infection is infected animals or carriers. The carrier state may be greater than 20 percent shortly after an outbreak, but within 6 weeks the rate is usually less than 5 percent. The causal agent does not survive for more than 2 to 3 weeks in the soil or on pastures. Close herding and wetness, as occurs during the rainy season, appear to contribute to spread. There is no evidence that biting arthropods are significant vectors.

Incubation Period [top](#)

The influence of extrinsic factors in the development of the clinical pasteurelloses, and particularly in hemorrhagic septicemia, has been noted by many workers. When favorable circumstances for the growth and multiplication of *P. multocida* in the animal body occur, severe septicemia develops within a few hours. However, the organisms may be harbored for varying periods in a small percentage of carrier animals without any clinical sign. The perpetuation of the disease from year to year or season to season is generally attributed to the carrier state. The immune status of the animal is thought to influence the severity of the disease.

Cattle or buffalo artificially inoculated subcutaneously with lethal doses (approximately 20,000 bacilli) show clinical signs within a few hours and succumb within 18 to 30 hours.

Clinical Signs [top](#)

The majority of cases in cattle and buffalo are acute or peracute with death occurring from 6 to 24 hours after the first recognized signs. In a few outbreaks, animals may survive as long as 72 hours. Dullness, reluctance to move, and elevated temperature are the first signs. Following these signs, salivation and

nasal discharge appear, and edematous swellings are seen in the pharyngeal region and then spread to the ventral cervical region and brisket. Visible mucous membranes are congested, and respiratory distress is soon followed by collapse and death. Recovery, particularly in buffaloes, is rare. Chronic manifestations of hemorrhagic septicemia do not appear to occur.

Gross Lesions [top](#)

Widely distributed hemorrhages, edema, and general hyperemia are the most obvious tissue changes observed in infected animals. In almost all cases there is an edematous swelling of the head, neck, and brisket region (Fig. 63). Incision of the edematous swellings reveals a coagulated serofibrinous mass with straw-colored or blood-stained fluid. This edema, which distends tissue spaces, is also found in the musculature (Fig. 64). There are subserosal petechial hemorrhages throughout the animal, and blood-tinged fluid is frequently found in the thoracic and abdominal cavities. Petechiae may be found scattered throughout some tissues and lymph nodes, particularly the pharyngeal and cervical nodes, which are also swollen and often hemorrhagic. Pneumonia is not usually extensive nor is gastroenteritis. Cases that are atypical in regard to throat swelling (absent) and pneumonia (extensive) are occasionally seen.

Morbidity and Mortality [top](#)

Husbandry, weather and immunity affect morbidity. In endemic areas, from 10 to 50 percent of the cattle or buffalo populations acquire solid immunity through exposure or subclinical infection. Close herding and wetness predispose to an increased morbidity. Most animals that develop clinical signs die.

Diagnosis [top](#)

Field Diagnosis [top](#)

In countries where hemorrhagic septicemia is endemic, it is usually readily diagnosed — particularly if there is a history of previous outbreaks and a failure to vaccinate. When a small number of animals are affected, diagnosis may be more difficult. This could be the case if hemorrhagic septicemia were to occur in the United States. In endemic areas, the rapid course, usual high herd incidence, and the appearance of edematous swellings in the throat, cervical, and parotid regions is highly suggestive.

Specimens for the Laboratory [top](#)

From an animal with typical signs, the organism can be isolated from heparinized blood, affected tissue, liver, lung, kidney, and spleen. All samples should be collected aseptically. Samples should be kept cool and shipped on wet ice as soon as possible. Swabs in transport media, ribs, and tips of ears are sometimes submitted from remote areas in developing countries.

Laboratory Diagnosis [top](#)

Isolation of a small gram-negative rod or coccobacillus in pure or nearly pure culture with the general colonial appearance of a *Pasteurella* species from an animal with typical signs is grounds to suspect hemorrhagic septicemia. If there has been postmortem decomposition with the presence of extraneous bacteria, the inoculation of mice and rabbits with blood or suspensions of tissues will facilitate recovery of the pasteurellae of hemorrhagic septicemia in pure or nearly pure culture. Both mice and rabbits are highly susceptible to the two serotypes B:2 and E:2. Definitive diagnosis depends upon the identification of the cultures as *P. multocida* and the subsequent identification of serotype B:2 or E:2. Because several different serotypes of *P. multocida* that do not produce classical hemorrhagic septicemia occur in cattle, it is necessary to serotype the isolate. The National Veterinary Services Laboratories, Ames, IA should be contacted regarding the serotyping of suspected hemorrhagic septicemia strains of *P. multocida*.

Serologic procedures for the detection of specific antibody are not used in diagnosis.

Differential Diagnosis [top](#)

The sudden death seen with peracute and acute hemorrhagic septicemia must be differentiated from that due to lightning, snakebites, blackleg, rinderpest, and anthrax.

Treatment [top](#)

The onset and course of the disease are generally rapid and leave little time for antimicrobial therapy. However, several of the sulfonamides and antibiotics such as penicillin and the tetracyclines can be used successfully in the early stages. In some outbreaks in Southeast Asia, animals with elevated temperatures are isolated and treated intravenously with a soluble sulfonamide.

Vaccination [top](#)

The most efficacious immunizing agent has been the oil-adjuvant vaccine prepared from the appropriate serotype. Vaccine of this type is more slowly absorbed and produces a longer-lasting immunity than do regular and alum-precipitated-type bacterins. The oil-adjuvant bacterin has the advantage of requiring only one dose annually, but it has the disadvantages of being difficult to syringe and occasionally produces a marked local reaction. A live vaccine prepared from a fallow deer strain of *P. multocida* has shown considerable promise with protection for as long as a year. This strain, serotype B:3,4, is closely related immunologically to serotype B:2 but is less virulent.

Control and Eradication [top](#)

In endemic areas the only practical ways to protect animals are by an organized program of vaccination and maintenance of animals in as good a condition as possible. When favorable conditions for outbreaks are known to recur periodically, such preventive measures can be carried out in advance, and the potential consequences of the disease will thus be lessened.

Public Health [top](#)

There is as yet no authenticated report of human infections due to serotypes B:2 and E:2. However, because other serotypes of *P. multocida* can cause a variety of human infections, precautions should be taken to minimize exposure to the hemorrhagic septicemia varieties of *P. multocida*.

GUIDE TO THE LITERATURE [top](#)

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