

Bovine Ephemeral Fever

*Bovine Epizootic Fever, Ephemeral
Fever, Three-Day Sickness, Three-
Day Stiffsickness, Dragon Boat
Disease, Lazy Man's Disease,
Dengue of Cattle*

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Importance

Bovine ephemeral fever is an economically important viral disease of cattle and water buffalo. This disease occurs in Africa, Australia, Asia and the Middle East, often in sweeping epizootics. Its impact includes lost production – decreased milk yield, loss of condition, abortion, temporary infertility in bulls, and prolonged recovery in some animals – as well as trade restrictions. Although mortality is usually low, cattle in good condition are affected more severely; mortality rates as high as 30% have been reported in very fat cattle.

Etiology

Bovine ephemeral fever is caused by the bovine ephemeral fever virus (BEFV), a member of the genus *Ephemerovirus* in the family Rhabdoviridae. There is only one serotype. Other members of this genus (Adelaide River virus, Kimberley virus, Berrimah virus, Puchong virus and Malakal virus) can cross-react in some serological tests.

Species Affected

Only cattle (*Bos* sp.) and water buffalo (*Bubalus bubalis*) develop bovine ephemeral fever. Antibodies to BEHV have, however, been reported in domesticated deer and goats, as well as many wild ruminants including Cape buffalo, hartebeest, waterbuck, wildebeest, kudu, deer, antelope and giraffes. Most of these seropositive animals have been found in Africa. Experimental infections have been established in sheep, but infections have not been reported in this species outside the laboratory.

Geographic Distribution

Bovine ephemeral fever is endemic in most tropical and subtropical areas of Africa, Australia, the Middle East and Asia. There is serological evidence that animals might be infected in central Russia. Some countries experience localized outbreaks in most years; others report cases only during epizootics. BEFV is not found in Europe, North or South America, or New Zealand.

Transmission

Bovine ephemeral fever appears to be transmitted by arthropods. The vector or vectors are not known, but BEFV has been isolated from a mixed pool of Culicine and Anopheline mosquitoes, as well as *Anopheles bancroftii*, in Australia, and from *Culicoides* (biting midges) in both Africa and Australia. Mosquitoes are suspected to be the most important biological vectors. The disease can also be spread by intravenous inoculation of small amounts of blood. Bovine ephemeral fever is not transmitted by close contact, body secretions, or aerosol droplets. The virus does not seem to be transmitted in semen and it is rapidly inactivated in meat. Carriers are not known to occur.

Incubation Period

In experimental infections, the incubation period is 1 to 10 days, with most cases developing between three and five days after exposure. The natural incubation period is probably similar.

Clinical Signs

Bovine ephemeral can be either mild or severe in cattle, with the most severe cases occurring in bulls and high-producing cows. Subclinical infections are also seen. The symptoms vary in individual animals, but the classic course begins with a fever, which is often biphasic, triphasic or polyphasic. The temperature peaks typically occur 12 to 18 hours apart. During the first fever spike, milk production in lactating cows often drops dramatically, but other clinical signs tend to be mild. Some animals may be depressed, stiff or reluctant to move. On the second day of illness, which may coincide with a second elevation in temperature, the symptoms are more severe. Animals usually become inappetent and depressed, with an increased heart rate, tachypnea, and serous or mucoid discharges from the nose. Profuse salivation, muscle twitching, waves of shivering or a watery ocular discharge may also be seen.

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Some animals develop submandibular or periorbital edema, or patchy edema on the head. Shifting lameness, stiffness and joint pain are common; the joints may or may not be swollen. The lameness can be severe enough to mimic a fracture or dislocation. Pulmonary emphysema and rales may be found in severe cases. Many animals, particularly cows in good condition and bulls, become recumbent for eight hours to days. Most animals lie in sternal recumbency, but in severe cases, animals may become laterally recumbent. Some animals temporarily lose their reflexes and are unable to rise. Recumbent animals may be bloated, have ruminal stasis, or lose their swallowing reflex. These clinical signs can be exacerbated by severe environmental stress or forced exercise.

Most animals begin to improve a day or two after the first symptoms appear, and recover completely within another one to two days. Lactating cows and animals in good condition are usually affected more severely and may take up to a week to recover. Generally, animals lose condition rapidly during the illness, and regain their weight only slowly. Complications are uncommon but can include temporary or (rarely) permanent paralysis, as well as gait impairment, aspiration pneumonia, emphysema, mastitis, and the subcutaneous accumulation of air along the back. Many of these complications may be the result of trauma or complications of recumbency. Temporary infertility (up to 6 months) can develop in bulls, and abortions can occur in cows. Permanent infertility is rare. In recovered animals, milk production is decreased by 10-15% for the rest of the lactation, but usually returns to normal after subsequent pregnancies. Cows that become ill late in lactation may not return to production. Death is uncommon, but may occur during either the febrile or the convalescent stage. Deaths are usually the result of secondary complications such as pneumonia or trauma.

Water buffalo have similar symptoms, but the disease is usually milder. Experimentally infected sheep remain asymptomatic.

Post Mortem Lesions

The most obvious lesion in bovine ephemeral fever is a small amount of fibrin-rich fluid in the pleural, peritoneal and pericardial cavities. Variable amounts of fluid may also be found in the joint capsules. Serofibrinous polysynovitis, polyarthritis, polytenosynovitis, and cellulitis are common. Patchy edema may be apparent in the lungs and lymphadenitis is often seen. Petechial hemorrhages or edema may be found in the lymph nodes. Areas of focal necrosis are common in the major muscle groups.

Morbidity and Mortality

Bovine ephemeral fever can occur as localized outbreaks or in seasonal epizootics that sweep across broad geographic areas. During epizootics, the pattern of spread seems to be influenced by the prevailing winds. Most cases are seen in the summer and early fall, and outbreaks are often associated with high rainfall. When it

is dry, outbreaks have been reported in cattle gathered around sources of water. Outbreaks usually end with the first heavy frosts.

The morbidity rate is highly variable, and can be as high as 80% or as low as 1-10%. Morbidity varies with the age and condition of the animal, as well as any immunity it may have. The clinical signs are usually more severe in adults than calves; symptomatic infections are rare in cattle less than 6 months of age, even when they have no maternal antibodies. Bulls, animals in good condition and high-producing cows are more severely affected. The mortality rate is 1-2% in most outbreaks, but it can be as high as 30% in very fat cattle.

Diagnosis

Clinical

Bovine ephemeral fever is usually diagnosed clinically during outbreaks in endemic areas. This disease should be suspected in cattle herds that develop severe but transient symptoms including fever, lameness, temporary paralysis or recumbency. The mortality rate tends to be surprisingly low for the severity of the signs. This disease may be difficult to diagnose when a single animal is affected.

Differential Diagnosis

Bovine ephemeral fever in a single animal can be confused with early Rift Valley fever, heartwater, bluetongue, botulism, babesiosis or blackleg. The salivation may also resemble foot-and-mouth disease, but no vesicles are found.

Laboratory Tests

Most cases of bovine ephemeral fever are confirmed by serology. A rising titer should be demonstrated with either virus neutralization or enzyme-linked immunosorbent assay (ELISA); both the neutralization assay and a blocking ELISA can distinguish BEFV from other members of the *Ephemerovirus* genus. Complement fixation can also be used, but this test identifies the antibodies only as *Ephemerovirus*-specific. Anamnestic responses to BEFV can be seen during the first exposure, if the animal was previously exposed to another virus in the genus.

Polymerase chain reaction (PCR) assays are used regularly for diagnosis in some countries, including Australia. Virus isolation can be attempted from blood samples, but often fails. *Aedes albopictus* (mosquito) cell lines are the most suitable cells for the initial isolation. BHK-21 and Vero cells can also be used to propagate the isolated virus. The identity of the virus is usually confirmed by immunofluorescence, virus neutralization or blocking ELISA; however, immunofluorescence may be able to identify the virus only as an *Ephemerovirus*.

Bovine ephemeral fever can also be confirmed by intracerebral inoculation into unweaned mice.

Samples to collect

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Before collecting or sending any samples from animals with a suspected foreign animal disease, the proper authorities should be contacted. Samples should only be sent under secure conditions and to authorized laboratories to prevent the spread of the disease.

Acute and convalescent serum samples should be taken for serology; these samples should be collected early in the illness and approximately 1 to 3 weeks later. In areas where bovine ephemeral fever has not been seen before, single serum samples from recovered animals may be suggestive. Although coagulated blood is normally collected for serology, it should be noted that blood taken during this illness often does not clot. BEFV can sometimes be recovered from blood samples during the first 24–48 hours of illness. At least 5 ml of whole, anticoagulated blood (an anticoagulant other than EDTA should be used) should be taken for virus isolation.

For faster confirmation, samples should be taken from animals in various stages of the disease.

Recommended actions if bovine ephemeral fever is suspected

Notification of authorities

Bovine ephemeral fever should be reported immediately to state or federal authorities.

Federal: Area Veterinarians in Charge (AVIC):
[http://www.aphis.usda.gov/animal_health/area_offices/State_Veterinarians:](http://www.aphis.usda.gov/animal_health/area_offices/State_Veterinarians)
<http://www.aphis.usda.gov/vs/sregs/official.html>

Control

Because illness and viremia are both transient, and the incubation period is short, import restrictions are usually effective unless the country shares a border with an endemic region. The vectors for BEFV are unknown, and successful eradication has not been reported once this disease becomes endemic. If an outbreak occurs among imported animals in a limited area, placing them in an insect-proof area and treating the area with insecticides has a chance of success. Sodium hypochlorite and other disinfectants effectively destroy BEFV; however, disinfection is relatively unimportant in preventing the spread of this virus. BEFV is not spread by casual contact or in secretions, and it is rapidly inactivated in carcasses after death.

In endemic areas, vaccination is generally used to prevent disease, particularly in lactating cattle and bulls. Vaccines are not always necessary in endemic areas where outbreaks occur regularly and most animals are immune before they become adults. Vaccination can also be used in the face of an outbreak. Although insect control would theoretically be helpful, its efficacy is unknown. Moving valuable animals into insect-proof facilities may be considered during outbreaks or in high-risk seasons.

Treatment is often unnecessary in non-lactating cows, but bulls or high-producing, lactating animals are often

treated, particularly when they have become recumbent. Anti-inflammatory drugs and calcium borogluconate injections are effective. Good nursing can also aid recovery. Recumbent animals should be provided with water, food and shelter if necessary, but animals should not be forced to stand or move. Force-feeding is not advisable due to the risk of aspiration pneumonia. Laterally recumbent animals may be rolled periodically to prevent loss of circulation and muscle damage.

Public Health

There is no evidence that humans can be infected by the ephemeral fever virus.

Internet Resources

United States Animal Health Association.
Foreign Animal Diseases
http://www.vet.uga.edu/vpp/gray_book02/fad/index.php
World Organization for Animal Health (OIE)
<http://www.oie.int>
OIE Terrestrial Animal Health Code\
http://www.oie.int/eng/normes/mcode/A_summry.htm

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