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EFSA – Disease profiles

# Epizootic haemorrhagic disease Fact Sheet

## 1. Disease overview

Epizootic haemorrhagic disease virus (EHDV) causes epizootic haemorrhagic disease, a Culicoides-borne viral infection primarily affecting deer and cattle, causing high mortality in deer but often remaining sub-clinical in cattle. When clinical disease does occur in cattle, it typically involves fever, oedema, haemorrhages and erosions in the upper gastrointestinal tract, and dysphagia (Spickler, 2019; WOAH, 2019a).

Epizootic haemorrhagic disease infection is a WOAH-notifiable disease, listed in the EU AHL under categories D and E.

## 2. Agent

EHDV is a non-enveloped, double-stranded RNA virus that belongs to the *Orbivirus* genus of the *Reoviridae* family. The virion has three protein layers. The outer capsid contains two proteins, VP2 and VP5, with VP2 serving as the main determinant of serotype specificity. The core particle is a bi-layered icosahedral structure composed of VP3 and VP7, where the latter is the serogroup-specific, immunodominant protein. Inside the core is the transcriptase complex, which includes VP1, VP4, VP6, and the segmented RNA genome.

EHDV is closely related to Bluetongue virus.

Seven EHDV serotypes are currently recognized, with additional serotypes proposed. Ibaraki disease is caused by the Ibaraki strain of EHDV serogroup 2. The virus remains stable in blood and tissues at 20 °C and 4 °C. It can be inactivated by heat treatment at 50 °C for 3 hours, 60 °C for 15 minutes, or 121 °C for 15 minutes. EHDV is resistant to lipid solvents but is susceptible to several disinfectants, including β-propiolactone, 2% (w/v) glutaraldehyde, acids, alkalis (e.g., 2% sodium hydroxide), 2–3% (w/v) sodium hypochlorite, iodophores, and phenolic compounds (WOAH, 2025b; Spickler, 2019).

## 3. Geographical Distribution

Cases of EHDV infection have been reported during 2021-2025 in domestic animals in North and South America, south-west Europe, northern Africa, Israel and Australia. Cases in wild animals have been reported from the same areas except for Australia (Figure 1). Up to date maps based on WAHIS are available in the online version of the Disease Profile (accessible via the button in the top right corner).

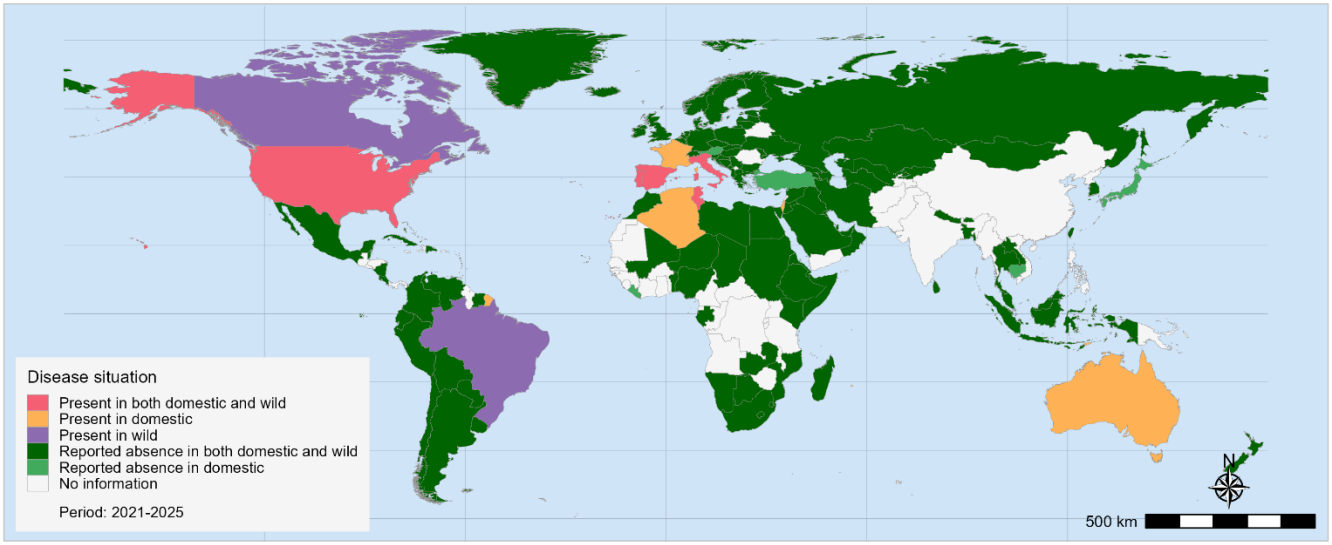



**Figure 1.** Geographical distribution of EHDV detected events (2021-2025), as reported to WOAH.

# 4. Animal hosts

## 4.1. Susceptible hosts

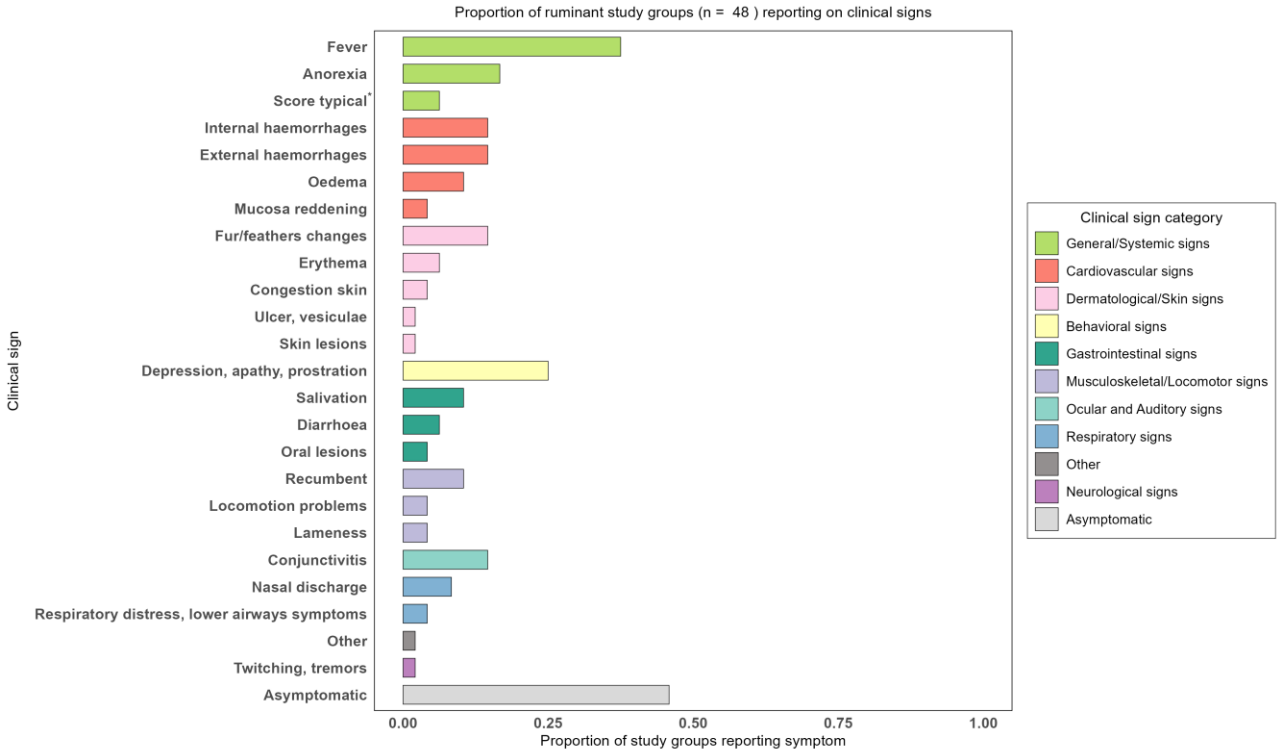
Based on epidemiological knowledge of host–pathogen–vector interactions and outbreak reports, the main hosts of EHDV are cattle and cervids. However, other susceptible species have been identified by the EFSA's systematic literature review (SLR), with the summary provided in Table 1.

**Table 1.** Susceptible host species of Epizootic haemorrhagic disease virus.

| **The systematic literature review reported in the EHDV disease profile, identified the following susceptible species (updated until 31/12/2025, for references see online disease profile)** |
|---|
| FIELD |
| Epidemiological studies carried out in the field<br>**Pathogen was detected in the following animal species:**<br>• Bovidae: *Bos taurus, Ovis aries*<br>• Cervidae: *Odocoileus hemionus, Cervus elaphus, Odocoileus virginianus*<br>**Antibodies were detected in the following animal species:**<br>• Bovidae: *Bos taurus*<br>• Cervidae: *Odocoileus hemionus, Cervus elaphus*<br>**Outbreaks reported to WOAH included the following species:**<br>• Bovidae: *Bos taurus, Capra hircus, Ovis aries*<br>• Cervidae: *Cervus elaphus, Dama dama, Mazama gouazoubira* |
| EXPERIMENTS |
| **Experimental studies demonstrated infection in:**<br>• Bovidae: *Bos taurus, Capra hircus, Ovis aries*<br>• Cervidae: *Odocoileus virginianus , Cervus elaphus, Dama dama, Capreolus capreolus, Cervus canadensis*<br>• Suidae: *Sus scrofa domesticus* |

## 4.2. Clinical Signs

Outcomes of a systematic literature review on clinical signs in 48 study groups of cattle and cervid study groups are displayed in Figure 2. Predominantly general signs, no clinical signs or cardiovascular signs were reported.




*Score typical: erosions in mouth, rumen and omasum. Study group count per species: Cattle n = 24; White-tailed deer n = 19; Wapiti elk n= 2; Fallow deer n = 1; Red deer n = 1; Roe deer n = 1. The SLR was updated until 31/12/2025, for references see the online disease profile.

**Figure 2.** Clinical signs reported in the main hosts of EHDV.

Deer: Clinical manifestations range from peracute to chronic disease. In the peracute form death often occurs within 36 hours, sometimes without previous clinical signs (Spickler, 2019). Clinical signs are oedema of the head, neck, tongue, conjunctiva and lungs. In the acute form clinical signs include fever, anorexia, diarrhoea, lethargy, lameness, haemorrhages and oedema in mucous membranes, skin and viscera. Erosions can be found in mouth, rumen and omasum which can lead to excessive, sometimes blood-tinged, salivation. Death is common in the acute form. Those that survive the infection often have erosions, ulcers and scars in the rumen and omasum resulting in emaciation. In the chronic form, apart from damages in the rumen and omasum, growth rings or sloughing of the hoof wall may be seen. White-tailed deer is the most affected species, but similar clinical signs including death has been reported in some other cervids (Spickler, 2019).

Cattle: Most infections in cattle are subclinical (WOAH, 2019a; Spickler, 2019). Clinical signs in cattle include fever, anorexia, lameness, oedema, haemorrhages and ulcers and erosions in the mouth, lips, abomasum and coronets, eye and nasal discharge and salivation. Damaged striated muscles in the pharynx, larynx, oesophagus and tongue can lead to difficulty swallowing. This may lead to

dehydration, emaciation and aspiration pneumonia. Abortions, stillbirths and foetal deformation have also been reported (Spickler, 2019).

Yak: Lameness, oral and nasal discharge has been reported in yaks infected with EHDV (Spickler, 2019).

Sheep: Reported clinical signs include fever, oedema of the head, lesions and hyperaemia in mouth and nose, lethargy, anorexia, lameness, abdominal distension and death. Clinical signs in experimentally infected sheep have been asymptomatic or showed mild clinical signs such as rise in body temperature, buccal hyperaemia or ulceration of buccal mucous membranes. (Spickler, 2019)

#### 4.2.1. Incubation Period

The incubation period in deer is reported to be 5-10 days in deer and 1-6 days in experimentally infected cattle (based on the systematic literature review, references available in the on-line version).

#### 4.2.2. Morbidity and case fatality

In captive white-tailed deer morbidity and case fatality might be up to 90% (WOAH, 2019a; Spickler, 2019). In wild white-tailed deer mortality was estimated to between 6-20% (Spickler, 2019). While the case fatality in experimentally infected white-tailed deer ranged between 25-60% (Quist et al., 1997).

In cattle, mortality rates of around 2-10% has been reported (Spickler, 2019). In experimentally infected cattle, the fatality rates ranged between 25-100% (Spedicato et al., 2024).

#### 4.2.3. Zoonotic Potential

EHDV is not known to infect humans under natural conditions.

## 5. Transmission

EHDV is transmitted by biting midges of the genus *Culicoides* (Diptera; Ceratopogonidae). For more information on vector distribution, visit the Vector section in the online disease profile.

The extrinsic incubation period is 10-14 days. The virus is not spread by direct contact between animals. In temperate climates infection is most common during peak vector population, i.e. late summer and autumn. In tropical regions outbreaks occur year-round. The midges can fly short distances but can be transported longer distances with the wind (WOAH, 2019a; Spickler, 2019).

Vertical transmission of the Ibaraki virus strain has been found in aborted foetuses in cattle. There is also one reported case of vertical transmission in cattle in the US (Spickler, 2019).

## 6. Diagnostic tests

WOAH-recommended tests for agent detection are virus isolation in cell culture, RT-PCR and real-time RT-PCR. For agent detection the recommended samples are whole blood, spleen, lungs, lymph nodes or liver (WOAH, 2025).

Real-time RT-PCR is the preferred method for EHDV detection due to its high sensitivity and specificity, and no amplification is observed with related serotypes of bluetongue virus. There are

commercial real-time RT-PCR kits that detect genome segment 9. There are also serotype-specific real-time RT-PCR available to distinguish the serotypes (WOAH, 2025).

Real-time RT-PCR is a sensitive and specific method that can distinguish EHDV from bluetongue virus. Due to its ability to detect small amounts of virus the results should be interpreted with caution since it does not necessarily indicate the presence of infectious virus and is sensitive to contamination. According to the systematic literature review, the sensitivity and specificity of real-time RT-PCR in cattle are 100% and 95.5%, respectively (Schroeder et al., 2013).

For immune response detection, the recommended tests are competitive ELISA, Virus neutralization test (VNT), Agar gel immunodiffusion (AGID) and complement fixation test (CFT).

Competitive ELISA detects serogroup-specific antibodies without cross-reactivity with other orbiviruses and is currently the preferred method. VNT detects and quantifies serotype-specific antibodies and is the reference method for this purpose, but it is time-consuming and labour-intensive and requires inclusion of all serotypes. AGID is a simple method for antibody detection but cannot distinguish between EHDV and BTV. The complement fixation test is serogroup-specific and can detect antibodies for 4–12 months after infection. (WOAH, 2025).

# 7. Prevention and control

## 7.1. Vaccination

In Japan live attenuated and inactivated vaccines have been developed and used to control the Ibaraki virus strain. In USA autogenous inactivated vaccines have been developed for captive deer (WOAH, 2019).

In the EU, an inactivated recombinant protein vaccine (serotype 8, VP2 protein) has been approved (EMA, 2026).

## 7.2. Treatment

There is currently no specific treatment for infection with EHDV (Spickler, 2019).

# 8. References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