Schmallenberg virus was first identified in November 2011. The information presented in this technical factsheet reflects the epidemiological observations and research done to date (April 2017), together with data extrapolated from genetically similar viruses of the same genus and serogroup.

AETIOLOGY

Classification of the causative agent

The “Schmallenberg virus” (SBV) is an enveloped, negative-sense, segmented, single-stranded RNA virus. It belongs to the Bunyaviridae family, within the Orthobunyavirus genus. The Schmallenberg virus is a member of the Simbu serogroup viruses, which includes Shamonda, Akabane, and Aino viruses. Within the Simbu serogroup, the viruses that are most closely related to SBV are Sathuperi and Douglas virus.

Field and laboratory studies indicate a causal relationship between SBV infection and reported clinical signs.

Resistance to physical and chemical action

Data for SBV or extrapolation from the California serogroup of Orthobunyaviruses:

Temperature: Infectivity lost (or significantly reduced) at 50–60°C for at least 30 minutes.

Chemicals/Disinfectants: Susceptible to common disinfectants (1% sodium hypochlorite, 2% glutaraldehyde, 70% ethanol, formaldehyde).

Survival: Does not survive outside the host or vector for long periods.

EPIDEMIOLOGY

According to the epidemiological investigations, reinforced by what is already known about the genetically related Simbu serogroup viruses, SBV infects ruminants and is not zoonotic. Transmission among animals is by insect vectors. The virus can also be transmitted vertically by in utero infection.

Hosts

- Confirmed by PCR or virus isolation:
  - Cattle, sheep, goats
  - Bison
  - Roe deer
  - Mouflon
  - Dog (a single case of a PCR-positive dog)
- Confirmed by serology only:
  - Red deer
  - Sika deer
  - Fallow deer
  - Alpacas
  - Wild boar
  - Various further wild ruminants and some zoo animals

Transmission

- Epidemiological investigations indicate insect vector transmission.
- Insect vectors include several Culicoides species where SBV RNA has been detected.
- Vertical transmission across the placenta has been proven.
- SBV has been found in bovine semen. However, transmission by natural breeding or artificial insemination has not yet been demonstrated.
- Direct transmission from animal to animal has not been reported, and is very unlikely.
Viraemia and incubation period

Experimental infection in cattle and sheep showed no or only mild clinical signs with an incubation period of between 1 and 5 days and a viraemia also lasting for 1 to 5 days.

Sources of virus in the animal host

Material found to be positive by virus isolation
- Blood from affected adults and brain from infected foetuses. Placental tissues collected at birth.

Material found PCR positive
- Blood and serum of acutely infected animals
- SBV RNA can be detected up to several weeks after infection in different tissues such as lymphatic organs, especially in mesenteric lymph nodes and spleen Organ and blood of infected foetuses, and further samples such as placenta, amniotic fluid, and meconium.

Occurrence

Some Orthobunyaviruses had previously been reported in Europe, but viruses from the Simbu serogroup had never been isolated in Europe prior to 2011.

Schmallenberg virus was first detected in November 2011, in Germany from samples collected in summer/autumn 2011 from diseased dairy cattle exhibiting fever and reduced milk yield. Similar clinical signs (including diarrhoea) were detected in dairy cows in the Netherlands where the presence of SBV was also confirmed in December 2011.

Congenital malformations were reported in 2012 in newborn lambs in the Netherlands, and SBV was detected in, and isolated from, the brain tissue. Further spread of SBV to many other countries in continental Europe, the British Isles, the Mediterranean Basin, and Turkey was reported, indicating that Schmallenberg virus was circulating widely across this region in 2012. In the following years, it was detected in new and previously affected countries.

For information on the initial occurrence of this infection, see the OIE World Animal Health Information Database (WAHID) interface [http://www.oie.int/wahis/public.php?page=home].

DIAGNOSIS

Clinical Diagnosis

Manifestation of clinical signs varies by species and age. Adult cattle typically exhibit only a mild form of acute disease. Congenital malformations are observed in cattle and other ruminant species e.g sheep, goats and bison. Diarrhoea has been observed in some cattle and sheep.

- Adults
  - Usually inapparent, but non-specific signs including the following:
    - Fever (>40°C)
    - Transitory reduced milk yield
    - Diarrhoea
    - Individuals recover within a few days
    - Abortion

- Malformed newborn animals and stillbirths
  - Arthrogryposis/ Hydranencephaly
  - Brachygnathia inferior
  - Ankylosis
  - Torticollis
  - Scoliosis

The incidence of malformation varies depending on the stage of gestation at the time of infection and the species. In some pregnancy-synchronised sheep flocks, high incidence has been reported. For cattle, the incidence is very low.
**Pathological Lesions**
In malformed newborn:
- Hydranencephaly
- Hypoplasia of the central nervous system
- Porencephaly
- Subcutaneous oedema (calves)
- Arthrogryposis

The pathology can be summarised as arthrogryposis-hydranencephaly syndrome.

**Differential diagnosis**
For the acute infection of adults:
The clinical signs are not specific. All possible causes of high fever, diarrhoea, milk reduction and abortion should be taken into account.

For the malformation of calves, lambs and kids:
- Other Orthobunyaviruses
- Bluetongue or Epizootic Haemorrhagic Disease Virus
- Pestiviruses
- Genetic factors
- Toxic substances

**Laboratory diagnosis**

**Samples**
Samples should be transported cooled

From live animals for the detection of acute infection:
- EDTA blood
- Serum
  - At least 2 ml, transported cooled

From stillborn or malformed newborn calves, lambs and kids:
- **Virus detection:**
  - Tissue samples of brain (cerebrum and brainstem)
  - Amniotic fluid
  - From live newborn:
    - Amniotic fluid and placenta
    - Meconium
- **Antibody detection:**
  - Pericardial fluid
  - Blood (pre-colostral)
- **Histopathology:**
  - Fixed central nervous system, including spinal cord

**Procedures**

*Identification of the agent*
- Real-time RT-PCR (Bilk et al., 2012, Fischer et al. 2013); commercial PCR kits are available
- Cell culture isolation of the virus: insect cells (KC), hamster cells (BHK), monkey kidney cells (VERO)

*Serological tests on serum samples*
- ELISA: commercial kits available
- Indirect Immunofluorescence
- Neutralisation test

For further information, reference material and advice, refer to Dr. Martin Beer (Martin.Beer@fli.bund.de), Institute of Diagnostic Virology, Friedrich-Loeffler-Institut, Federal Research Institute for Animal Health, Greifswald-Insel Riems, Germany.
Interpretation of the tests:
Serological results (ELISA) for index cases should be confirmed by neutralisation tests.
PCR-positive results for index cases should be confirmed by sequencing.

PREVENTION AND CONTROL

There is currently no specific treatment for Schmallenberg virus.

Inactivated vaccines are commercially available in some countries.

Sanitary prophylaxis
Control of potential Culicoides vectors during the vector-active season may decrease the transmission of virus.
Reschedule of sheep breeding outside the vector season may decrease the number of foetal malformations.

REFERENCES AND OTHER INFORMATION


ProMed Mail from Published Date: 2013-01-23 19:25:46; Subject: PRO/AH/EDR> Schmallenberg virus - Europe (07): (Germany) virus RNA box semen ; Archive Number: 20130123.1511878


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