OIE Technical Fact Sheet
Schmallenberg Virus

Dr Elisabeth Erlacher-Vindel

Deputy Head of the Scientific and Technical Department

Introduction to the OIE

World Organisation for Animal Health

An intergovernmental organisation preceding the United Nations

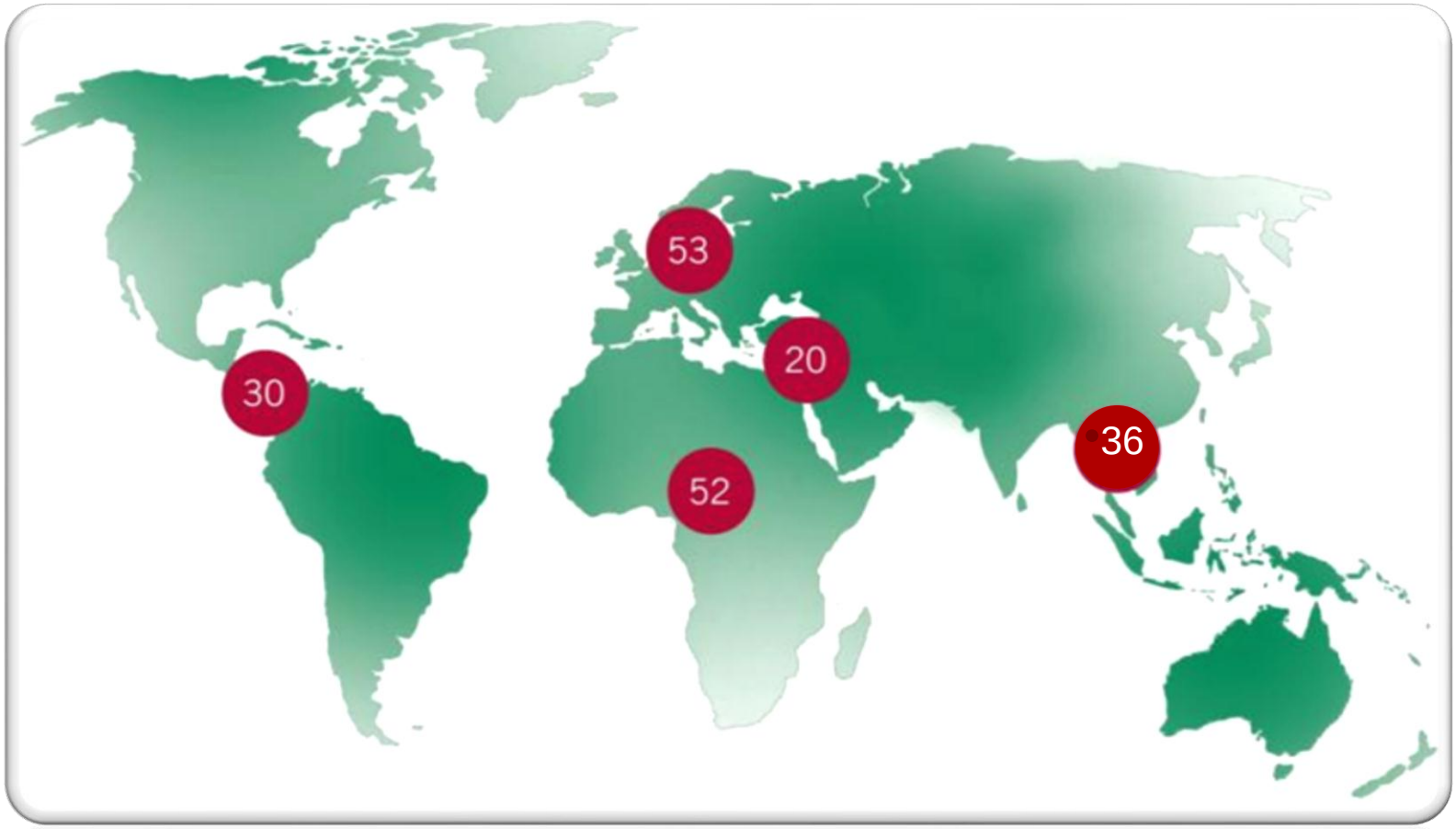
1924 — Creation of the Office International des Epizooties (OIE) — to prevent the spread of animal diseases throughout the world

1945 — Creation of the United Nations

2003 — World Organisation for Animal Health

2010 — the improvement of animal health, veterinary public health and animal welfare world-wide

178 Members (2011)



Africa 52 – Americas 30 – Asia, the Far East and Oceania 36 – Europe 53 – Middle-East 20

Some countries belong to more than one region

Structure

Headquarters in Paris (France)

5

Regional Representations

Sub-Regional Representations

6

Improve animal health and welfare worldwide

Transparency of world animal disease situation (including zoonoses)

Collect and publish veterinary scientific information, notably animal disease prevention and control methods

Sanitary safety of international trade in animals and their products under the mandate given by the WTO

5th Strategic Plan 2011-2011: consolidation of 4th plan

OIE'S Strategic objectives 2011–2015

Communicate timely and accurate animal disease information, including information on zoonoses, by making the best use of scientific data modelling, modern information technologies, and tracking systems for non-official information.

Provide scientifically based recommendations on measures for the prevention, control and eradication of animal diseases including zoonoses, taking into account the economic, social and environmental impacts of such measures.

Ensure the scientific excellence and timeliness of information and advice available to national Veterinary Services and other interested parties in all areas covered by the Organisation's mandate.

OIE Scientific excellence

- **Founded on:**
  - Objective criteria
  - Scientifically valid evaluations provided by independent experts
- **It is necessary to continuously update OIE's expertise and advice to respond effectively to the requirements of its Members and a changing environment**


OIE TECHNICAL FACTSHEET

SCHMALLENBERG VIRUS

Aetiology | Epidemiology | Diagnosis | Prevention and Control | References

Schmallenberg virus –was discovered recently (November 2011) and epidemiological, immunological and microbiological investigations are still ongoing in several European countries. The information presented in this technical disease card describes the epidemiological observations and research done during the first months following its discovery, and data extrapolated from genetically similar viruses of the same genus and serogroup.

AETIOLOGY

Classification of the causative agent

The provisionally named 'Schmallenberg virus' is an enveloped, negative-sense, segmented, single-stranded RNA virus. It belongs to the Bunyavirales family, within the Orthobunyavirus genus. The Schmallenberg virus is related to the Simbu serogroup viruses, in particular Shamonda, Akabane, and Akhi virus. So far, sequence data suggests the closest relationship to Shamonda virus. This classification has to be confirmed with further sequence data and investigations e.g. about the serological relationship to other Simbu sero-group viruses.

Even though the exact role of Schmallenberg virus needs to be further investigated, first inoculation experiments as well as the diagnostic data from malformed lambs and calves strongly suggest a cause relationship between the presence of the virus and the reported clinical signs.

Resistance to physical and chemical action

From 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 %

OIE Technical Fact Sheet on Schmallenberg Virus:

— • Context

Context

- End of 2011: first scientific information available
- Beginning of January 2012
  - First immediate notification to the OIE of an emerging disease by the Netherlands
  - Followed by Belgium, Germany, United Kingdom, and France
- February and March 2012
  - notifications by Italy, Luxembourg and Spain

Context

Member Countries asked OIE for information on Schmallenberg Virus from January 2012 on

- The OIE has published and updated Technical Disease Cards for 33 important animal diseases, including 32 OIE-listed diseases in October 2009
  - available online on the OIE Website (http://www.oie.int/en/our-scientific-expertise/specific-information-and-recommendations/technical-disease-cards/)
- Decision was taken to use a similar template and to prepare a “Technical Factsheet” on Schmallenberg Virus.

Context

- First draft reviewed electronically by experts
- Physical meeting appeared to be a better choice
- First meeting of the *ad hoc* Group (following OIE procedures to organise expert meetings): 9 February 2012
- Report and Factsheet were discussed in detail and endorsed with minor amendments by the OIE Scientific Commission (SCAD) at their February meeting

OIE Technical Fact Sheet

SCHMALLENBERG VIRUS

Schmallenberg virus was discovered recently (November 2011) and epidemiological, immunological and microbiological investigations are still on-going in several European countries. The information presented in this technical disease card describes the epidemiological observations and research done during the first months following its discovery, and data extrapolated from genetically similar viruses of the same genus and serogroup.

Aetiology

Classification of the causative agent

- The provisionally named “Schmallenberg virus” is an enveloped, negative-sense, segmented, single-stranded RNA virus. It belongs to the Bunyaviridae family, within the Orthobunyavirus genus. The Schmallenberg virus is related to the Simbu serogroup viruses, in particular Shamonda, Akabane, and Aino virus. So far, sequence data suggests the closest relationship to Shamonda virus. This classification has to be confirmed with further sequence data and investigations e.g. about the serological relationship to other Simbu sero-group viruses.
- Even though the exact role of Schmallenberg virus needs to be further investigated, first inoculation experiments as well as the diagnostic data from malformed lambs and calves strongly suggest a causal relationship between the presence of the virus and the reported clinical signs.

Resistance to physical and chemical action

- From 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, Schmallenberg virus affects domestic ruminants. It is unlikely to be zoonotic. The spatial and temporal distribution suggests that the disease is first transmitted by insect vectors and then vertically in utero.

Epidemiology

Hosts

- Cattle, sheep, goats
- Bison
- No information on the susceptibly of exotic ruminants (camelids, llamas, etc.), or other wild ruminants, or on other species. It is worth noting that other viruses of the Simbu serogroup affect wild ruminants and that antibodies to Akabane virus have been found in horses, donkeys, buffalo, deer, camels and even in pigs. Some viruses of the Simbu serogroup (Mermet, Peaton and Oropouche viruses) have also been detected in birds. Mice and hamsters can be infected experimentally.

Epidemiology

Hosts

- Humans: No human disease related to Schmallenberg virus have been reported in the affected zone so far, and the genetically most related Orthobunyaviruses do not cause disease in humans. Thus current risk assessments conclude that the virus is unlikely to cause disease in humans even if it cannot be fully excluded at this stage. Nevertheless, close collaboration between public health and animal health services is recommended for the early detection of potential human cases, particularly in farmers and veterinarians in close contact with potentially infected animals, and especially during interventions for dystocia.

Epidemiology

Transmission

- The transmission of Schmallenberg virus needs to be confirmed but hypotheses have been developed through recent epidemiological investigations and comparison with other Orthobunyaviruses:
- It is likely to be transmitted via insects vectors (biting midges and/or mosquitoes)
- Vertical transmission across placenta is proven
- Direct contamination from animal to animal or animal to human is very unlikely but needs further investigation (first experiments have been started)
- Further research is still needed to confirm these transmission routes and to determine the competent insect species.

Viraemia and incubation period

- Experimental infection in 3 calves showed mild clinical signs of acute infection at 3 to 5 days post-inoculation and viraemia at 2 to 5 days post-inoculation. No data are available for sheep and goats up to February 2012.

Epidemiology

Sources of virus

- Source of transmission:
- Likely to be infected insect vectors
- Material found to be positive in virus isolation (up to February 2012):
- Virus has been isolated from blood from affected adults and infected foetus and brain from infected foetus.
- Material found PCR positive (up to February 2012):
- Organs and blood of infected foetuses, placenta, amniotic fluid, meconium
- All these findings have to be further investigated for their role in transmission.

Occurrence

- Only some Orthobunyaviruses had been reported in Europe: e.g. Tahyna virus from the California serogroup, but viruses from the Simbu serogroup had never been isolated in Europe before.
- First phase: Schmallenberg virus was first detected in November 2011 (diseased dairy cattle)…
- Second phase: In early December 2011 (congenital malformations were reported in newborn lambs) …
- Up to February 2012: 6 countries reported stillbirth and congenital malformations with PCR positive results.

For more recent, detailed information on the occurrence of this disease worldwide, 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: bovine adults have shown a mild form of acute disease during the vector season, congenital malformations have affected more species of ruminants (to date: cattle, sheep, goat and bison). Some dairy sheep and cow farms have also reported diarrhoea.

- Adults (cattle)
  - Probably often inapparent, but some acute disease during the vector-active season
  - Fever (>40°C)
  - Impaired general condition
  - Anorexia
  - Reduced milk yield (by up to 50%)
  - Diarrhoea
  - Recovery within a few days for the individuals, 2–3 weeks at the herd scale

Diagnosis

Clinical diagnosis

- Malformed animals and stillbirths (calves, lambs, kids)
  - Arthrogryposis
  - Hydrocephaly
  - Brachygnathia inferior
  - Ankylosis
  - Torticollis
  - Scoliosis
- The exact rate of malformation is not known up to February 2012. Some sheep farms have reported in a period related to acute infection in Summer and Autumn 2011 more than 25% malformed lambs.

Diagnosis

Lesions

- In malformed newborn
  - Hydranencephaly
  - Hypoplasia of the central nervous system
  - Porencephaly
  - Subcutaneous oedema (calves)
- The symptoms can be summarised as arthrogryposis and hydranencephaly syndrome (AHS)

Diagnosis

Differential diagnosis

- For the acute infection of the adults:
  - Bluetongue virus
  - Epizootic haemorrhagic disease (EHD) virus
  - Foot and mouth disease (FMD) virus
  - Bovine viral diarrhoea (BVD) virus, border disease and other pestiviruses
  - Bovine herpesvirus 1 and other herpesviruses
  - Rift Valley fever virus
  - Bovine ephemeral fever virus
  - Toxic substances
- The symptoms are not specific. Other sources of diarrhoea and milk reduction could be taken into account.

Diagnosis

Differential diagnosis

- For the malformation of calves, lambs and kids:
  - Toxic substances
  - Genetic factors
  - Bluetongue virus
  - Pestiviruses
  - Other viruses of the Simbu serogroup (Akabane)

Diagnosis

Laboratory diagnosis:

Samples

- From live animals for the detection of acute infection:
  - EDTA blood
  - Serum
    - At least 2 ml, transported cooled
- From stillborns and malformed calves, lambs and kids:
  - From necropsy: Tissue samples of brain (cerebrum and cerebellum), additional samples: central nervous system, spleen and blood
  - From live newborn: blood, (preferably pre-colostral) serum and meconium
    - Samples should be transported cooled or frozen
  - Placenta and amniotic fluids

Diagnosis

Laboratory diagnosis:

Procedures

- Identification of the agent
  - Real-time RT-PCR
  - Cell culture isolation of the virus
- Serological tests on serum samples
  - Indirect Immunofluorescence
  - Neutralization test
  - ELISA to be developed

Prevention and control

There is currently no specific treatment or vaccine for Schmallenberg virus

Sanitary prophylaxis

- Control of potential vectors during the vector-active season may decrease the transmission.
- Delay of breeding may decrease the number of foetal malformations.

Final statement

The OIE will update this Technical Factsheet when relevant

OIE Technical Factsheet Schmallenberg Virus: • Follow up

The Technical Fact sheet is available at the OIE Website in:

- English

  http://www.oie.int/fileadmin/Home/eng/Our_scientific_expertise/docs/pdf/A_Schmallenberg_virus.pdf

- French

  http://www.oie.int/fileadmin/Home/fr/Our_scientific_expertise/docs/pdf/F_Schmallenberg_virus.pdf

- Spanish

  http://www.oie.int/fileadmin/Home/fr/Our_scientific_expertise/docs/pdf/F_Schmallenberg_virus.pdf

OIE Technical Factsheet Schmallenberg Virus: • Follow up

- The first updated of the Factsheet is planned for mid-May 2012.
- The Factsheet will be further updated when relevant.
- With time, the “Factsheet” might become another Technical Disease Card.

Thank you for your attention

Organisation mondiale
de la santé animale

World Organisation
for Animal Health

Organización Mundial
de Sanidad Animal

12 rue de Prony, 75017 Paris, France - www.oie.int – oie@oie.int