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2. SCHMALLENBERG VIRUS: NEW EMERGENT PATHOGEN OF CATTLE, SHEEP AND GOATS*

Petrovic T., Djuricic B.

Abstract

Schmallenberg virus was first detected in November 2011 in Germany from samples collected in summer/autumn 2011 from diseased (fever, reduced milk yield) dairy cattle from the farm near the city of Schmallenberg (North Rhine-Westphalia, Germany). The virus was detected in pooled blood samples using metagenomics analysis. Similar clinical signs (including diarrhea) were detected in dairy cows in the Netherlands where the presence of Schmallenberg virus was also confirmed in December 2011. In early December 2011, congenital malformations were reported in newborn lambs in the Netherlands, and Schmallenberg virus was detected in and isolated from the brain tissue. Up to March 2012, Belgium, Germany, United Kingdom, France, Luxembourg, Italy and Spain have reported stillbirth and congenital malformations with PT-PCR positive results. According to the data processed until now, the new virus has no zoonotic potential and the risk for public health can be regarded as extremely low. The diagnostic methods like TaqMan real-time RT-PCR and virus isolation for virus detection, and VN test and indirect immunofluorescence test for antibody detection are already developed. The other diagnostic tests are in the process of development. The disease is not notifiable according to OIE and EU experts and regulations, but currently there are no specific control measures on place to control this virus infection. Still there are many unanswered question that has to be resolved in the future.

Key words: Schmallenberg virus, cattle, sheep, goats

History

In summer and autumn 2011, farmers and veterinarians in North Rhine-Westphalia, Germany, and in the Netherlands reported to the animal health services, local diagnostic laboratories, and national research institutes an unidentified disease in dairy cattle with a short period of clear clinical signs, including fever (>40°C), impaired general condition, anorexia and reduced milk yield by up to 50%, and diarrhea. The symptoms disappeared after a few days (ProMED-Mail, 2011; FLI, 2011; Hoffmann et al., 2012; ECDC, 2011).

Laboratory investigations performed at the Institute of Diagnostic Virology Friedrich-Loeffler-Institut (FLI), the German Federal Research Institute for Animal Health at Greifswald-Insel Riems, by analysis excluded all the other relevant infections like blue tongue virus, foot and mouth disease virus, enzootic hemorrhagic disease virus, bovine viral diarrhoea virus and other pestiviruses, bovine herpes virus-1 and

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other herpes viruses, Rift Valley fever and bovine ephemeral fever (Hoffmann et al., 2012).

On 18 November 2011, the FLI reported identification of a new virus in pulled blood samples from 3 infected cattle through next generation sequencing with 454 Genome Sequencer FLX, and metagenome data analysis. The new virus was classified as orthobunyavirus, similar to Akabane, Aino and Shamonda virus, and based on the geographic origin of the samples, the virus was provisionally named “Schmallenberg virus” (ProMED-Mail, 2011; FLI, 2011; Hoffmann et al., 2012). During November and December 2012, molecular test, namely TaqMan real time RT-PCR test was developed by researchers at FLI, and the procedures were distributed to the interested laboratories. Similar clinical signs (including diarrhoea) were detected in dairy cows in the Netherlands where the presence of Schmallenberg virus (SBV) was also confirmed in December 2011. In early December 2011, congenital malformations were reported in newborn lambs in the Netherlands, and Schmallenberg virus was detected in and isolated from the brain tissue. Up to February 2012. Belgium, Germany, United Kingdom, France, Luxembourg and Italy have reported stillbirth and congenital malformations with PCR positive results (OIE, 2012). On March 13th, the presence of Schmallenberg virus was also confirmed in one sheep flock in Spain (Sanidad Animal, 2012a).

By the end of 2011, based on the research done on virus genome analysis and human exposure data from the field, risk assessment for potential influence on human health were made. It is concluded that Schmallenberg virus most probably have no zoonotic potential and that it is not a threat for public health (RIVM, 2011; ECDC, 2011).

From the beginning of 2012, more research is done on diagnostic procedures. Virus is isolated on BHK cell line in FLI, Germany (Hoffmann et al., 2012), and serologic test for antibody detection, like virus neutralization and indirect immunofluorescence, were developed at FLI, Germany (FLI, 2012) and CVI, The Netherlands (ProMED, 2012a). So today, just a few months after the first detected occurrence, the virus genome has completely sequenced, virus classified, epidemiology connected to the well known similar viruses, and the diagnostic test mostly developed. Still there are many questions that have to be answered.

**Etiology**

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 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 is still not the final one and has to be confirmed with further sequence data and with investigations of the serological relationship to other Simbu sero-group viruses (ProMED-Mail, 2011; FLI, 2011; ScienceNOW, 2012; OIE, 2012).

The virus was for the first time detected by metagenomic analysis, for the first time isolated, on BHK-21 cells, and visualized by electron microscopy by researchers from FLI Germany (FLI, 2011; Hoffmann et al., 2012; FLI, 2012a)
Members of this genus within the family Bunyaviridae are widely distributed in Asia, Africa, and Oceania. Transmission occurs predominantly through biting midges, mainly Culicoides spp. and mosquitoes. Especially the Simbu serogroup, which includes Akabane, Aino, and Shamonda viruses, can play a role as pathogens of ruminants. However, viruses of this serogroup have not previously been detected in Europe (Saeed et al., 2001; VLA, 2012).

Schematic diagram of the Schmallenberg virus

Sheme - Friedrich-Loeffler-Institut.

Electron microscopy image of the Schmallenberg virus. The image shows a membrane-enveloped virus particle diameter of 100 nanometers (150,000-fold enlargement). © Friedrich-Loeffler-Institut. First virus visualization 8th of March 2012.

Epizootiology

According to the epidemiological investigations, reinforced by what is already known about the genetically related Simbu serogroup viruses, Schmallenberg virus (SVB) affects domestic ruminants, cattle, sheep and goats and bison. It is unlikely to be zoonotic. There are no information on the susceptibility of exotic ruminants (camelids, llamas, etc.), or other wild ruminants, or on other species (FLI, 2012). 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 (OIE, 2012).

Schmallenberg virus, like other Orthobunyaviruses is transmitted via insect vectors (biting midges – Culicoides spp.). At the beginning of 2012, SBV has now been identified in the Culicoides obsoletus and Culicoides dewulfi midge (ProMed Mail, 2012). According to the Institute of Animal Health Culicoides.net, both C. obsoletus and C. dewulfi are found throughout North Europe, including the UK, and often together. In the case of C. dewulfi, its importance as a vector is not certain, while C. obsoletus is the primary vector for bluetongue 8 in Northern Europe (IAH, 2012). As
addition, in March 2012 Belgian scientists have demonstrated that SBV is transmitted by the midges Culicoides obsoletus, dewulfi and pulicaris (Institute of Tropical Medicine Antwerp news release, 2012).

Midges are really small compared to a common mosquito. © ITG

Besides vector transmission, vertical transmission of virus across placenta is proven. Direct contamination from animal to animal or animal to human is very unlikely but needs further investigation. Further research is still needed to confirm these transmission routes and to determine all the competent insect species (OIE, 2012). It could be concluded that if biting insect vectors are the major route of transmission, significant spread is unlikely during the winter period when biting insects are usually inactive (VLA, 2012).

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. Just in case, DEFRA advised farmers and veterinary surgeons to take sensible hygiene precautions when working with livestock and abortion material. Although several members of the group of related viruses can affect humans, the ability to do is thought to be due to a gene sequence which is not present in Schmallenberg virus. Pregnant women were advised that should not have contact with sheep and goats at lambing/kidding time due to risks of exposure to other disease causing organisms (HPA, 2012).

The first risk assessments done by RIVM (2011) conclude that the virus is unlikely to cause disease in humans even if it cannot be fully excluded at that early stage. Besides that, until now, all the current knowledge based on the data from the field, the ECDC risk assessment for public health from December 2011 that are based on genetic relationships of the virus, as the previous one that was done by RIVM, still holds. The risk for public health can be regarded as extremely low. EFSA and ECDC are closely monitoring the situation in order to address public health concerns should these arise (ECDC, 2011; AHVLA briefing report, 2012; EFSA, 2012).

There are still so many unanswered questions. A host of questions remains unanswered. Can animals infect each other directly? And of course, where did the virus come from? The problem with orthobunyaviruses is that their segmented genome makes the emergence of new combinations very easy, just like with influenza viruses (ScienceNOW, 2012).
Clinical signs and pathomorphological lesions

Manifestation of clinical signs varies by species: bovine adults have shown a mild form of acute disease with fever and sometimes diarrhoea during the vector season, and in the later period congenital malformations have been found in more species of ruminants (to date: cattle, sheep, goat and bison). *Acute infection in adults (cattle)* is manifested often as inapparent, or as acute disease with fever (>40°C), impaired general condition, anorexia, reduced milk yield (by up to 50%), in rare cases, severe diarrhoea, for approximately one week. Recovery is within a few days for the individuals, and 2–3 weeks at the herd scale. Sometimes herds experienced outbreaks of high morbidity (20–70%) lasting 2–3 weeks, with individual affected animals recovering over several days (AHVLA Briefing note, 2012; VLA, 2012).

Experimental infection in 3 calves showed mild clinical signs of acute infection at 3 to 5 days post-inoculation, viraemia at 2 to 5 days post-inoculation, and diarrhea in one animal (Hoffmann et al., 2012). No data about these acute clinical symptoms have been reported in adult small ruminants (sheep and goats) up to March 2012. It is speculated that one of the reason for this could be due to less intense supervision as in dairy cattle.

Fetal infection plays a specific role. Schnallenberg virus has teratogenic properties, so in pregnant animals virus cause fetal malformations (affecting mainly sheep but also cattle and goats). So, the major clinical sign of SBV is congenital malformations in newborn animals similar to those observed in infections by Akabane virus. If infection occurs during a vulnerable stage of pregnancy (probably between days 28 and 36 or 56 and in cattle between days 75 and 110 or 150), the virus may infect the fetus and cause severe damages. In addition to abortions and mummified fetuses, malformed animals and stillbirths or birth of week newborn could be found in calves, lambs and kids. The fetal malformations include: arthrogryposis, hydrocephaly, brachygnathia inferior, ankylosis, torticollis and scoliosis (FLI, 2012; OIE, 2012). 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 (OIE, 2012). Lesions found in malformed newborn include hydranencephaly, hypoplasia of the central nervous system, porencephaly and subcutaneous oedema (calves). The symptoms can be summarized as arthrogryposis and hydranencephaly syndrome (AHS) (FLI, 2012; OIE 2012). Also, malformations observed include bent limbs and fixed joints, brain deformities and marked damage to the spinal cord. Some animals are born with a normal outer appearance but have nervous signs such as a ‘dummy’ presentation or blindness, ataxia, recumbency, an inability to suck and sometimes fit. The foetal deformities vary depending on when infection occurred during pregnancy (VLA, 2012).
Current epizootiology situation and predictions

Besides the data of the first introduction in Germany and The Netherlands, which are described in the History part of this paper, most recent epizootiology situation is as following. On January 23, AHVLA reported the presence of Schmallenberg virus (SBV) on four sheep farms in Norfolk, Suffolk and East Sussex in the UK. In these initial cases, the disease was diagnosed following the testing of deformed lambs. Until February 7th the disease has been identified in 33 submissions from 29 farms, including the first positive case in a bovine in West Sussex on February 5th and a first positive submission from premises in Hertfordshire (AHVLA report, 2012). Until March 2012, SBV has also been identified in deformed lambs and calves in the South West, South East and East of England as well as seven outbreaks reported in sheep, cattle and goats in Luxembourg (Roberts H., 2012). Regarding to the update report from March 16th Schmallenberg virus (SBV) infection has been identified on 176 farms in UK. Twelve of the positive cases have been diagnosed in cattle, 164 in sheep, and none to date in other species such as goats, camelids or deer. Two new counties are included in the list - Greater London and Warwickshire (AHVLA report, 2012).

European Commission and Member States experts discussed the latest developments on the Schmallenberg virus (SBV) situation in the EU at the meeting of the Standing Committee of the Food Chain and Animal Health held on 8 and 9 March in Brussels. The conclusion was that SBV has been detected in seven Member States: 205 cases in Belgium, 879 in Germany, 486 in France 1 in Italy, 7 in Luxembourg, 143 in the Netherlands and 121 in the UK (EU Commission, 2012).

A few days after that announcement, the Spanish Ministry of Agriculture, Food and Environment (MAGRAMA) made official on March 13th, 2012 the declaration of the first case of Schmallenberg virus infection in Spain. This first outbreak occurred in Cordoba (Andalusia), in the location of Hinojosa del Duque. A birth abortion case was detected on a mixed farm of sheep and goats (644 sheep and 12 goats) with clinical
symptoms of the disease (Sanidad Animal, 2012). The last information from Germany, on March 16th, is that animals from 980 holdings have been tested positive for SBV. The cases occurred in 143 cattle holdings, 796 sheep holdings and 41 goat holdings (FLI, 2012b). The recent data of SBV detection is presented in Figures 3. and 4. and in Table 1.

**Fig. 3:** Occurrence of SBV. The Telegraph: 3:49PM GMT 27 Feb 2012

**Fig. 4:** Outbreaks of SBV in cattle, sheep and goats, affected regions in the EU and UK. Roberts H., March 2012
Table 1: Positive or negative SBV cases across the EU (Surveillance until March 2012). Roberts H., March 2012

<table>
<thead>
<tr>
<th>Country</th>
<th>Species</th>
<th>Establishments (according to the OIE for 2010)</th>
<th>Positive farms</th>
<th>Negative farms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Netherlands</td>
<td>Cattle</td>
<td>33,268</td>
<td>38</td>
<td>396</td>
</tr>
<tr>
<td></td>
<td>Sheep</td>
<td>12,833</td>
<td>101</td>
<td>104</td>
</tr>
<tr>
<td></td>
<td>Goat</td>
<td>3,916</td>
<td>5</td>
<td>21</td>
</tr>
<tr>
<td>Belgium</td>
<td>Cattle</td>
<td>24,969</td>
<td>55</td>
<td>340</td>
</tr>
<tr>
<td></td>
<td>Sheep</td>
<td>-</td>
<td>150</td>
<td>62</td>
</tr>
<tr>
<td></td>
<td>Goat</td>
<td>-</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>Germany</td>
<td>Cattle</td>
<td>174,960</td>
<td>98</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sheep</td>
<td>29,325</td>
<td>770</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Goat</td>
<td>10,900</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>France</td>
<td>Cattle</td>
<td>219,962</td>
<td>26</td>
<td></td>
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<tr>
<td></td>
<td>Sheep</td>
<td>66,064</td>
<td>634</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Goat</td>
<td>19,993</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Sheep/Goats</td>
<td>-</td>
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<td></td>
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<tr>
<td>Italy</td>
<td>Cattle</td>
<td>151,501</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Sheep</td>
<td>96,686</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Goats</td>
<td>51,160</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Luxembourg</td>
<td>Cattle</td>
<td>196,470</td>
<td>1</td>
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<td></td>
<td>Sheep</td>
<td>8,842</td>
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<td></td>
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<tr>
<td></td>
<td>Sheep/Goats</td>
<td>-</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>UK (England only)</td>
<td>Cattle</td>
<td>49,782</td>
<td>9</td>
<td></td>
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<tr>
<td></td>
<td>Sheep</td>
<td>41,164</td>
<td>136</td>
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</tr>
<tr>
<td></td>
<td>Goat</td>
<td>6,093</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

Besides virus detection data, serological examination for antibodies against SBV can indicate with certainty if animals have undergone infection, despite the fact that the virus cannot be demonstrated by the PCR technique. The Central Veterinary Institute (CVI) has developed a virus neutralization test for the demonstration of antibodies against SBV (ProMED Mail, 2012a). Until recently, only a PCR technique enabled the detection of virus particles in brain material of deformed newborn calves, lambs, and goats. In contrast to lambs, many deformed calves were found negative by the PCR test. The CVI prevalence study incorporated 1123 frozen-stored blood samples from dairy cows, which were sampled between 1 Nov 2011 and 1 Feb 2012 in the context of bluetongue monitoring. The samples are proportional to the presence of dairy cows in the selected provinces, from which a representative sample was obtained. The sample size was chosen so that an accurate estimate could be made on a national level, and also with sufficient accuracy to detect differences in prevalence between the 3 regions (north, east, and south). From the obtained results it is estimated that the prevalence of antibodies against SBV in the dairy cattle population in the Netherlands is about 70 per cent, indicating widespread exposure to the virus. The prevalence of SBV antibodies in dairy cattle in eastern Netherlands is found to be considerably higher than findings in the north and south. Within infected units, SBV serology in 2 infected sheep flocks and 2 dairy cattle farms was found to be in the range between 70 and 100 per cent. It becomes clear that the number of clinically affected cattle farms and of affected animals within them, based on the PCR diagnostics in malformed calves, was grossly underestimated, and most probably not only in Netherlands but also in other SBV-affected countries (ProMED Mail, 2012a).
Prof. Vim van der Poel assumed that since the virus is transmitted by insects, and especially midges which are not active in winter, there probably is no virus circulation at the moment. All malformed calves and lambs born recently were infected during gestation, most likely in late autumn 2011. In sheep on mainland Europe the number of malformed newborns is already decreasing. In cattle, due to the longer gestation period, this number is still rising. If the virus survives over the winter, midges will start biting again in spring and there may be a further spread over Europe. In this moment, while affected countries within Europe are working on disease surveillance, other countries fear introduction of the virus and are trying to put diagnostic tools in place as soon as they can (University of Liverpool news, 2012).

Without knowing the susceptibility to SBV in animal populations throughout the EU, and assuming that SBV induces a strong immunity similar to Akabane virus, according to EFSA, three types of epidemiological situations can be envisaged: 1) areas where a recent virus introduction might have occurred in populations not previously exposed to the pathogen, that is naive populations, causing clinical disease in adult animals and, at a later date as consequence of infection of dams, malformation in foetuses; 2) areas where virus introduction occurred in the past and part of the ruminant population is immune and where congenital malformations are not observed or observed at a low level (mainly not reported); and 3) areas where no virus incursion occurred but a susceptible population is present (EFSA, 2012). The hypothetical scenarios show that, depending on the temperature and the number of vectors, SBV might spread further in susceptible populations. Whenever the number of vectors per host and the temperature are above a specific threshold there is a possibility of a wider disease epidemic affecting more countries (EFSA, 2012).

Akabane virus infection is endemic in many tropical and subtropical areas. In these, susceptible ruminant species become infected at an early age when fed on by ubiquitous midge and mosquito vectors and develop a long-lasting protective immunity by the time of breeding; thus, congenital abnormalities are seldom seen in endemic areas even though cases can occur when naive, susceptible animals are introduced into such areas. Under favourable environmental conditions, the vectors (and hence the virus) may spread beyond their usual range, and outbreaks of congenital disease then occur in areas where the disease process has rarely, or never been experienced before. Essentially it is at the interface between free and endemic areas that severe outbreaks are to be expected. In that areas the acute infection following postnatal exposure, accompanied by unremarkable clinical signs, is usually not recognised to have occurred until malformed lambs and calves are born. Repeated outbreaks in Turkey and Israel over the last 40 years indicate clearly that, at least from 1970 until 2010 or 2011, the eastern Mediterranean was situated at the interface between endemic and free areas (Roeder, 2012).

Now that a Simbu Group virus, like bluetongue viruses in 2006 to 2010, expanded to the north Europe, and without understanding the determinants that favoured this change, it is impossible to predict what will happen next. There are many possible scenarios. The virus could just pass away and the earlier status be re-established; maybe we will see a permanent shift in the interface between endemic and free zones; or, alternatively, will the epidemic wave move on as vector range extends or previously free populations of vectors become infected for the 1st time? The real
problem and question is regarding several other viruses that are in a similar situation to that of SBV and pose an immediate threat to the livestock of northern Europe. Not least of these are the orbiviruses causing epizootic haemorrhagic disease [EHHD] of ruminants, African horse sickness [AHS], and equine encephalosis [EE] (Roeder, 2012).

Laboratory diagnosis

Samples for laboratory detection of acute infection include EDTA blood for virus detection, or blood serum for serology testing, from live animals and tissue samples of brain (cerebrum and cerebellum), spleen and blood from dead animals, stillborns and malformed fetuses. Placenta and amniotic fluids as well as meconium could be sent for virus testing (FLI, 2012; OIE, 2012).

In this moment, identification of the virus is done mostly by molecular tests like Real-time RT-PCR, but virus isolation on cell culture is also possible. Until now, Culicoides variipennis larvae cells (KC cells) and BHK was confirmed as susceptible cell line for virus isolation (Hoffmann et al., 2012). Currently most widely used method for detection and confirmation of the virus is real time RT-PCR protocol described by virologists from FLI Institute in Insel Riems, Germany.

Presence of the specific antibody against Schmallenberg virus in blood sera could be done by virus neutralization test, indirect immunofluorescence and by ELISA test (FLI, 2012; OIE, 2012). The ELISA tests are still not commercially available and just some labs in a few European countries like CVI in the Netherlands and FLI in Germany working on the development of ELISA test.

Prevention and Control

As it is vector borne disease the Schmallenberg disease is very hard to control by many usually used restriction measures inside or between the countries. The vaccination could be one of the possible successful measures, but there is currently no specific treatment or vaccine for Schmallenberg virus. At best the development of a new vaccine with all the controls will take at least 18 - 24 months. Some researchers indicate that available vaccine for Akabane virus could be helpful until the specific vaccine would be available. As one of the characteristics for all orthobunyavirus infections is that long lasting antibodies is produced after the infection. It is also the situation after the vaccination with e.g. Akabane virus vaccine. Those long lasting antibodies possibly could prevent the infection of the fetus in the next season. Some other control measures could include the control of potential vectors during the vector-active season that may decrease the transmission and delay of breeding may decrease the number of foetal malformations (OIE, 2012).

The European Commission and the EU Member States emphasize that the SBV does not deserve a treatment different to the one applied to Akabane virus including for trade, a virus that is not an OIE listed disease nor notifiable in the EU nor subject to specific OIE standards or restrictions despite it being endemic in many areas of the world. Until now, the disease caused by Schmallenberg virus is not "notifiable", meaning farmers have no legal duty to report it, and there are no control measures imposed on infected farns or restrictions on buying and selling animals (EU Commission, 2012). So far, the Netherlands is the only country in which the disease has
References:


SCHMALLENBERG ВИРУС: НОВО ОТКРИВЕНИ ПАТОГЕН ГОВЕДА, ОВАЦА И КОЗА*

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Кратак садржај

Шмаленберг (Schmallenberg) вирус је први пут откривен у новембру 2011. године, у Немачкој из узорака прикупљених у лето / јесен исте године од оболелих млечених крава са повишееном температуром и смањеним приносом млека са фарме у близини града Шмаленберг (области Северна Рајна-Вестфалија, Немачка). Вирус је откривен у збирним узорцима крви коришћеним најновије метагеномске анализе. Слични клинички знаци (укључујући и пролив) су детектовани и код млечених крава у Холандији, где је присуство Schmallenberg вируса потврђено у децембру 2011. године. Почетком децембра 2011. године у Холандији су пријављене и конгениталне малиформације код новорођене јајњади, а Schmallenberg вирус је откривен у и изолован из можданог ткива. До марта 2012. године, у Белгији, Немачкој, Великој Британији, Француској, Луксембургу, Италији и Шпанији су пријављена рађања мртвих новорођених животиња и конгениталних малиформација уз позитиван налаз на Schmallenberg вирус у RT-PCR тестовима. Према подацима обрађеним до сада, нови вирус нема зоонотских потенцијала и ризик за јавно здравље се може сматрати изузетно ниским. Већ су развијене дијагностичке методе као што су TaqMan real-time RT-PCR и изолација вируса које се користе за детекцију вируса и ВН тест и индиректни имунофлуоресцентни тест за откривање специфичних антитела. Остале дијагностичке тестови су у процесу развоја. По ОИЕ и ЕУ стручњацима и тренутно важећим прописима и препорукама, болест није обавезна за пријављивање, али је чињеница да тренутно не постоје усностављене посебне мере контроле ове вирусне инфекције. Још увек постоје многа питања на које је неопходно одговорити у будућности.

Кључне речи: Schmallenberg вирус, говеда, овце, козе