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Bluetongue is a non-contagious vector viral disease that affects certain ruminants and camelids.

In the UK Bluetongue is a notifiable disease and any cases even if suspected should be reported to DEFRA.

The main route of disease transmission is from livestock being bitten by infected midges of the genus *Culicoides*.

The Bluetongue virus is not thought to pose a risk to human health.

Introduction

Bluetongue (genus *Orbivirus*, family *Reoviridae*, subfamily *Sedoreovirinae*) is a non-contagious vector viral disease that affects certain ruminant (sheep, goats, cattle, deer) and camelid (alpacas and llamas) species. In the UK, Bluetongue is categorised as a notifiable disease, due to the negative effects it has on animal health and the direct (high morbidity, mortality, abortion, foetal abnormalities) and indirect (restriction on movement and trade of animals and products, cost of treatment and control programmes) effects it has on economics. As such, there is legal obligation in the UK to report any cases of Bluetongue to the Animal Health and Plant Agency (Wales 0300 303 8268, England 03000 200 301, Scotland local Field Services Office), even if it is just a suspected case. It is important to note that this virus is not known to affect humans and therefore is not thought to pose any risks to human health or food safety (meat and milk products).

Some of the earliest reports of Bluetongue were made in the 18th century in the Cape Province of South Africa after the importation of fine-wool Merino sheep from Europe and the disease was given the name Bluetongue from the Afrikaan words “bluotong” and “blaauwtong” referring to the clinical symptom of cyanosis (blue or grey lips or skin) in infected sheep. With regards to the presence of the disease in Europe, Bluetongue was first reported in 1998 in four Greek islands (Rhodes, Leros, Kos, Samos) and then over the course of seven years was

found to have spread further into the Mediterranean affecting a further 16 other countries. The disease was first reported in Northern Europe in 2006 in countries such as, Northern France, Belgium, Netherlands, Luxembourg and Germany and in 2007 the disease was reported to be present in the UK alongside countries such as Denmark and the Czech Republic. One suggestion for the spread of the virus into Northern Europe is climate change, where conditions are thought to be favourable for the main Bluetongue vector (*Culicoides imicola*) and for the persistency of the virus especially over the winter months.

How is the Virus transmitted?

The Bluetongue virus is predominantly transmitted to livestock by infected female blood-feeding biting midges of the genus *Culicoides* (family *Ceratopogonidae*). These midges become infected with the virus after biting infected livestock species and it is thought that they carry the virus for the entity of their lives once infected. A diagram of the typical transmission cycle of the Bluetongue virus can be found below in Figure. 1. In the UK the activity of these biting midges tends to occur between April – November and they can be carried by the wind to a range of geographical locations. As such, factors such as wind speed, wind direction, temperature and rainfall can all have a bearing on the location of these midges. Other routes of disease transmission include, the ingestion of infected tissues, consumption of infected placenta, consumption of virus contaminated colostrum by neonates, contact with contaminated blood, contact with contaminated needles and contact with infected germinal products (semen, eggs, ova, embryos). Moreover, certain serotypes (strains) of the Bluetongue virus have been demonstrated to be transmitted from infected dams to their unborn offspring.

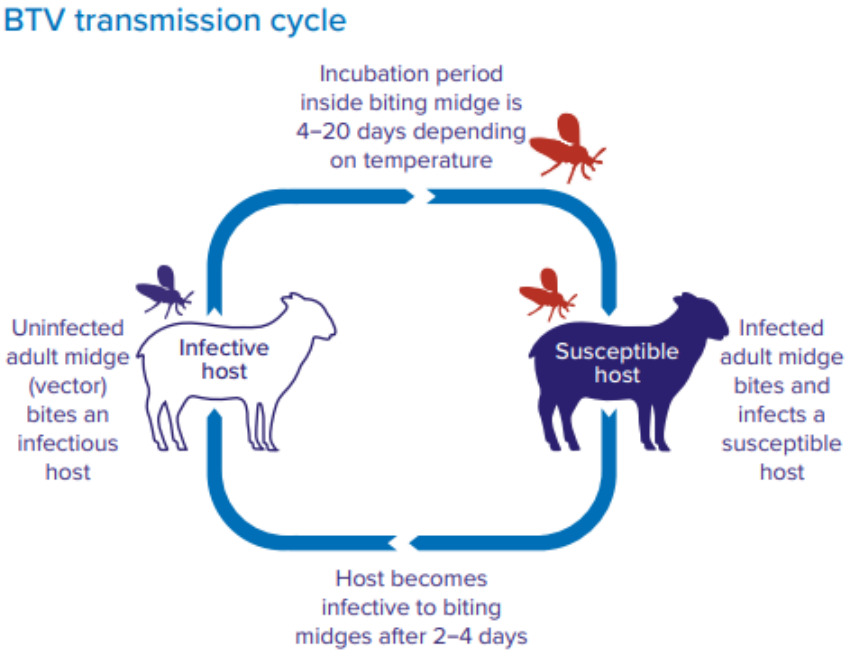

Figure 1: Typical transmission cycle of the Bluetongue virus, image by Welsh Government.

Bluetongue Virus

The bluetongue virus itself consists of three capsid proteins surrounding a genome comprised of 10 segments of double-stranded RNAs (dsRNAs, Seg-1 – Seg-10). These 10 segments range in length from 0.9 – 4 kb and encode for 7 structural proteins (VP1-VP7) and 5 non-structural proteins (NS1 – NS4). To date, 28 different serotypes (strains) of the Bluetongue virus have been identified alongside novel serotypes. These different serotypes have been demonstrated to have variations in their nucleotide sequences and are thought to be associated with different geographical locations. For example, the virus has been categorised into two lineages, a western lineage (Africa, Caribbean, Americas) and an eastern lineage (Asia, Indonesia and Australia) and there are also regional topotypes too. It is important to note that if an animal recovers from being infected with one particular serotype, then they will only develop immunity to that particular serotype and not to any of the others, therefore they are still at risk of disease. Moreover, recovery from infection can be long with negative effects still seen long after recovery on factors such as fertility, milk production, wool quality and body condition.

In Great Britain two serotypes of the Bluetongue disease have been identified, BTV-8 which was first detected in 2007 and BTV-3 which was first detected in November 2023. Most recently, BTV-3 was detected in the East coast of England in August 2024, an area that is classified as being high risk for infected midges due to its proximity to Northern Europe. As such, temporary control zones were put in place which were later extended and made into restricted zones encompassing more areas. With regard to Wales, in September 2024 a case of BTV-3 was detected on a farm in Gwynedd, Wales. The disease was introduced to the farm following the movement of three sheep from the East of England before the disease was known to be circulating and movement restrictions were put in place. The latest situation regarding the disease in Great Britain can be found here, including detail as to which counties are currently within restriction zones.

Preventing and Stopping the Spread of Bluetongue on Farm

When reading this section please take note of the date and that this technical article was written in December 2024 and therefore changes may have occurred since. Current advice for farmers from the Welsh Government is to remain vigilant for any signs of the disease and to continue to practice the responsible sourcing of livestock. Moreover, the UK Government has outlined a series of measures that can be put in place on farm to prevent and stop the spread of the virus, these can be found in Table 1.

Table 1: UK Government recommendations for preventing the spread of the Bluetongue virus on farms.

- Responsible sourcing of livestock
- Remain vigilant to signs of disease
- House livestock in buildings that keep biting midges out especially at dawn and dusk
- Practice good biosecurity and hygiene
- Not letting farm dogs, cats or pets to eat, chew on or play with potentially infected materials such as aborted material and afterbirth
- Vaccinate animals with a suitable authorised vaccine

With regards to vaccinations within the UK, there are currently vaccines under general licence for serotypes BTV-1, BTV-2, BTV-4 and BTV-8 and usage should be reported to DEFRA within 48 hours. These vaccines are reported to take up to 6 weeks before animals show signs of immunity and some animals may require two doses 3 weeks apart. Most recently, three unauthorised vaccines for the serotype BTV-3 have been approved for use by DEFRA's secretary of state under general licence in England. However, these vaccines are not currently licenced for use in Wales, Scotland or Northern Ireland. These vaccines have been assessed by the Veterinary Medicines Directorate (VMD) and are considered to be consistent in quality, safety and efficacy and meet administrative criteria under Schedule 4 of the Veterinary Medicine Regulations 2013 (VMR 2013). It is important to note that animals vaccinated with these vaccines are still subject to movement restrictions due to the way in which the vaccine works, whereby these particular vaccines work by reducing viraemia rather than preventing animals from becoming infected. This means that the vaccines work by reducing or preventing the development of clinical symptoms or mortality and animals may still be susceptible to infection or become infectious even though vaccinated.

Resistance to Bluetongue?

As previously mentioned, Bluetongue can affect certain ruminant and camelid species. Sheep, ox, llamas and alpacas appear to be most sensitive to disease, whereas cattle, goats and wild ruminants appear to have a degree of tolerance, although they are still susceptible. Moreover, cattle are reported to act as "reservoirs" for infection owed to long periods of viremia (presence of the virus within the blood). A list of the various clinical symptoms of Bluetongue can be found here. However, it is important to note that clinical signs are highly variable and dependant on factors such as the mammalian species, breed, age, and serotype. Likewise, variation is reported to occur among individuals within a flock/ herd or within breeds.

Sheep have been demonstrated to be particularly sensitive to the Bluetongue virus and have high mortality rates. For example, mortality averages are thought to reside between 2 - 30% but can be as high as 70%. European fine wool and muton breeds are reported to be highly susceptible to the disease and show clinical symptoms, whereas, certain breeds of sheep native to Africa and South-East Asia have demonstrated a degree of resistance to the disease and often just present sub-clinical symptoms. This is most likely a result of the serotype infected with and that these breeds of sheep due to prolonged exposure may have developed a degree of resistance through natural selection processes. For example, a paper by Haresnape, et al. (1988) suggested that in Malawi (South East Africa) although the bluetongue virus is present and described as endemic within the country, disease in sheep is relatively uncommon and tends to occur in areas that have introduced European fine-wool and mutton breeds. This is thought to be attributed to these native breeds having tolerance (high levels of innate resistance) to the disease with those infected with the disease tending to be less susceptible to developing adverse effects or clinical symptoms. However, the disease still causes inconvenience for some, in that it is a potential barrier for the uptake of European sheep breeds and could therefore slow down the success of genetic improvement projects. Likewise, there is suggestion that the crossbreeding of native breeds with European breeds may reduce disease tolerance as well. Moreover, the introduction of new serotypes is always a threat.

Summary

In summary, Bluetongue is a non-contagious vector viral disease that affects certain species of ruminants and camelids. Of the species affected, sheep appear to be highly sensitive and show clinical symptoms of infection and have high mortality rates. In the UK Bluetongue is classified as a notifiable disease and cases even if suspected should be reported to the Animal and Plant Health Agency. This is due to the devastating effects that the Bluetongue virus can have on animal health and the indirect and direct effects it can have on economics. Moreover, recovery from the Bluetongue virus can be long and there is the potential for longer-term knock-on effects to body condition, performance, fertility, milk production and wool quality.

However, it is important to note that the Bluetongue virus is not known to pose any risks to human health.

The Bluetongue virus is predominantly transferred to livestock following being bitten by infected midges of the genus Culicoides. However, other routes of transmission exist such as the ingestion of infected tissues, placenta and colostrum and contact with contaminated blood and germinal products. To date, 28 different serotypes (strains) of the Bluetongue virus have been identified along with other novel serotypes and the presence of the different serotypes appears to associated with different geographical regions. In the UK serotypes BTV-8 and BTV-3 have been identified. BTV-3 has been detected most recently (August 2024) in the East of England and as such temporary control zones and restriction zones have been put in place to prevent the spread of the disease. Regarding Wales, a case of Bluetongue was detected on a farm in Gwynedd following the movement of three sheep from the East of England from areas where the disease is now known to be circulating and before movement restrictions were put in place. Current advice for Welsh farmers is to be vigilant for signs of the disease and to continue to practice responsible sourcing of livestock.