

Bluetongue disease

- ▷ Bluetongue virus (BTV) causes a non-contagious disease of domestic and wild ruminants, including sheep, cattle, goats, deer, antelope and camels.
- ▷ BTV is carried by the *Culicoides* midge and is transmitted to mammals through a bite.
- ▷ Symptoms of bluetongue disease are variable and depend on the serotype of the virus and on the animal infected.
- ▷ The disease cannot be transmitted to humans or horses.

The virus

Bluetongue virus is a member of the *Reoviridae* family. There are 24 serotypes of BTV. Because the virus is spread by midges, the disease can be spread widely and quickly, so serotypes are not confined to geographical regions. By identifying serotypes responsible for outbreaks, scientists can develop appropriate vaccines to prevent the spread of disease as well as finding the midge population in which the virus originated.

History

Bluetongue disease was first reported in South Africa at the turn of the last century and was for a long time restricted to Africa. The first confirmed outbreak outside of Africa occurred in Cyprus in 1924 followed by outbreaks in 1943-1944 when about 2,500 sheep died, the mortality rate reaching 70 % in flocks. The virus is now endemic in countries within a wide geographical band around the equator, where the *Culicoides* midge is prevalent. Since the late 1990s BTV has been spreading north. Some experts believe this could be due to global warming: a rise in temperature causes an increase in midge populations that spread the disease. In 2007, Germany, Belgium, France, the Netherlands, Luxembourg, Denmark and the UK had confirmed cases of bluetongue disease. Experts believe infected midges were carried to the UK from the continent on the wind.

Symptoms

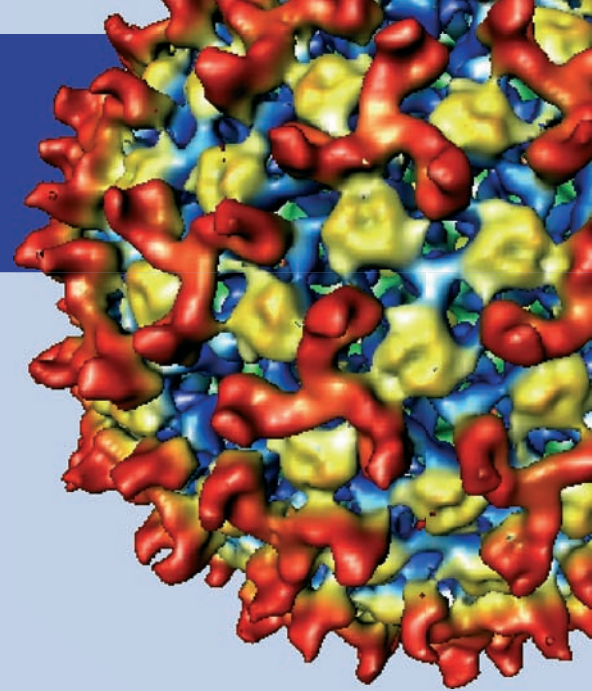
Symptoms vary depending on the host species and the virus serotype. 30 % of sheep develop clinical signs of disease when infected, whereas only 5 % of cattle show symptoms.

Sheep: Disease is acute with high mortality. Symptoms include: high fever, reddening of the mouth, nose and eyes (hyperaemia), excessive salivation and frothing, oral lesions and cyanotic (blue) tongue, lameness, depression and death. BTV can also cause abortions, stillbirths and 'dummy lamb' live births.

Cattle: Disease is less severe and often asymptomatic. Symptoms include hyperaemia, necrosis of the muzzle and patchy dermatitis. BTV can decrease reproduction efficiency and cause early abortions.

Spread

BTV is usually transmitted through a bite from an infected *Culicoides* midge. Several species of midge can pass BTV to animals and the midges can travel over 100 km in a day, spreading the disease fast. BTV can, in a very few cases, be transmitted sexually in semen and also from mother to offspring. People can occasionally spread the virus by unhygienic practices such as using contaminated surgical instruments. However, only midge to animal transmission can cause bluetongue disease to become endemic. BTV can re-emerge after dormancy during winter months in a temperate climate. This could be due to re-introduction of the virus, survival in an infected animal or survival in the midge population.



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Treatment

There is no successful treatment for bluetongue disease. Animals at risk can be given a vaccine to increase their immunity to the disease. A live attenuated (less pathogenic) virus of the same serotype as the virus causing disease in the affected area is used. Because of this, vaccination only protects animals against particular serotypes of BTV. In northern Europe, the strain was BTV-8 so existing vaccines could not be used. For example, in 2007 BTV-2 and BTV-4 circulated in southern Europe, so vaccines against those serotypes were available. There are question marks over the safety of the live attenuated vaccine, it has resulted in birth defects when pregnant animals are vaccinated, and there are instances of re-assortment between vaccine and field strains of the virus. In some countries serotype specific 'killed virus vaccine' has also been used in recent years.



The latest

- ▷ Scientists have made a protein-based designer vaccine, which shows good protection in sheep in Africa. It is currently being tested in Europe for the ongoing problems.
- ▷ Scientists have designed 'reverse-genetics' based vaccines to improve safety, which are targeted specifically against several European serotypes of BTV.
- ▷ Researchers are looking at animal cell-virus interactions to understand why certain breeds of animals but not others get very sick.
- ▷ Research on the epidemiology of the vector and virus is going on at the Institute for Animal Health in Pirbright, UK.
- ▷ Scientists are working out how the enzymes of the virus work as a molecular machine to make many copies of virus so efficiently. The answer to this question may help in the development of drugs to stop the virus from multiplying.

Management

An outbreak of bluetongue disease leads to export bans on livestock and animal products for a set length of time. Where the disease is spreading, infected animals may be quarantined or slaughtered to minimise the economic impact of trading bans. Control zones and movement restrictions are put in place. Disinfectants are used on potentially contaminated surfaces and surgical instruments. Vector control using insecticides is also an option but is not very successful. Infected midge populations will be reduced naturally during the colder winter months in temperate areas, but some scientists think the virus can survive the cold temperatures inside adult midges or larvae.

Further reading

Roy, P. & Gorman, B. M. (1990). *Bluetongue Viruses*. Springer.

www.defra.gov.uk/animalh/diseases/notifiable/bluetongue/index.htm

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