Bluetongue: An Updated Overview

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Though this virus poses no threat to human health it is a very real health risk to sheep and other species; most importantly this disease greatly impacts the economics of many animal agricultural industries due to its trade implications. It is found in many parts of the world including Africa, the Middle East, Australia, North and South America and parts of Asia. Recently this virus has expanded its geographic range to now include some southern European countries that it hadn’t been seen in before 1998 and there is current concern it could move to northern Europe with changing weather conditions (Iowa State). This concern extends to Canada and the veterinary industry and producers should be informed as the virus’s distribution grows.

Characteristics Bluetongue Virus (BTV)

- Genus Orbivirus, family Reovirida
- 26 serotypes recognized
- Double stranded RNA virus with 2 protein shells but lacks a lipid envelope

Transmission and animals at risk

Bluetongue virus is capable of replication in both domestic and wild ruminants; however disease occurs primarily in fine wool and mutton sheep breeds as well as deer (Purse, 2005). Cattle are the main reservoir, as they are able to maintain the virus for up to 100 to 140 days (Purse, 2005, MacLachlan, 1994). This prolonged maintenance of the virus in cattle and wild ruminants allows for increased transmission of the virus to sheep by blood feeding midge species (Culicoides imicola and Culicoides variipennis) that act as vectors.

The adult midge can live for 2-3 weeks and due to the harsh winters we typically see in Canada they are unable to continue their life cycle throughout the year. There is speculation that global warming and milder winters may allow for the midges to continue reproduction through the winter and increasing the possibility of the bluetongue virus moving further north into Canada. Midges have limited flight range; however, their distribution is greatly facilitated by wind, which can carry the midge hundreds of kilometers where it can bite and infect susceptible hosts (Purse, 2005).
Pathogenesis

The midge deposits the virus in the skin where it migrates to regional lymph nodes to undergo initial replication. The virus then moves to organs such as the spleen, lymph nodes and lungs where secondary replication occurs. In later stages, the virus uses red blood cells to further proliferate. The infection of the erythrocytes induces a prolonged viremia in cattle and facilitates the infection of midges for subsequent spread of the virus (MacLachlan, 1994).

In response to a bluetongue viral infection, the ruminant host produces interferon and develops both a humoral and cell-mediated specific immune response. Interferon production helps the host prevent dissemination of the virus through the body, but does little for actual clearance. Humoral immunity is based on antibodies forming to the viral outer capsid protein VP2. Bluetongue virus has the capability of antigenic variation through genetic drift and recombination and the variable presentation of VP2 may affect the efficacy of an antibody response by the ruminant. If the structure of VP2 on the virus is a strong match for the antibody, the virus is easily neutralized; however, poor matches lead to decreased ability of the antibody to neutralize the virus. The neutralizing antibodies help to protect the animal from reinfection. The virus prevents clearance by closely associating with host erythrocytes (MacLachlan, 1994). Cell mediated immunity that forms is not specific to the serotype and results in CD8+ cells lysing cells infected with the virus therefore decreasing viral replication.

(Purse et al, 2005)
Clinical Signs

- Common presentations of disease are lesions of the mouth and oral cavity, excess saliva, exudate from the nose and lameness as the disease progresses (Goltz)
- May see high fever and swelling of the face
- Cyanosis of the tongue gives the virus it’s name

Diagnosis

Early diagnosis is essential as it helps prevent spread of the virus and decreases the virus pool by removing infected animals that can spread disease to susceptible animals (Billinis).

Diagnosis is based on clinical signs and the animal’s history.

Bluetongue virus must be confirmed in the lab once the disease is suspected. There are several tests that are used such as PCR, RT-PCR, electron microscopy, ELISA or inoculation of the virus into a tissue sample.

RT-PCR is one of the best options as it is a sensitive test that works by amplifying the virus RNA present and detects gene expression to positively confirm that the animal has the virus (Billinis).

ELISAs (Enzyme Linked Immunosorbant Assays) are another commonly used test, however, they are not as reliable because they require a high level of virus in the serum. As a result, an animal with the disease can falsely test negative (Billinis).

Inoculation of virus into cell culture has traditionally been considered the gold standard for diagnosis. It is a time consuming and labour intensive procedure that can take more than five weeks to see results. This is not practical from a production standpoint as a definitive diagnosis is needed quickly to know which animals are infected. The results of the tests also affect export and import of livestock.

The tests used for definitive diagnosis are some important considerations to keep in mind when discussing diagnosis with your veterinarian to increase speed and accuracy.
Prognosis
This is a severe disease of sheep and all sheep are susceptible (Erasmus). Bluetongue virus causes a multi-systemic disease which is typically acute with a mortality rate up to 90% in particularly susceptible sheep breeds.

In cattle, the disease has three manifestations: reproductive effects, congenital defects and persistently infected cattle with hypersensitivity (Iowa beef centre.org). Often, they are asymptomatic.

Treatment
There is no effective treatment. As Bluetongue is a reportable disease in Canada, infected animals are typically culled before they can propagate the disease. In endemic areas, animals can be given supportive therapy including fluids, soft foods and possibly antibiotics to prevent secondary bacterial infections of the oral cavity lesions (Merck Veterinary Manual). However, these measures do not always prove efficacious. Prevention is vital for animal health and economic stability (Erasmus).

Prevention and vaccination
After February 2007 importation testing of cattle from the USA for bluetongue virus is no longer required. As a result, potentially positive cattle can enter the Canadian herd. This increases the possibility of positive animals becoming a reservoir of infection within Canada. However, bluetongue virus is spread by the midge fly which can only be found in certain areas within Canada. These areas are the Okanagan valley and southern parts of the Prairie Provinces, Alberta, Saskatchewan and Manitoba. Because of this, Bluetongue is not a serious threat to Canadian livestock (CFIA, 2013).

The most effective means of controlling bluetongue virus include midge fly control, restricting animal movement, culling infected animals and vaccination. Control of the midge fly population can be impractical but insect repellants may help to reduce the chances of exposure in areas where midge flies exist within Canada. When bluetongue virus is detected, animal movement is restricted by quarantine and the CFIA may mandate that the infected animals be culled (CFIA, 2013).

There are vaccines available for both cattle and sheep. Vaccines are only effective against specific serotypes so the use of multivalent vaccines is needed in areas where multiple serotypes may be present. There are a variety of different vaccines against bluetongue virus available worldwide which include live attenuated, inactivated, recombinant and virus-vectored (Bhanuprakash, 2009).

Vaccination programs are available against bluetongue virus and are country specific. The European Union cattle are vaccinated against serotype 8 (Bhanuprakash, 2009). However, vaccination is not currently used in Canada. (Canadian Cattleman’s Association, 2002)
**Laws and Regulations**

If bluetongue virus is suspected or confirmed the animal's owner, or the veterinarian must immediately contact the district veterinarian for the Canadian Food Inspection Agency, CFIA. Depending on the serotype, measures may be put into place to either control the spread the virus or eradicate it from the Canadian herd (CFIA, 2013). There are two different control programs set up by the CFIA.

In May of 2012 serotypes that are endemic to the USA were removed from the Federally Reportable Disease List. These serotypes include bluetongue types 2, 10, 11, 13 and 17. Serotyping must be done to determine which bluetongue virus is suspected so only laboratories must contact CFIA. The serotypes above are on the Immediately Notifiable Disease list rather than the Federally Reportable List. Immediately notifiable means that there are no programs in place for control or eradication of the virus when detected and CFIA will no longer respond to the detection of these serotypes (CFIA, 2013). Instead the importance of reporting of these serotypes to the CFIA is for them to pass on information about bluetongue occurrence within Canada to our trading partners and the OIE (World Organization for Animal Health) to meet our international reporting obligations (Canada Gazette, 2010). Moving the bluetongue serotypes to the Immediately Notifiable Disease list does not impact Canadian cattle exports to the United States.

Although the serotypes 2, `10, 11, 13 and 17 are exotic to Canada, detection of them within certain regions does not change Canada's designation as a country free of bluetongue virus. The Okanagan valley is the only region that it is acceptable to find bluetongue virus within Canada. If
bluetongue were to be detected elsewhere within Canada our status as being bluetongue virus free would be re-evaluated (CFIA, 2013).

Serotypes that are not endemic to the USA are Federally Reportable to the Canadian Food Inspection Agency. Federal responses to detection of exotic serotypes would vary with the circumstances. If detection occurred in winter, there would be less concern about the potential spread of the disease. This is because the midge flies that are needed to transmit the virus between animals cannot thrive in Canadian winters (CFIA, 2013).

At slaughter, random cattle have their blood tested for bluetongue virus in addition to brucellosis and anaplasmosis. The blood samples are tested using serology to determine if the individual animal had bluetongue virus. A positive sample doesn't necessarily mean that the animal had the disease since false positives may occur with this type of testing. A positive test results in further investigation to determine if the animal actually had the virus. The investigation would trace the animal back to the farm of origin and test the remaining herd to see if those animals were at risk of the virus. If the herd was at risk; control measures would be put into place. These measures range from quarantine and testing of the herd to culling. If the animals were culled then the producer is given money in compensation for the loss of their animals (CFIA, 2013).
References:

Bagley. C.V. Bluetongue in Cattle. Utah State University. Adapted from Cattle Producer's Library.


