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Blue Tongue Disease in Sheep and Goats

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INTRODUCTION

Blue tongue disease is caused by Bluetongue virus (BTV) of the genus *Orbi-virus* in the family *Reoviridae*. BTV is a non-enveloped virus, 90 nm in diameter, with a triple-layered icosahedral protein capsid. So far 26 BTV serotypes have been identified world-wide. Bluetongue is an infectious, non-contagious disease of ruminants and camelids transmitted by *Culicoides* biting midges. The losses caused due to disease are both direct (death, abortions, weight loss or reduced milk yield and meat efficiency) and, what is more important, indirect as a result of export restrictions for live animals, their semen and some products such as foetal bovine serum.

Host range

All ruminants are susceptible to infection with bluetongue, but clinical disease is most often manifested in sheep; a serious disease also develops in white-tailed deer (*Odocoileus virginianus*). In cattle, which play an important role in the epidemiology of BTV mainly because of prolonged viraemia, the disease has in the past mostly been reported to have a sub-clinical course. Under natural conditions the disease may also be present in wapiti (*Cervus elaphus canadensis*), proghorn *(Antilocapra americana)*, African antelopes and other wild ruminants, but it can also affect camelids and elephants. Bluetongue has also been recorded in axis deer (*Axis axis*), fallow deer (*Dama dama*), sika deer (*Cervus nippon*), red deer (*Cervus elaphus*), roe deer (*Capreolus capreolus*), mouflon (*Ovis orientalis musimon*), Spanish ibex (*Capra pyrenaica*) and captive yak (*Bos grunniens grunniens*).

Clinical signs

Clinical signs are usually detected in fine-wool breeds of sheep and the white-tailed deer (*Odocoileus virginianus*) and include fever, facial oedema, haemorrhages into, and ulceration on, the oral mucosa and coronitis. Bluetongue typically occurs when susceptible animal species are introduced into areas with circulating virulent BTV strains, or when virulent BTV strains extend their range to previously unexposed populations of ruminants.

Transmission

Bluetongue is transmitted by biting midges of the genus *Culicoides* (Diptera: *Ceratopogonidae*) and therefore outbreaks depend on the concomitant presence of competent insect vectors and susceptible ruminants.

Diagnosis

A preliminary diagnosis based on clinical signs, post-mortem findings and epidemiological assessment should be confirmed by laboratory examination. Samples to be examined in the laboratory should include non-coagulated blood (use of ethylene diamine tetra acetic acid or heparin is preferred), blood serum, post-mortem tissue samples of spleen, lymph nodes, lungs, liver, bone marrow and, when indicated, heart and skeletal muscles; in addition, brain tissue is collected in foetuses.

For transport, blood/serum samples should be frozen at –20 °C and the other samples should be kept on ice. Full blood samples can be stored at +4 °C for a long time; isolated blood cells in 10% dimethyl sulphoxide require storage at a temperature of –70 °C. Lab diagnosis can be done by identification antigen or antibody.

a.) Antigen identification

BTV antigen can be identified by virus isolation and Polymerase chain reaction (PCR). Bluetongue virus can be propagated in embryonated chicken eggs, cell cultures or in sheep. Embryonated eggs, nine to 12 days old, are used for BTV isolation and intravenously inoculated with the material examined. Bluetongue virus can also be isolated in cell lines of insect origin, such as the KC line derived from *Culicoides sonorensis* cells or the C6/36 line from *Aedes albopictus* (AA) cells; the mammalian BHK-21, CPAE or Vero cell lines can also be used. The cytopathic effect produced by BTV is observed only on cell lines of mammalian origin at three to five days after inoculation and appears as foci of rounded and refractile cells.

A direct identification of BTV in blood or tissue samples is possible with use of the reverse transcription-polymerase chain reaction (RT-PCR) method that allows for serotyping and can detect BTV RNA in samples as late as six months after infection. A quantitative assessment of RNA in an examined sample is possible by real time-RT-PCR.

b.) Antibody identification

Serogroup-specific antibodies against BTV can be detected by a competitive ELISA test targeted to the VP7 protein. This is a rapid method permitting determination of serum or plasma antibody as early as the 6th post-infection day.

Differential diagnosis

The clinical signs of bluetongue can easily be mistaken for those of other ruminant diseases such as orf (contagious pustular dermatitis), foot-and mouth disease, acute photosensitisation, acute haemonchosis (with depression and submandibular oedema), facial eczema, *Oestrus ovis* infestation, pneumonia, plant poisoning, salmonellosis, sheep pox, peste des petits ruminants, malignant catarrhal fever, pododermatitis, rinderpest, infectious bovine rhinotracheitis, bovine viral diarrhoea, bovine popular stomatitis, bovine herpes mamillitis and epizootic haemorrhagic disease.

Prevention and control

There is no specific therapy for animals with bluetongue. Symptomatic therapy includes

gentle handling of affected animals, their stabling and, if indicated, administration of non-steroidal antiphlogistic drugs.

An immediate ban on animal import from countries with bluetongue is the priority measure, followed by the monitoring of farms raising domestic ruminants which include clinical examination and serological and virological testing, and a monitoring of insect vectors. Prophylactic immunization by vaccinating animals and the removal of vectors or prevention of vector attacks can also be used. Two types of vaccines, inactivated and live attenuated, are currently available. The reference laboratory for bluetongue in the European Union is the The Pirbright Institute, United Kingdom.

CONCLUSION

Blue tongue disease remains a formidable challenge for sheep and goat producers worldwide due to its complex epidemiology, clinical variability, and economic impact. Effective management requires a multifaceted approach encompassing surveillance, vaccination, vector control, and biosecurity measures to mitigate the risk of outbreaks and minimize losses. Ongoing research into BTV epidemiology, vaccine development, and vector biology is essential to improve prevention and control strategies against this devastating viral disease.

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