Epizootic haemorrhagic disease (EHD)
Summary

Introduction

This note provides a brief summary of the Disease and Product analysis prepared by a DISCONTOOLS group of experts on Epizootic haemorrhagic disease (EHD). They reviewed the current knowledge on the disease, considered the existing disease control tools, identified current gaps in the availability and quality of the control tools and finally determined the research necessary to develop new or improved tools. Full details are available on the web site at http://www.discontools.eu/.

Disease profile

EHD is an insect-borne, non-contagious viral disease of wild and domestic ruminants. Its etiological agent, the EHD virus (EHDV) is a non-enveloped virus of the genus *Orbivirus* (family *Sedoreoviridae*). Currently, 7 serotypes (1, 2, and 4 to 8) of EHDV are officially recognized. EHDV is transmitted among its susceptible ruminant hosts exclusively by blood-feeding biting midges (*Culicoides* spp.), and as such, its distribution depends on the presence and abundance of competent vector population. Outbreaks generally occur in late summer/early autumn.

EHD outbreaks have been described in USA, Australia Caribbean region, Asia and Africa. Between October and November 2022, EHDV was for the first time reported in Europe. In particular, EHDV serotype 8 reached Italy and Spain, probably via wind-borne infected midges from Northern Africa. North American white-tailed deer (*Odocoileus virginianus*) represent the wild species most severely affected, with morbidity and mortality rates that can be significant; other wild cervids can also develop symptomatology.

In cattle, EHDV infections generally occur asymptomatically. However, in the last decades, some strains/serotypes have been able to cause severe diseases and production losses. In particular, infections with Ibaraki strain of EHDV-2 in Japan and EHDV serotypes 6 and 7 in North Africa, the Middle East and Reunion Island were able to cause severe disease and death in affected cattle. The recent EHDV-8 outbreaks reported in Tunisia, Italy and Spain have also been associated with mortality and bluetongue-like clinical symptoms in cattle.

The current unavailability of commercial vaccines in EU and the vector transmission route make EHD control very difficult once established. Vector control and movement restrictions are then the main measures that can be implemented by affected Countries to limit the EHDV spread to disease-free Countries/areas.

Risk

Climate change and globalization will probably facilitate the incursions of EHDV, while the demonstrated presence and abundance of competent vectors in EU will make its spread possible Authorities should be prepared to implement an early warning system to early detect and face the eventual EHDV incursions. It is not possible to prevent infection and contrast the disease, as vaccines are not available. Therefore, only restrictive measures are applicable for controlling the EHDV spread. A joint public and private effort is necessary and strongly recommended for vaccine development and commercialization.

Diagnostics

The competitive VP7 ELISA is one of the WOAH recommended tests for determining prevalence of infection-surveillance and individual animal freedom from infection before movement. It is widely used amongst veterinary diagnostic laboratories, both for domestic and wild ruminant species. However, only a few competitive ELISA kits for antibody detection are available in the market. The virus neutralisation test can also be used for identifying the serotype and determining the antibody titer.

For virus detection, serogroup-specific real-time RT-PCR assays are commercially available from different companies, while serotype-specific real-time RT-PCR assays for the seven EHDV serotypes are available in house only. Both RT-PCR assays are very sensitive, rapid and easy to perform, and can be used for either *intra-vitam* or *post-mortem* diagnosis. Virus isolation using susceptible cell culture is not used for diagnostic purposes because it is time-consuming (three to

four weeks to be completed) and necessitates *ad hoc* areas for growing cell lines and highly skilled personnel.

Vaccines

No vaccine products are currently available in EU Member States. In Japan, both a dual inactivated vaccine against bovine ephemeral fever and Ibaraki disease (EHDV serotype 2) and a live monovalent vaccine against Ibaraki disease are available.

Autogenous inactivated vaccines produced from EHDV-1 or EHDV-2 isolates originating from ill or dead deer in affected herds are also available in North America. They are not tested for efficacy and application has to be approved by the United States Department of Agriculture.

Pharmaceuticals

There is no specific treatment for infected and sick animals other than symptomatic treatment and supportive care. Cost/effectiveness should be evaluated, and the withdrawal period of drugs taken into consideration. Repellent can be used to protect animals from midge attacks. Any treatment of free-ranging wildlife is not feasible.

Knowledge

Not much is known about EHD, and, in particular, about EHD in domestic ruminants. However, we know that EHDV is a species of the *Orbivirus* genus. In this regard, after studying bluetongue virus for many years, we have learnt that Orbiviruses have the ability to modify their characteristic and behavior and to easily adapt to new environment and episystems. We have also realised that dealing with these kind of viruses implies, most of the time, to face unexpected scenarios and to be prepared to continuously adapt our understanding. Many critical questions about pathogenesis, immunology, vaccinology, epidemiology and control of EHD are still unanswered. New and more efforts are needed to improve our understanding and knowledge on this arboviral disease. Many aspects related to immunity, strains and isolates, transmission and spread, reservoirs, carriers and geographical distribution have to be clarified. This information is of extreme value in order to develop appropriate tools to control the disease and put in place more effective control measures. Full details of the gaps are shown in the Disease and Product Analysis for EHD on the DISCONTOOLS web site.

Conclusions

In the future, EHDV will probably expand its current geographical limits because of eco-climate change and globalization. We are afraid that the recent EHDV-8 incursions in Italy and Spain are just the beginning of new incursions or further spread of EHDV. Even so, no official surveillance and control programmes are in place on a regular basis in risk areas of both European and Mediterranean countries. The economic impact that EHD and EHDV circulation could have on the livestock industry, can be critical because of both, the direct losses caused by the disease and, more importantly, the indirect losses due to restrictions imposed on the animal trade. The inaccessibility to commercial vaccines certainly makes this situation even worse. A joint public and private effort is therefore urgently needed for improving this alarming scenario.