DISCONTOOLS

African Swine Fever

Summary

Introduction

1. This note provides a brief summary of an analysis undertaken by a DISCONTOOLS group of experts on African Swine Fever (ASF) in 2015. 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 of the analysis can be downloaded from the web site at http://www.discontools.eu/ by selecting Disease Database, then the specific disease and highlighting the variables of interest. This is completed by selecting "create a report" which can then be downloaded as either a PDF or Excel spread sheet.

Disease profile

2. ASF is a serious viral disease of pigs with highly pathogenic strains that can cause high mortality in naïve pigs. The ASF virus is endemic in sub-Saharan Africa and infects domestic pigs, warthogs and bush pigs as well as soft ticks which are possible vectors. The double-stranded DNA virus replicates in the cytoplasm of infected cells. Although the virus causes a lethal haemorrhagic disease in domestic pigs and wild boar, in African species (warthogs and bushpigs) infections are generally asymptomatic. The disease can spread very rapidly in pig populations by direct or indirect contact. The virus can also persist for long periods in the environment and in pig products.

3. Disease outbreaks have occurred in Europe, South America and the Caribbean, and the cost of eradication has been significant. ASF is now established in Sardinia and also in Georgia, Armenia and southern Russia, with an increasing number of outbreaks in northern regions since 2011. The situation in Russia in wild boar and domestic pigs, with two endemic regions recently described has resulted in a sporadic spill-over of ASF to the adjacent countries such Ukraine and Belarus. In earlier 2014, ASF cases in wild boar were reported in Lithuania and Poland in bordering regions with Belarus. Since then ASF cases or outbreaks in wild boar and domestic pigs have been detected in the EU countries Estonia, Latvia, Lithuania, and Poland.

4. Conventional strategies to develop a vaccine have not been successful and no vaccine currently exists. Front line diagnostic tests are lacking. The nature of virus-host interaction, the carrier state and the basis of immunity against infection are poorly understood, as is the role of ticks as reservoirs of infection.

Risks

5. Changes in production practices and increased globalization have increased the risk of ASF being introduced into free areas. The main risk of ASF introduction into Europe remains via infected pig meat or meat products, for example illegally imported pig meat or bush meat from infected countries or legally imported meat from areas with undetected infection. Events have proved that the threat of ASF spreading to other regions remains and it is potentially devastating to the global pig industry.

Diagnostics

6. Currently a number of good and fast diagnostic tools are available for both virus and antibody detection. Most of the existing tools allow early detection of the disease and a confident diagnosis in any epidemiological situation of African and European affected countries. An increasing number of commercial kits (serology, PCR) have become available in the last few years. The new validated real time PCRs have been shown to provide higher sensitivity for the detection of carriers animals surviving the infection. On-site first-line tools have been developed and there are validated commercial tests available. Nevertheless, ASF

diagnosis is complex and some gaps and needs are pending yet. Some epidemiological information and virus transmission characteristics are gaps of great importance as influencing the strategy, quality and reliability of ASF diagnosis. Some needs include i) expansion of field validation for all tests and appropriate specimens; ii) standardization and validation of ASF diagnosis in alternative types of samples; iii) there is a lack of established cell lines that makes virus isolation a cost-effective test for its implementation at the National Reference Laboratories; iv) development of new diagnostic tools should be directed to assure the detection of survivor animals and carriers; and v) improvements in molecular characterization tests to determine the source of the outbreaks.

To support surveillance and control/eradication programmes, the diagnosis of ASF should involve the simultaneous detection of specific antibodies and identification of the virus (DNA/Antigens) in the same animal.

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Vaccines

7. Attempts over many years to develop inactivated or attenuated vaccines to ASF have failed. Conventional strategies for a vaccine have not been useful to date. Inactivated vaccines have conferred no protection. Attempts to attenuate the virus through passage in cell culture and/or macrophages induced some protection but are not totally safe. To date DNA vaccine strategies have not been successful nor have the deletion mutant strategies. There is little commercial interest in licensing of new vaccines due to potential demand. A better understanding of the immune response to infection and the humoral and cellular basis for the lifelong immunity post infection is needed with the identification of target proteins or genes.

Pharmaceuticals

8. There may be some potential for the use of antivirals in ASF control but there would be considerable problems in both developing and licensing such products.

Knowledge

9. Many gaps have been identified in the understanding and knowledge about ASF. Research is needed to fill these gaps, many of which are closely linked to the research requirements to develop more effective tools for the control of the disease. Considerable work is needed to elucidate the immune response to infection especially the characterization of viral interactions with pig macrophages and with the host (domestic pigs). ASFV infection with isolates exhibiting different virulence need to be well characterised at genome level. This may open new insights for the manipulation of pig immune responses, towards the stimulation of protective immune response.

10. Persistence mechanisms of the virus in the host are poorly understood. Strains and isolates need to be investigated to gain an understanding of the pathogenesis mechanism of infection by ASFV of different virulence along with potential changes in virulence ofcirculating isolates.

11. There are gaps in the understanding of transmission and spread, reservoirs, carriers and the geographical distribution. The vector capacity in Caucasus and ticks biting habits needs to be investigated. Full details of these gaps are shown in the Disease and Product analysis for ASF on the DISCONTOOLS website.

Conclusions

12. ASF has the potential to enter free countries if sanitary and border controls are ineffective. The development of effective vaccines for contingency use in Europe and for routine use in endemic countries would be advantageous.

13. Current diagnostic tests are relatively rapid but require centralised laboratory facilities and clinical specimen submissions which delays disease diagnosis. Pen side tests could improve the speed of diagnosis,

14. There is an important need to improve awareness of the disease of field staff, veterinarians and producers.