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 2022. 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/.

Disease profile

2. ASF is a serious viral disease of pigs with highly pathogenic strains that can cause high mortality in naïve pigs. Attenuated virus isolations are also present in endemic countries. They cause clinical symptoms and lesions that are different from the acute form. 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. The virus causes a lethal haemorrhagic disease in domestic pigs and wild boar. In African species (warthogs and bushpigs) infections are generally asymptomatic; also in areas with attenuated strains, the clinical signs and lesions are less acute and more chronic. 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 infected pig products. Disease outbreaks have occurred in Africa, Asia, Europe, South America (Brasil) in the 1950s-1990s and the Caribbean in 2021, and the cost of eradication is significant. ASF is now established 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 as Ukraine and Belarus. In earlier 2014, ASF cases in wild boar were reported in Lithuania and Poland in bordering regions with Belarus. ASF cases or outbreaks in wild boar and domestic pigs have been detected in many EU countries including Estonia, Latvia, Lithuania, Poland, Germany and Italy.
3. The nature of virus-host interaction, the carrier state and the basis of immunity against infection are still poorly understood, as is the role of ticks as reservoirs of infection.

Risks

4. 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 proven that the threat of ASF spreading to other regions remains and is potentially devastating to the global pig industry.

Diagnostics

5. 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) are available. The new validated real time PCRs have shown to provide high sensitivity for the detection of carrier animals surviving the infection. On-site, first-line tools have been developed and there are validated commercial tests available. Nevertheless, some gaps and needs remain present. Epidemiological information and virus transmission characteristics are gaps of great importance because they influence the strategy, quality and reliability of ASF diagnosis. 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) established cell lines that make virus isolation a cost-effective test for its implementation at the National Reference Laboratories; iv) development of new diagnostic tools 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

6. Conventional strategies for a vaccine have not been successful. 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. DNA vaccine strategies have not been successful to date. On the other hand, deletion mutant strategies are giving good results in both protection, safety and DIVA performance: vaccine prototypes such as those developed from the EU VACDIVA project and other research teams in the USA, Europe and Asia are expected to be on the market in the coming years.
7. A better understanding of the immune response to infection and the humoral and cellular basis for the lifelong immunity post infection remains needed, together with the identification of target proteins or more genes related with a safe protection.

Pharmaceuticals

8. There is some potential for the use of antivirals in ASF control and could be easy to mix in feed formulations but there are considerable challenges in both developing and licensing such products.

Knowledge

9. 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 needs to be well characterized at genome level and may open new insights for the manipulation of pig immune responses.
10. Persistence mechanisms of the virus in the host are poorly understood. We need to gain an understanding of the pathogenesis mechanism of infection by ASFV of different virulence along with potential changes in virulence of circulating isolates.
11. There remain some 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.

Conclusions

12. ASF has the potential to enter free countries if sanitary and border controls are ineffective. The development of effective, safe and DIVA 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 are improving the speed of diagnosis.
14. There is an important need to improve awareness of the disease of field staff, veterinarians and producers.