African swine fever: how can we stop it from spreading?

African swine fever (ASF) does not need an introduction. The characteristics of the virus have been described in numerous scientific articles. The epidemiology of the recent spread has been studied in great detail. All the details about how genotype II of this ASF virus is travelling around the globe are well known. Journals, magazines, and websites have been full of reports over the alarming situation in a steadily increasing number of countries. There are also success stories but they are few. Most reports are dramatic when describing the economic damage, the social disruption in rural areas, the psychological impact on pig farming communities, the empty shelves signalling the reducing pork supply in bigger cities of China, etc. Is there nothing that can be done to stop this tragedy?

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Before trying to answer this question, some aspects involved in the spread need to be considered. It all starts with the virus, secondly the role of domestic pigs and wild boars, and last but not least it is the human involvement that has proven to be a crucial aspect in the control programme.

African swine fever virus

The structure of ASF was recently detected by using electron microscopy. A quote from researchers stated that 'the cryo-EM structure of African swine fever virus unravels a unique architecture comprising two icosahedral protein capsids and two lipoprotein membranes. This high-level organisation confers to ASFV a unique architecture among the nucleocytoplasmic large DNA virus (NCLDV) that likely reflects the complexity of its infection process and may help explain current challenges in its control'.

The genotype II of ASF virus affecting pigs is not very contagious and direct contact is needed. It is far less contagious than, for example, CSF or FMD virus, but the virus is very pathogenic. Close to 100% of the ASF virus affected pigs die within 10 days. The immune apparatus of the pigs has no chance to provide any sort of immunity against ASF virus in that short period of time.

Delicious pork meat. The whole industry must ensure that it is free of ASF virus.

The percentage of ASF seropositive wild boars is still very low (<2.0%). This can be considered a good sign because no ASF virus carriers are present. But on the other hand, because there is no immune population, the infection will not die out by itself. There will be always naïve animals.

The ASF virus is also a bug of 'steel'. It can survive for long periods in all kind of edible materials. The OIE has issued a study on the survival of ASF virus in different materials and Kansas State University determined the half-life of ASF virus in feed ingredients.

Both revealed that all materials tested under their conditions can be a prolonged source of ASF virus infection. Epidemiology could not demonstrate any evidence of airborne infection, which should make control easier.

There are promising reports on the development of a vaccine. But here caution is in place because there are still many questions to be answered and regulations to be altered before it can be used.

In summary, the combination of a virus that will survive for longer periods in all kind of (edible) materials, that either has been in contact with pork or contains ingredients of pork origin, that is transported over the globe, combined with the presence of an ASF naïve pork (and wild boar-) population that encounters possible ASF infected materials, makes control of ASF very difficult.

Domestic pigs versus wild boar (or feral pigs)

The role of domestic pigs in the epidemiology of ASF differs from the role of wild boar or feral pigs.

In wild boar an ASF reservoir will be created by continuous infection, which might lead to infections in the domestic population. In countries where the soft tick is present, the tick will act as an reservoir.

When the wild boar gets sick it will seek shelter and in the case of ASF, it will die in the sheltered place. This can be in the forest but also inside a corn field, contaminating the harvested corn. When that harvested feed is fed within a short period after the harvest, domestic pigs can be infected.

In countries where biosecurity is at a high level (for example Belgium, Czech Republic and Poland) and harvested feed is only fed some months after harvesting, only very seldom will the wild boar population act as a source of infection for the domestic population.

The situation is totally different when the ASF virus infects the domestic pig population. Now there are a lot of possibilities for direct and indirect contact between the infected population and the non-infected domestic pig population.

The current global spread of the ASF virus in the domestic population is almost exclusively caused by material of domestic pig origin. Even a number of infections in the wild boar population can be traced back by making infected domestic pork material accessible to these wild boar.

In conclusion, many attempts are made to reduce the wild boar population in order to control the spread of ASF, while the main source of ASF virus for both the domestic pig as well as the wild boar population, are products made of the ASF virus infected domestic pig population. Only seldom are

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ASF virus infected wild boar products involved. This makes controlling ASF infection in pigs a problem for the industry keeping domestic pigs. Why is this such a problem?

Human involvement in controlling the spread of ASF

At ESPHM2018, the keynote lecturer in the ASF session posed the title 'ASF is a human driven disease' to the audience. Dr Klaus Depner, and also other scientists, tried to make it clear that the human factor is an extremely complicated matter.

There are many different individual aspects that play a role when small scale pig farmers, small scale meat processors and meat traders get confronted with a possible loss of income.

There are many examples reported, including a director of a zoo who bought tons of pork from (ASF infected) Vietnam because the zoo was losing money and the animals needed to be fed. This was done in an attempt to survive and they were willing to take risks to do so.

But this is the key message: in the case of controlling the spread of ASF the industry cannot take any risk. ASF virus infected pork should never end up in any of the food chains. Not in the human food chain but also not in the feed chain for animals. If the industry cannot control the risk that some of the parties involved are willing to take, ASF will continue to spread around the globe.

The risks are clearly identified and reported in all kinds of communication materials. However, discipline to adhere to the recommendations and control of proper execution is often lacking. This is mostly fuelled by a loss of income when applying the no-ASF-virus-spreading-risk attitude. On the other hand, providing financial compensation might lead to over reporting, which is another typical human peculiarity.

In countries with low biosecurity standards and greater backyard farming or outdoor production, ASF will enter the domestic pig population first, mainly by swill feeding, and from there it will enter the wild boar or feral pig population because of unsuitable, lacking or insufficient rendering capacity. These countries will focus on ASF virus freedom in the domestic population.

In countries with high biosecurity standards, ASF might enter the wild boar population through international travellers coming from countries where risks are taken. In these, often more sophisticated countries, an increasing level of outdoor production is present. This has to stop immediately. Contact between wild boar and outdoor raised domestic pigs cannot be prevented by any (affordable) means. These countries will focus on ASF virus freedom in the wild boar population or eradicating the wild boar population, as some states in the USA are currently investigating.

Border control of possible ASF infected materials is essential. This is not only for free countries on incoming goods, but ASF infected countries also have a global obligation to help in controlling the spread of ASF virus by checking outgoing goods.

Conclusion

Yes, ASF virus spread can be stopped. Spreading is 100% a human activity and so is its control. The industry supplying services and ingredients, the pork producers themselves and the pork processing industry need to all be convinced that they can do it together. Their work must be coordinated and they should take a no-risk approach.

When all ASF infected material is kept away from the domestic pig population, no new cases will occur.

Early diagnosis (on-site PCR test), the correct disposal of all pigs on infected farms, proper disinfection and strictly adhering to restocking procedures, frequent checking of meat processing plants and meat on the market, are just a few of the recommendations.

In a no-risk scenario, a comprehensive list is a long one! ■