Case report/Fallbericht

Food and Veterinary Service, Riga, Latvia
Institute of Food Safety, Animal Health and Environment – "BIOR", Riga, Latvia

African swine fever outbreak investigations in a large commercial pig farm in Latvia: a case report

Untersuchungen eines Ausbruchs der Afrikanischen Schweinepest in einem großen kommerziellen Schweinebestand in Lettland: ein Fallbericht

Kristīne Lamberga1, Mārtiņš Seržants1, Edvīns Oļševskis1,2

Summary

In Mid-January 2017 a large commercial pig breeding farm in Latvia with almost 5000 animals was affected by African swine fever (ASF). Epidemiological investigations using a hypothesis based approach were conducted to trace the source of virus and to reconstruct the course of the disease until notification. Although the farm was located in an area where the disease is circulating in the wild boar population, it was found highly unlikely that wild boar might have played a direct role in this outbreak. Management inconsistencies related to human behavior proved to be the main vulnerabilities for virus introduction. Farm management did not fulfill biosecurity requirements in all aspects to prevent virus introduction. Therefore, the human factor could not be ruled out and has been considered to be the most serious risk factor. Most probably the ASF virus entered the farm beginning of December 2016, about six weeks before disease confirmation.

It was concluded that early detection of ASF by passive surveillance is most crucial and has to be improved. In risk areas dead pigs should be compulsory tested for ASF even if farm mortality is below the normal threshold.

Keywords: Outbreak investigation, Biosecurity, African swine fever

Zusammenfassung


Schlussfolgernd ist die Früherkennung von ASP durch passive Überwachung wesentlich und muss verbessert werden. In Risikogebieten sollten tote Schweine verpflichtend auf ASP getestet werden, selbst wenn die Mortalität des Betriebes unterhalb des normalen Grenzwertes liegt.

Schlüsselwörter: Ausbruchsuntersuchung, Biosicherheit, Afrikanische Schweinepest
**Background**

The epidemic currently affecting parts of Eastern Europe started in Georgia in 2007 and has reached the eastern borders of the European Union at the beginning of 2014 (European Food And Safety Authority 2015, European Food Safety Authority et al. 2017, Sanchez-Vizcaino et al. 2013,). First cases of infected wild boar were reported by Lithuania in January 2014, followed by Poland, Latvia and Estonia. The African swine fever virus (ASFV) entered Latvia from the South East of the country and continued to spread westwards and northwards. By May 2018 Latvia notified over 3000 cases in wild boar and 53 outbreaks in domestic pigs (Table 1, Figure 1). The course of ASF in wild boar proved to be very complex and difficult to control (European Food Safety Authority et al. 2017) and about 87% of Latvia had to be placed under trade and sanitary restrictions (European Commission 2014,). Apart from the Baltic States and Poland where the disease became endemic in wild boar populations further cases and outbreaks were reported from Romania, Moldova, Czech Republic and Hungary during 2017 and 2018. In contrast the outbreaks in domestic pigs could be controlled timely and without major problems. Apart from three outbreaks which affected large commercial farms, all other outbreaks occurred in small farms or back yard holdings.

In case of an outbreak a timely epidemiological investigation has to be conducted to identify the possible origin of the ASFV and to estimate the high risk period, which is the length of time during which ASFV was on the farm before notification (Anonymus 2002). All direct or indirect contacts with the outbreak holding during the high risk period have to be regarded as suspect and followed up accordingly.

**Case presentation and chronology of events**

The case report presented is an observational study in a large pig breeding farm with almost 5000 animals (sows, piglets and boars) in Krimuldas County where ASF was confirmed mid-January 2017. After weaning, piglets were delivered to a fattening farm, which was located 50 km away and belonged to the same company. The last delivery of piglets took place one day before outbreak confirmation. Three weeks later ASF was confirmed also in the fattening farm.

The animals were kept in seven separate stable buildings with a common yard. At the entrances of each stable there were no sanitary filters. Based on the information received...
from the farm manager apparently the first health problems started in stable No. 5 where pregnant sows were kept in groups. According to the farm records (necropsy documents) the first sow with lesions died on 28th of December, 2016. Four pigs showed loss of appetite and vomiting on the 2nd of January and were found dead on 4th of January. Another dead sow was found on 6th of January, followed by one on 9th, one on 11th, 4 on 12th and 6 sows on 13th of January. On 9th of January several sows were moved from stable No. 5 to stable No. 6A for farrowing. Two of those pigs were found dead on 12th and 13th of January. The movement of sows from stable No. 5 to stable 6A was considered as ASFV introduction to stable No. 6A. Breeding boars were kept in a separate stable (No. 2). In this stable, the first boar was found dead on the 7th January and a second one on the 14th January. However, no sampling was carried out for laboratory investigations. On the 14th January another boar found dead on 12th and 13th of January. The movement of No. 5 to stable No. 6A for farrowing. Two of those pigs were found dead on 12th and 13th of January. The运动 of

Discussion and Conclusion

Possible length of time during which ASF may have existed on the farm
A time-line of the potential course of the disease was created based on laboratory results, anamnestic data, and records on morbidity, mortality and post mortem findings. In December (19th and 28th December) pathological changes which where indicative for ASFV (enlarged spleen and hemorrhages) were noted in two dead sows of one stable. However, no samples were taken for laboratory confirmation. During the first two weeks of January an increased morbidity and mortality of sows was noticed, particularly in one stable where 17 sows died. ASF was suspected and first samples were taken from five sows which died on 13th January. All five samples were positive for ASF viral DNA. In addition, 50 live pigs from the same stable were sampled and only four of them were positive for ASF viral DNA. In total, 75 animals were sampled and tested for the presence of ASF viral DNA and antibodies. No ASF antibodies were detected, while ASF viral DNA was found in 23 animals. The absence of seropositive animals supports the assumption that no chronic or sub clinical forms of ASF occurred. All infected animals must have died, before detectable antibodies were present in the blood.

Taking into consideration the incubation period of ASF of few days up to one week (Blome et al. 2013), most probably the ASFV entered the farm at the beginning of December 2016 about six weeks before disease confirmation. However, regardless of the time point of virus introduction (early December or later) the virus spread within the farm was very slow; only relative few animals were affected until beginning of January. This slow spread can be explained by the low contagiousness of the virus and the housing of sows within the stables. It indicates that virus transmission from one animal to the next is rather a slow process. Infected blood plays a major role in virus transmission. Efficient transmission takes place when diseased animals start bleeding or when they die and susceptible animals start licking and nibbling on their carcasses (Pietschmann et al. 2015). Our findings do not support a massive virus introduction. If a high amount of virus would have been introduced (e.g. via contaminated feed or several infected animals), a rapid and fulminating disease development would have been expected. More probable is the introduction of small amount of virus infecting initially only one or few animals. The mortality during the beginning phase of the disease did not exceed the normal mortality threshold of the farm, which might have been the main reason for not suspecting ASF much earlier. If the dead sows from December, which showed pathological changes, had been tested for ASF, it is most likely the disease would have been diagnosed much earlier and infection of the fattening farm, which took piglets from the breeding unit, could have been avoided.

Biosecurity and risk pathways

The initial impression of the farm setup was that it seemed to be suitable for pig farming in an area, where ASFV is the disease. However, interviews and in-depth assessment revealed that the daily management of the farm did not fulfill biosecurity requirements in all aspects to prevent virus introduction (Table 1). The weakest points were the sanitary filters (locker rooms) for the staff and the entry points of the farm. The locker and resting rooms were not aligned to provide clean separation between staff reception areas and the animal accommodation. The farm employees could bring and consume their own food inside the farm. Taking into consideration that it was the cold period of
the year (winter time) when ASF was circulating on the farm, failure in disinfection efficiency cannot be excluded and also documentary evidence of proper disinfection of vehicles was missing.

It was considered that a significant contribution to poor biosecurity may have been the large turnover of staff (almost 50%) in the 10 weeks prior to confirmation of disease, which had poor biosecurity training and awareness of the risks of ASF.

In a previous ASF study in Latvia in 2014 it was reported that biosecurity shortcomings were the common finding and the most serious factor responsible for virus introduction in pig holdings, either via the link to infected wild boar or via swill feeding (Oļševskis et al. 2016). Our findings confirmed that inadequate farm biosecurity is still a major issue. Good farm biosecurity is considered to be the most important tool for preventing ASFV introduction on a holding (Bellini et al. 2016).

The possible origin of ASFV on the holding (Table 2)

Wild boar hypothesis

Although the study farm was located in a restricted area due to ASF in wild boar, no direct or indirect contacts with wild boar were identified. The farm is fenced in by a newly build fence which effectively prevents the access of wild boar. No wild boar or traces of wild boar have been seen in the nearby vicinity. The closest ASF positive wild boar was found about 4.4 km away from the study farm 4 months before outbreak confirmation. Furthermore, no indirect contacts to the wild boar environment were identified. No feed or bedding originating from areas where infected wild boar might have had access entered the farm. No farm employees or other persons visiting the farm participated in hunting or were otherwise involved in activities linked to wild boar. Based on these findings it is highly unlikely that wild boar might have played a direct or indirect role in this outbreak.

Fomites and meat hypothesis

The role of fomites or of contaminated meat or meat products as a potential source of ASFV could be addressed only indirectly by interpreting the biosecurity findings (Table 1). Due to the insufficient biosecurity, infectious material could have entered the farm anytime and ASFV introduction by people could not be ruled out.

Trade hypothesis

The study farm did not receive any live pigs during previous 12 months. Therefore, virus introduction via infected pigs could be excluded (trade hypothesis). However, the opposite was the case. Weaning piglets were regularly delivered to a fattening unit belonging to the same company where ASF was later confirmed. The fattening unit was located around 50 km from the breeding unit. Apart from movements to the fattening farm, one gilt was sold to a small holding and one boar to another small holding in October 2016. However, none of these holdings became infected. Considering incubation period and possible time when ASFV was on the farm, the above mentioned movements took place before the breeding farm was infected.

Conclusions and lessons to be learned

The hypothesis based working approach proved to be a suitable tool to conduct epidemiological investigation, particularly to exclude some potential ways of virus introduction. However, certain risk factors remained unclear, particularly some aspects related to human activities on the farm.
Nevertheless, the human factor proved to be the main risk for ASFV introduction on pig farms. Therefore, farm biosecurity has to be addressed more rigorously, particularly all aspects related to human activities. Information campaigns with all stake holders (farmers, veterinarians and staff) are a vital issue.

Early detection of disease is essential to keep the high-risk period as short as possible; passive surveillance must be enhanced in ASF restricted and risk areas. In breeding farms all dead gilts, sows and boars must be compulsory tested for ASF, even if farm mortality is below the normal threshold. In fattening farms at least the first two deaths in each production unit each week, should be tested for ASF virus.

Acknowledgements

The authors wish to thank Dr. Klaus Depner for a critical review of the manuscript and to Dr. Fred Landeg for reviewing the English. The authors also want to thank Dr. Katja Schulz and Nicole Reimer for helping to draft the manuscript and Figure 1.

Conflict of interest

The authors declare that they have no competing interests.

Funding

This article is based upon work from COST Action (ASF-STOP CA15116), supported by COST (European Cooperation in Science and Technology).

Ethical Approval

Not applicable.

Authors contribution

KL, MS, and EO designed and conducted the study, KL and EO drafted the manuscript.

References


Address of correspondence:

Kristīne Lamberga
Food and Veterinary Service
Peldu iela 30
Riga
LV-1030
Latvia
kristine.lamberga@pvd.gov.lv