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African Swine Fever (ASF) Outbreak in the Kalinga State University Native Pig R&D Project: The Yookah Depopulation Ordeal

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Abstract— *The outbreak of African swine fever in the Yookah Native Pig R&D Project is really a devastating experience, not just wasted financial assistance but most difficult feeling in the part of the researchers who put all their time and effort to produce research results and new knowledge and technology significant in the native pig industry. The objective of the study looked into the factors that caused the outbreak and identified the preventions and controls done during the outbreak. It is found out that human negligence is the number one factor that causes the spread of ASF. But, a good biosecurity protocol and strict implementation of farm rules can somehow prevent and control the spread of the disease in the farm. Based from the results and conclusions of the study, the following is recommended to somehow control and prevent the spread of the disease (1) with or without disease outbreaks, farm biosecurity protocols should be strictly implemented; (2) once confirmed through laboratory test that there is ASF positive in the herd, depopulation of the entire herd is necessary; and (3) if a certain area has still positive cases for ASF, repopulation or acquiring new herd should be avoided. May these ASF outbreak ordeal will serve as a lesson to each and every researcher to be more objective in their approach in conducting researches to avoid uncontrolled situations like this.*

Keywords— ***Yookah, Native pig, African Swine Fever, Outbreak, Depopulation.***

I. INTRODUCTION

African swine fever (ASF)

This disease can affect pigs of any age. High mortality rates. The key clinical signs include blue-purple cyanosis of snout, ears, tail and lower legs; high fever; and heavy discharge from eyes and nose. This disease is notifiable – contact your vet and local authorities if you believe this disease is affecting your herd.

Background and history

African swine fever (ASF) resembles classical swine fever (CSF) (hog cholera) so closely that laboratory tests are required to differentiate them. The clinical signs and post-mortem lesions of the two diseases are almost indistinguishable. ASF is caused by a unique virus which is distinct from that of CSF and which infects only domestic and wild pigs and a variety of soft bodied ticks. The virus is endemic in Africa south of the equator, in warthogs and bush pigs, but the infection in them produces no clinical disease. It circulates between warthogs and the soft bodied ticks which inhabit their burrows. The ticks transmit it through all stages of their life cycle and perpetuate it. It is also endemic in the domestic pigs of some African countries.

The pig (and its close relatives, boars and hogs) is the only natural host of the double-stranded, *Asfarviridae* family of viruses, meaning the virus does not cause harm to humans or other animals. This does not mean that humans and other animals cannot spread the virus as carriers; African swine fever (ASF) is commonly carried by arthropods, such as the soft-bodied tick, through uptake of blood from infected pigs.

Contamination generally occurs via direct contact with tissue and bodily fluids from infected or carrier pigs,

including discharges from the nose, mouth, urine and feces or infected semen. It also spreads through transport and consumption of contaminated food products, and some cases have originated from failure to comply with biosecurity standards by feeding waste food to domestic pigs. It is believed that a highly pathogenic strain of ASF was introduced to domestic pigs and, subsequently, wild boar populations in the port of Poti, Georgia, in 2007 when waste food from a ship originating in South Africa was fed to local pigs.

Although the virus in wild boar and hogs does not manifest any signs of the disease, it remains highly contagious across all swine species and can survive in pigs for long periods of time post-slaughter – even in frozen carcasses. It is also important to note that curing and smoking pork products does not destroy the virus.

It is vital to immediately distinguish the disease that is infecting a herd; ASF and classical swine fever are caused by very similar viruses which are only distinguishable by laboratory testing. Notifying a vet as soon as any signs arise is the best way to ensure the correct quarantine and treatment procedures are followed – it could save the rest of your pigs.

Clinical signs

- High fever 40-42°C.
- Loss of appetite.
- Depression.
- Lethargic- sometimes refusal to stand or move.
- Very unsteady when stood up.
- Vomiting and/or diarrhea with bloody discharge.
- White skinned pigs: extremities (nose, ears, tail and lower legs) become cyanotic (blue-purple color).
- Discrete hemorrhages appear in the skin particularly on the ears and flanks.
- Group will huddle together and are usually shivering.
- Abnormal breathing.
- Heavy discharge from eyes and/or nose.
- Comatose state and death within a few days.
- Some pigs can show conjunctivitis with reddening of the conjunctival mucosa and ocular discharges.

Pregnant sows commonly undergo miscarriage or deliver stillborn piglets that are malformed – piglets can be tested for the virus.

Mortality rate in infected groups of pigs is high and there is no vaccination proven to prevent or cure infection, therefore, it is crucial that control begins on-farm. European, South American and Caribbean countries which have been infected have adopted a slaughter policy to eradicate the virus within the herd. Mild strains of the virus also occur which cause a milder but equally serious disease in domestic pig herds – individuals from these herds must also be slaughtered to prevent pathogenesis.

Diagnosis

Pigs that die early in an outbreak may not have any noticeable lesions but as the disease progresses the lesions then are striking. Bright red hemorrhages in the lymph nodes, kidneys, heart and linings of the body cavities are common findings. There may also be excess hemorrhagic fluid in the body cavities and gelatinous fluid in the lungs. The spleen may be enlarged, darkened and crumble on slight pressure.

The veterinarian will have to send samples to a laboratory which specializes in CSF and ASF diagnosis. The best samples to send are blood, lymph nodes, spleen and, in chronic cases, serum for serology. In the case it is CSF and not ASF, the tonsils might also be sent. The veterinarian should consult the appropriate veterinary authorities on how best to send these.

The tonsils of the pig are very easy to find. Laying the dead pig on its back, cut away the skin and flesh under and between its lower jaw bone and tongue. The pair of tonsils are two large red patches each about the size of the end half of your thumb or perhaps slightly bigger. Their surfaces are covered with small pits or depressions.

In South Africa and countries outside Africa it is essential to isolate and identify the virus. Only about six laboratories in the world can do this. In African countries where the disease is endemic in the domestic pig population, the veterinarian may only send serum samples for antibody detection.

The virus may be isolated in primary cultures of pig bone marrow or peripheral blood leucocytes. Infected cells hemadsorbie, pig red cells will adhere to them. Virus can also be detected in infected cells by fluorescent antibody tests. ELISA tests are also used to detect antibodies. In doubtful cases samples can be injected into experimental pigs.

Serum antibody titers may be tested in a number of ways. The indirect immunofluorescence (IIF) and the ELISA tests seem to be the most favored.

Note that porcine dermatitis and nephropathy syndrome, which occurs from time to time in most pig rearing areas can resemble ASF and CSF clinically and at post-mortem

examination. Laboratory examination may be necessary to eliminate them form the diagnosis.

Cause

African swine fever is caused by the *Asfarviridae* family of viruses which are distinct from the viruses associated with Classical swine fever. There are 22 known types of the ASF virus, allowing the epidemiological tracing of outbreaks to the source.

The infection can be introduced to uninfected herds in a number of ways:

- the feeding of contaminated feed and contaminated food waste used to supplement feed;
- through the bites of soft-bodied ticks, lice and flies;
- through inoculation with contaminated syringes and use of contaminated surgical equipment; and
- through the introduction of infected pigs to the herd.

Transmission of the virus within the herd is generally through direct contact with infected bodily discharges, feces and vomit.

Prevention

There is no live or attenuated vaccine for the prevention of ASF therefore control of the virus is reliant on strict biosecurity.

- Do not feed domestic pigs food waste; this is illegal in the UK, other EU regions and some states within the US
- Where 'permitted garbage feeding' is legal in US states, pigs fed this way are prohibited from exportation.
- Do not leave food waste exposed for wild swine species to access. Dispose of food waste properly.
- Abide by strict biosecurity rules. Do not take pig meat onto farms, or restrict all food (and consumption of food) to a canteen. All staff on farm should be inducted onto a strict program of hand and equipment sanitization before and after contact with pigs.
- Follow rules and regulations on disposal of food waste at ferry ports and airports.
- Provide the means for staff and visitors to thoroughly sanitize their hands and equipment.
- Ensure that wild boar, warthogs and wild pigs, and materials potentially contaminated by such wild species do not come into contact with domestic pigs.
- Check infected regions before import of goods that could potentially be contaminated.
- Advise and educate people on the risks of bringing back pork products from infected regions.

Treatment

There is no treatment.

All infected animals must be isolated and culled immediately upon confirmation of presence of the virus.

Analysis of the Problem

The City Veterinary Office (CVO) has intensified efforts to contain spread of African Swine Fever (ASF) disease in this city.

This following swine blood samples from barangays San Julian and Bulanao Centro that were brought for laboratory test at the Bureau of Animal Industry had been found ASF-positive, Carmen Wanas of the CVO said. At least 63 pig deaths in barangay Bulanao Centro and 38 in barangay San Julian were reported. Immediately the CVO enforced the 1-7-10 kilometer protocol on these barangays, where pig depopulation is mandatory within the 1-kilometer radius, tight surveillance within the next 7 kilometers and close monitoring within the 10 kilometer radius. House to house disinfection is also made to prevent spread of the ASF virus to other barangays.

Wanas said they also distributed health support items, vitamins and disinfectants to other barangays especially in places with reported ASF mortality. They continue gathering blood samples in various sites of the city for confirmatory test.

The CVO has also intensified barangay level information and education campaign on ASF.

At the city slaughter house, disinfection procedure is made to all pigs before they are slaughtered as well as to people entering and leaving the facility.

Tabuk City is now on lockdown where entry and exit of live pigs, pork and other processed pork products is banned

II. REVIEW OF LITERATURE

Epidemiological considerations on African swine fever in Europe 2014–2018

Background

African swine fever (ASF) is a fatal viral disease of pigs, affecting domestic pigs and wild boar of all ages without sex predilections (ML Penrith, et al., 2013). Depending on virus strain and immunological status of the animal, infection can lead to a wide range of clinical presentations varying from per-acute to chronic disease, including apparently asymptomatic courses [C. Gabriel, et al. 2011 & JM Sanchez-Vizcaino, et al., 2015). Infection with virulent strains typically causes per-acute to acute lethal ASF with signs including sudden death, high fever, hemorrhages in the skin and internal organs. The animals usually die within three to ten days after infection and the case fatality rate can reach 90% or more.

In most cases, high titers of ASF virus (ASFV) can be found in the blood of infected animals from the time they develop clinical signs. Thus, transmission through contact with infected animals mainly happens once clinical disease is evident. Transmission can either occur directly through close contact with infectious animals or indirectly through ingestion of infected pork products or contact with fomites, and possibly via mechanical vectors (ML Penrith, W Vosloo, 2009). In addition, the virus can be efficiently transmitted through the biological soft tick vector, genus *Ornithodoros* spp., where this is present. However, the *Ornithodoros* spp.is not considered to play a role in the epidemiology of ASF in the current epidemic in Central and Eastern Europe. In absence of the tick vector, the most efficient way of virus transmission is via direct contact with blood from infected animals.

Epidemiology

Until recently ASF epidemiology was described as comprising three independent epidemiologic cycles (sylvatic, tick–pig, and domestic), involving soft *Ornithodoros* spp. ticks, wild African pigs (mainly warthogs), domestic pigs, and pig-derived products such as pork (S. Costard, et al. 2013) In the sylvatic cycle, ASFV circulates between the natural reservoirs of the virus (i.e., warthogs and soft ticks), without causing disease in the vertebrate host (W Plowright, et al, 1994). This ancient cycle is the origin of the tick–pig cycle and the domestic cycle, and thus the origin of ASF as a disease. In the tick–pig cycle, the virus is mostly transmitted among domestic pigs, with the ticks serving as a reservoir allowing the virus to persist locally in the environment (PJ Wilkinson, 1984). This cycle has been described in parts of sub-Saharan Africa, but also played an important role for the persistence of the disease during the epidemic on the Iberian Peninsula in the ‘60s and ‘70s of the past century (FS Boinas, 2011). In the domestic cycle, which is the cycle involved in the vast majority of outbreaks of ASF globally(ML Penrith, W Vosloo, 2009), the virus is transmitted among domestic pigs, or from pig products to domestic pigs. This cycle does not involve the natural reservoirs. The epidemiological pattern observed from the current ASF epidemic in Central and Eastern Europe, however, does not match any of the previously described cycles. Rather it revealed an additional epidemiological cycle including Eurasian wild boar (*Sus scrofa*), the wild boar habitat and their carcasses. This fourth cycle has been named the wild boar–habitat cycle (e Chenais, 2018). This cycle is characterized by both direct transmission between wild boar, and indirect transmission via the habitat. The habitat contamination through ASFV infected wild boar carcasses offers possibilities for new infections depending on landscape, time, season and carcass decomposition (C Probst, 2017). Environmental persistence of the virus is favored by cold and moist climate.

Transmission

From the start of the current epidemic in 2007, until the detection of the first case inside the EU in 2014, infections were mainly seen among pig farms with generally low biosecurity, and with incidental spill over to the wild boar population. At that point in time, it was predicted that the disease would spontaneously fade out from the local wild boar population as soon as the disease was under control in the domestic pig population, due to the high case fatality rate and the absence of long-time carriers (A Petrov, et al., 2018). However, in the ecological context which prevailed in Poland and the Baltic states this epidemiological hypothesis proved to be wrong. The infection survived locally in the wild boar population independently from outbreaks in domestic pigs, with a steady and low prevalence below 5% and a local transmission speed of 2–5 km/month (K Depner, et al., 2017). In addition to the local transmission within the wild boar population, long distance jumps responsible for disease incursion into areas far from known infected regions occurred. In the EU the most recent events of such long distance ASF spread took place in the Czech Republic (Zlin area), Poland (area of Warsaw), Hungary and Belgium. These recently infected areas were each several hundreds of kilometers away from previously known infected regions. Likewise, in early March 2017 an ASF outbreak was reported from the Irkutsk Region in the RF, close to the Mongolian border, more than 4000 km away from the nearest outbreaks in the European parts of the RF (D Kolbasov, et al., 2018), and more recently in August 2018 a first outbreak was reported from the province of Liaoning in north-eastern China (X Zhou, et al., 2018). The described long-distance jumps are most probably attributable to human activities (anthropogenic factors), e.g. transport of contaminated meat or meat products

ending up as waste or kitchen leftovers either in pig stables or in natural environments inhabited by wild boar (P Satran, 2018). These examples demonstrate that due to the anthropogenic factors, ASF has a huge capacity of transboundary and transcontinental spread (S De la Rocque, et al., 2011).

OBJECTIVES

The study looked into the ASF outbreak at the Yookah Native Pig R&D Project. Specifically, it aimed to:

a. identify the factors that cause the outbreak; and
b. identify the preventions and controls done during the outbreak.

III. MATERIALS AND METHODS

Materials

Before the ASF outbreak, the total inventory of the herd as of December 31, 2019 was 83;with 23 sows, 6 boars, 36 growers and 23 weanlings. This study was conducted in the KSU Yookah Native Pig R&D Farm.

Methodology

On January 1 to 15, 2020, an average of 3 mortality per day was recorded, only 15-surviving herd of the Native Pig R&D project was left. The SRA of the project, Dr. Mark Stephen Ballog reported the incident to the City Veterinary Office (CVO). With immediate action on the report, the staffs from the DA-CAR Veterinary Office and CVO led by Dr. Amla visited the farm on January 16, 2020 and conducted random sampling collection of tissues of dead animals. The collected tissue samples were immediately hand carried and travelled to Baguio City by the staff of DA-CAR to conduct confirmatory tests for ASF. And on the 24th of January, a Letter from the OIC Regional Executive Director of DA-CAR addressed to the Governor of Kalinga confirming a positive case of African Swine Fever of the three (3) samples from different farms including the KSU Yookah Farm.

IV. RESULTS AND DISCUSSIONS

I. The Onset of the African Swine Fever Outbreak

During the last quarter of 2019, the Province of Kalinga was hit by the African Swine Fever (ASF) outbreak. As early as September 2019, the University Veterinarian and the Project staffs of the R&D Project implemented a strict Biosecurity measure to restrict the entry of unauthorized persons (KSU employees, students, visitors). Biosecurity signages were placed at all the entrance of the farm to warn and stop people from entering the premises. Multi-vitamin supplementation and treatment and control of respiratory diseases was prescribed by the University Veterinarian as prevention measures. Only one (1) authorized person (farm aide) is allowed to enter the farm premises to prevent the entry of disease which may cause high mortality rate when hit with the virus. It is noted that since the start of the outbreak up to December 2019, there were no ASF related mortality reported. It is recorded as of December 31, 2019 the following herd inventory:

Herd	No. of Animals
Sow	18
Boar	6
Grower	36
Weanlings	23
Total	**83**

Unfortunately, come January 2020, due to uncontrollable circumstances, the Yookah Native Pig R&D farm was hit by the ASF outbreak. It was noted that an average of 3 mortality daily was recorded until January 16, 2020. Only 15 heads (3 Sow, 5 growers & 7 Piglets) survived the outbreak. During these times, multi-vitamin supplementation and treatment and control of respiratory diseases was practiced. The incidence was reported by Dr. Ballog to the City Veterinary Office (CVO) for further investigation and action on the matter. On January 16, 2020, staffs from the DA-CAR Veterinary Office and CVO led by Dr. Amla visited the farm and conducted random sampling collection of tissues of dead animals. On January 24, a Letter from the OIC Regional Executive Director of DA- CAR addressed to the Governor confirming a positive case of African Swine Fever of the three (3) samples from different farms including the KSU Yookah Farm.

On February 10, 2020, The City Veterinarian, together with his staff arranged a meeting with the VP-RDET and the Native Pig staff to discuss the possible depopulation of the Yookah herd hence the positive ASF result. During the meeting, it was agreed that we give the surviving herd the benefit of the doubt not to be depopulated to see if they will survive the outbreak. It was then suggested that the CVO will conduct a second sampling collection. On February 17, 2020, staff of the

CVO conducted sampling collection for the remaining 15 heads and it came out with negative results.

On January 2021, the Yookah R&D Project was turned-over to the Business Affairs Office with 13 remaining herd. Sometime in March 2021, Dr. Ruby Orange Agyao,the University Veterinarian conductedblood sample collection to the remaining herd but the result came out to be negative in ASF. Unfortunately,after the sample collection, the remaining herd got sick and died for unknown reasons. Sadly, only 2 boar and sow remained in the herd.

Because of this incident, The BAO, together with the University Veterinarian submitted a proposal to the DA-CAR for funding for the repopulation of Kalinga Native Pig in KSU. The proposal was approved, but the DA-CAR suggested that there would be no more herd in the farm and they suggested for the disinfection and cleaning of the farm premises and depopulation of the 2 remaining Yookah.

II. Cause

According to the Disease Guide in The Pig Site, the infection can be introduced to uninfected herds in a number of ways:

- The feeding of contaminated feed and contaminated food waste used to supplement feed;
- Through the bite of soft-bodied ticks, live and flies;
- Through inoculation with contaminated syringes and use of contaminated surgical equipment; and
- Through the introduction of infected pigs to the herd.

Transmission of the virus within the herd is generally through direct contact with infected bodily discharges, feces and vomit.

III. Prevention

During the ASF outbreak, the Native Pig R&D farm was put on total lockdown and tightened its biosecurity measures, no unauthorized persons and stray animals are allowed to enter the farm premises. Only the caretaker is allowed in the farm and strictly follow farm biosecurity protocols.

Biosecurity measures are strictly implemented in the KSU R&D farm. Biosecurity signages are put in all gateways in the farm premises to warn unauthorized persons for not entering. Footbaths, washing and disinfecting areas are strategically placed in the entrance of the farm. There is a room for changing of clothes and foot wears for the caretaker.

As part of the biosecurity measures, sick animals are isolated and treated in the quarantine areas provided to prevent the spread of disease. Dead animals are handled with caution and buried in the graveyard located at the farthest area of the farm. No pork products and other food is allowed inside the farm. Strictly no cooking and eating in the farm premises. And lastly, regular cleaning and disinfecting of housing and other farm facilities is strictly implemented.

IV. Transmission

Human activities

Despite the strict implementation of total lockdown and biosecurity protocols in the farm, some individuals take no notice of the rules and disregard all the established preventive measures. During the ASF outbreak that human carelessness is the number one factor that spread the disease. The following human negligence was noted:

- unauthorized persons going in and out of the farm without proper sanitation
- bringing in food and cooking pork meat/products inside the farm
- unnecessary activities such as doing carwash without sanitizing the car
- mishandling of dead animals where discharges has been spilled in the pens because of late detection of sick and dead animals
- damaged pens where in stray native pig from infected nearby household enters the farm and into the pens

V. SUMMARY AND CONCLUSIONS

The outbreak of African Swine Feverhas no treatment, a good biosecurity protocol and strict implementation of farm rules can somehow prevent and control the spread of the disease in the farm. But a simple human error can eradicate the entire herd and put all your efforts to waste.

It is therefore concluded that human negligence is the number one factor that causes the spread of ASF.

RECOMMENDATIONS

Through these ordeals, the following is recommended:

- with or without disease outbreaks, farm biosecurity protocols should be strictly implemented.
- once confirmed through laboratory test that there is ASF positive in the herd, depopulation of the entire herd is necessary

- if a certain area has still positive cases for ASF, repopulation of new herd should be avoided

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