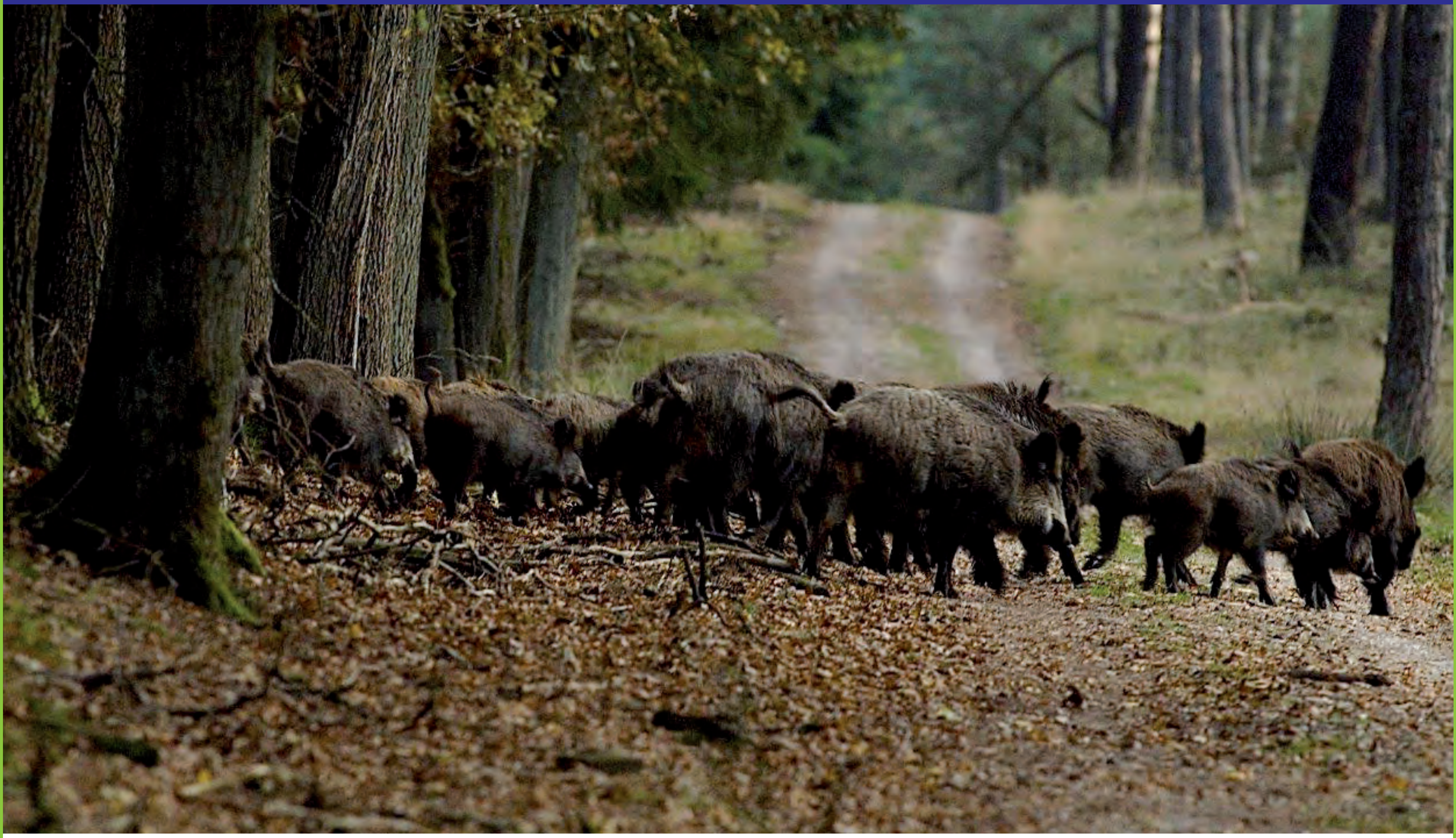

African swine fever in wild boar and African wild suids

1. Introduction

African swine fever (ASF) is a contagious* hemorrhagic* disease of suids*. Enzootic* in many African countries and in Sardinia, it was introduced into the Caucasus region in 2007. From there it has spread north-west, reaching the Eastern European countries belonging to the European Union (EU) in 2014 (cf. § 4)

This incursion into the EU has caused losses with severe economic impact on the pig sector in the affected countries, and in the pig industry in EU in general. In addition to the direct costs, such as those incurred by eradication programs, there are also indirect costs, including the consequences of trade bans on pigs and pig products.

* Complex terms are explained in the glossary (p.13)

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2. The virus

African swine fever virus (ASFV) is a large, enveloped DNA virus, of the genus *Asfivirus* (family *Asfarviridae)*[86, 87]. ASFV is the only member of its genus and it is the only known DNA arbovirus*. Twenty-three different genotypes have been described, and virulence* differs greatly from one isolate to another[17, 68, 107].

The ASFV strain affecting the Caucasian and Eastern European region is the genotype 2. The virus is highly virulent (up to 100% lethality* upon infection)[34, 101].

3. Survival of the virus

Temperature and organic matter

ASFV is a resistant virus, and can survive for long periods in a proteinaceous environment. ASFV remains infectious for months in blood when frozen, stored at 4°C and also when kept at room temperature[29]. In contrast, the virus is inactivated by heat treatment at 60°C for 20 minutes[50, 52]. ASFV remains viable for long periods in feces and tissues, including uncooked or undercooked pork products[50, 52, 73].

Disinfection

ASFV is inactivated by many solvents that disrupt the viral envelope and by disinfectants (1% formaldehyde in 6 days, 2% NaOH in 1 day). Paraphenylphenolic disinfectants are very effective at inactivating the virus. The pH range in which the virus can survive is wide, with some infective virus remaining at pH4 or pH13[29].

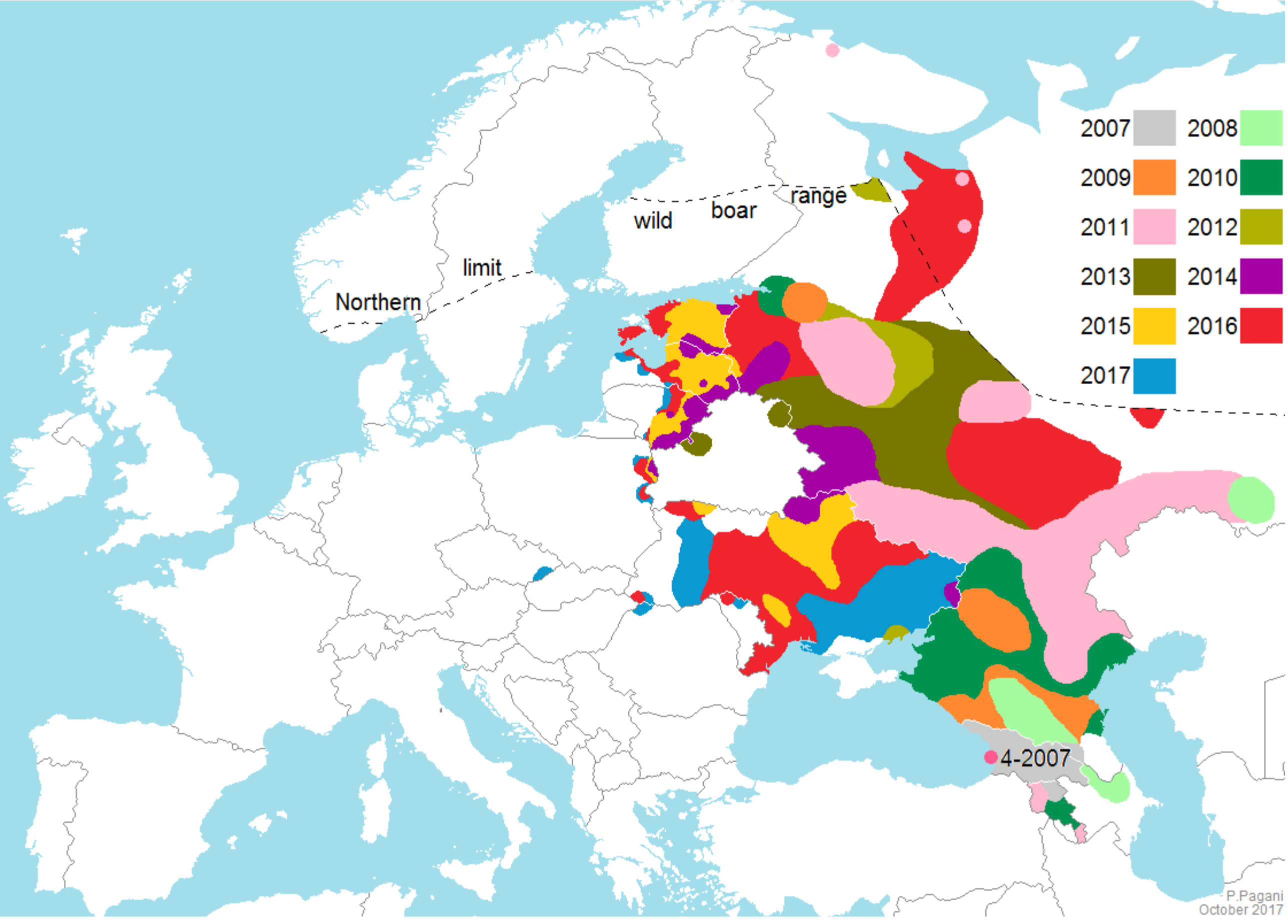
4. Geographical distribution

ASF was first described in Kenya in 1921 and the initial reports were from Eastern and Southern African countries, which is where ASFV is presumed to have evolved[87] (cf. § 5). ASF has subsequently spread to other areas of Africa, Europe and the Americas (Table 1). Currently, ASF is endemic in most of sub-Saharan Africa[68].

During previous outbreaks* in Europe and the Americas, the disease has been successfully eradicated, except on the Italian island of Sardinia where it became endemic after its introduction in 1978[36]. However, in 2007 the disease emerged in Georgia[84] and has since spread to 13 countries, including Lithuania, Poland, Latvia, Estonia in 2014, Moldova in 2016, and the Czech Republic and Romania in 2017[24, 67, 80] (cf. Table 1, Map 1).

Table 1 Year and country of ASF introductions. In brackets the countries where the disease was introduced but subsequently eradicated.

Year 1st detection	Africa	Eurasia	Americas
1957		(Portugal)[16]	
1960		(Spain)[10]	
1964		(France)[29]	
1967		(Italy mainland)[36]	
1971			(Cuba)[89]
1978	Senegal[28, 32, 74, 98]	(Malta)[96], Sardinia[36]	(Brazil)[48], (Dominican Republic)[24]
1979			(Haiti)[24]
1982	Cameroon[28, 32, 74, 98]		
1985		(Belgium)[13]	
1986		(Netherlands)[90]	
1996	Other central and western African countries[28]		
1998	Madagascar[83]		
2007	Mauritius[47]	Georgia[84], Armenia, Russia[24, 67], Iran[80]	
2008-2013		Azerbaijan, Ukraine, Belarus[24, 67]	
2014		Lithuania, Poland, Latvia, Estonia[67]	
2016		Moldova[67]	
2017		The Czech Republic, Romania[67]	



Map 1: Progression in Eurasia of the ASF outbreaks reported to the OIE from April 2007 to September 2017

5. Host species

ASFV exclusively infects suids and argasid ticks of the genus *Ornithodoros*. There are no public health concerns because humans are not susceptible to ASFV[2].

Suids

The natural hosts of ASFV are the African wild suids, the most important being the warthog *(Phacochoerus africanus)*[87]. The bushpig *(Potamochoerus larvatus)* and the red river hog *(Potamochoerus porcus)* are considered to be of lesser importance in the epidemiology* of ASF, because they are only sporadically infected[5, 39], and there is only a single case of ASFV being reported in the giant forest hog *(Hylochoerus meinertzhageni)*[44]. African wild suids are susceptible to infection but usually show no signs of disease.

Wild boar, domestic pigs and feral pigs* (all *Sus scrofa)* are also susceptible to infection by ASFV[87], regardless of their breed and age. In these animals, virulent strains of the virus cause a devastating hemorrhagic fever with up to 100 % lethality[68]. However, an increasing level of resistance is being described in local domestic pigs in Africa[76, 115].

Ornithodoros ticks

ASFV also infects soft ticks of the genus *Ornithodoros* (family *Argasidae*). In Southern and Eastern Africa, the *O. moubata* complex is considered the natural arthropod host[43].

All *Ornithodoros* species tested to date are susceptible to ASFV infection[30]. The virus can multiply in ticks and there is some speculation that ASFV is actually a virus of arthropods, with suids being "accidental hosts"[68].

Whilst species of *Ornithodoros* ticks are present in different regions of the world, none have been reported in the Netherlands or elsewhere in Northern Europe[27, 30, 92, 104].

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Photo 2. Free-ranging domestic pig in Sardinia

6. Transmission

Routes of infection

Four routes of infection with ASFV are recognized:
(i) contact between sick and healthy animals,
(ii) ingestion of infected meat,
(iii) tick bites or bites from other vectors,
(iv) fomites*[24, 68].

The routes and their relative importance vary, depending amongst others on the host species involved. For example, direct contact is relevant for pigs and wild boar, but not warthogs. People contribute to the spread of ASFV by the movement of infected pigs and wild boar and pork-products[73, 75].

Contact between sick and healthy animals

Wild boar, domestic pigs and feral pigs can infect each other by direct contact, in particular when blood is present[43]. In contrast, field and experimental data indicate that direct contact is an unlikely means of transmission both amongst African wild suid species, and between them and pigs[5, 23, 24, 41, 44].

There is no reliable evidence of the transmission of virus from sows to fetuses during pregnancy[75]. Whilst sexual transmission of this virus has not been documented in pigs, ASF virus is shed in genital secretions[73,75].

Ingestion of infected meat

The disease can be transmitted among domestic and feral pigs and wild boar by ingestion of infected meat products[23, 43, 73, 87, 91]. This potential pathway is currently not considered to be very important at the African wild suid-domestic pig interface[75, 88]. However further investigation may be useful, given that under experimental conditions, certain African wild suid tissues contained sufficient virus particles to infect pigs by ingestion[91].

Tick bites or bites from other vectors

All tested soft ticks of the *Ornithodoros* genus have been shown to be competent vectors, at least under laboratory conditions[5, 23, 29, 30, 43, 116]. In contrast, there is no evidence for transmission of ASFV via hard ticks (family *Ixodidae*)[29, 110].

Some *Ornithodoros* species may have a life cycle of 15-20 years. At certain life stages they are able to survive 5-6 years without feeding[7, 16]. During that period, ASFV infected ticks may remain infective. Ticks from infected premises were able to transmit the infection to pigs more than a year after being collected and the virus was detected in cell culture five years after the tick collection[70]. Transmission among ticks can be transovarial*, transstadial* and/or sexual[68, 79, 81].

ASFV infection of naïve *Ornithodoros* ticks during blood meals depends on age and infection status of the suid involved. Naïve ticks can be readily infected when feeding on viremic domestic or feral pigs, wild boar and bushpigs[5, 71]; however, when feeding on warthogs, ticks only become infected after feeding on young warthogs during the viremic phase (cf. Map 2).

Ornithodoros species only feed for short time periods (up to 30 minutes), so they are often found only in the resting places (burrow or pig pens). In the wild, only warthogs live in burrows, whilst wild boar, feral pigs and bushpigs rest in thick

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vegetation, changing place regularly. Accordingly, it is less likely that this latter group will come into contact with *Ornithodoros* ticks[37, 43].

In addition to ticks, stable flies (*Stomoxys* spp.) have also been shown experimentally to be potential mechanical vectors. The virus survived in these flies for at least two days without apparent loss of viral titer[8, 53]. It is not known how relevant this finding is for transmission under natural conditions. Anyhow, although these flies have a world-wide distribution, they do not fly long distances. Therefore they are considered more likely to contribute to transmission within herds than between herds[73].

Fomites

Indirect contact through fomites may play a role in ASFV transmission. These routes of transmission seem only to be efficient when a high virus load is involved. Infectious blood is the main matrix by which the virus is indirectly transmitted[29].

Unlikely routes

Airborne infections are unlikely. They may act only over short distances and, experimentally, the half-life of ASFV in the air was on average less than 20 min[22, 95].

Other potential—albeit to date unproven and therefore unlikely—sources of ASFV include water (the virus is rapidly diluted), and mechanical vectors such as rodents and birds[75].

Infectious period and latent infections

Experimentally, fever is a valid marker for onset of infectiousness and the duration of infectiousness was 1 to 7 weeks[20]. Depending on the virulence of the viral strain and the response of the pig to the virus, some animals may survive infection, and animals with a positive antibody titer have been detected during serological surveys[77, 115]. Pigs that recover may shed the virus for up to a month after the disappearance of clinical signs[73].

Whilst some authors claim that there is no evidence that recovered pigs can become long-term carriers of the virus[76, 93, 97], others suggest that these animals may be long-term carriers of the virus, and therefore represent a potential source of infection[6, 19, 68, 88, 115]. Persistent infections of at least 70 days have been demonstrated experimentally[21].

7. Virus cycles and the role of the wild boar

Different ASF epidemiological scenarios can occur depending on the involvement of different hosts and their interactions with domestic pigs (cf. Map 2):

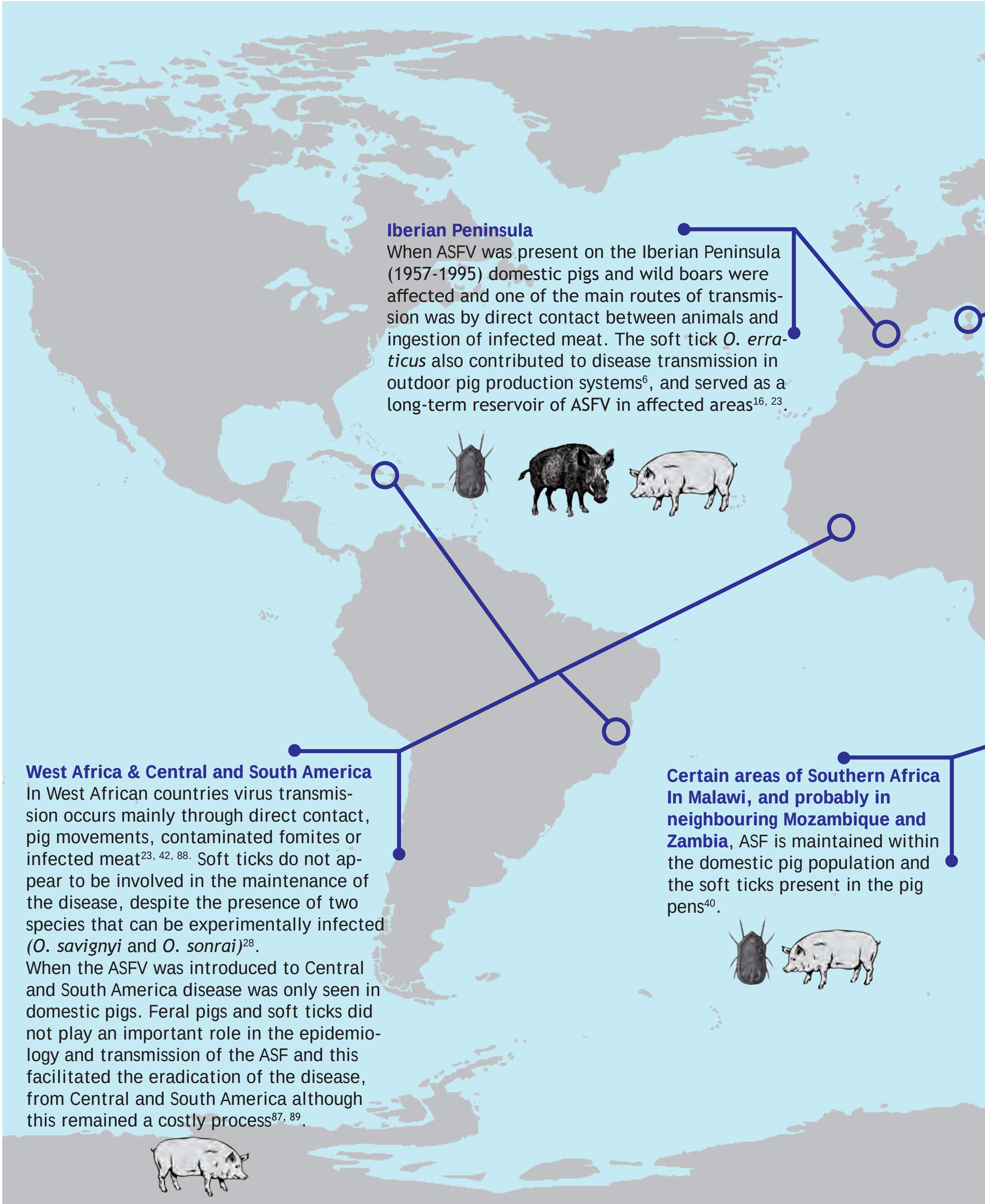
(i) African wild suids, soft ticks and domestic pigs,
(ii) domestic pigs, wild boar and soft ticks,
(iii) domestic pigs and wild boar,
(iv) domestic pigs and soft ticks, and
(v) only domestic pigs.

Possibly there is a sixth scenario involving only wild boar and the contaminated environment in North-Eastern Europe (cf. text box p.8 *Role of wild boar*).

All these epidemiological scenarios have two characteristics in common. Except for the East African sylvatic cycle, all others are triggered by human activities and all are exacerbated by the pig rearing systems in place.

For example, in sub-Saharan Africa it is common to keep free-ranging pigs that scavenge[78], and in Sardinia, free-ranging pigs share communal lands with wild boar [54, 78]. In the Caucasus the majority of pig breeding facilities are backyard holdings, and in the affected areas of Georgia, Armenia and Azerbaijan, backyard pigs often share communal lands, and free-ranging is widely practised[12, 88].


Photo 3. Wild boar



Iberian Peninsula
When ASFV was present on the Iberian Peninsula (1957-1995) domestic pigs and wild boars were affected and one of the main routes of transmission was by direct contact between animals and ingestion of infected meat. The soft tick *O. erraticus* also contributed to disease transmission in outdoor pig production systems[6], and served as a long-term reservoir of ASFV in affected areas[16, 23].

West Africa & Central and South America
In West African countries virus transmission occurs mainly through direct contact, pig movements, contaminated fomites or infected meat[23, 42, 88.] Soft ticks do not appear to be involved in the maintenance of the disease, despite the presence of two species that can be experimentally infected *(O. savignyi* and *O. sonrai)*[28].
When the ASFV was introduced to Central and South America disease was only seen in domestic pigs. Feral pigs and soft ticks did not play an important role in the epidemiology and transmission of the ASF and this facilitated the eradication of the disease, from Central and South America although this remained a costly process[87, 89].

Certain areas of Southern Africa In Malawi, and probably in neighbouring Mozambique and Zambia, ASF is maintained within the domestic pig population and the soft ticks present in the pig pens[40].

Map 2. ASF epidemiological scenarios

Sardinia, Caucasus & Eastern Europe

In all three areas, cases have occurred in domestic pigs and wild boar, and ticks are not known to play a role (scenario iii). In Sardinia, *Ornithodoros* ticks do not occur so far known[31, 36] and the disease is maintained by the interaction of domestic pigs and wild boar[45, 49]. In the Caucasus, *Ornithodoros* tick species do inhabit the region, but are not known to play a role in the cycle[29, 87]. In the Caucasus, most of the outbreaks have affected domestic pigs and have been caused by human activities, such as movements of infected animals and their products. Only a minority of the reported outbreaks have involved wild boar, and these have typically been traced back to contact with infected domestic pigs[12, 29]. In the Baltic States and Poland, *Ornithodoros* ticks do not occur so far known[104], but here only a minority of outbreaks have involved domestic pigs, the great majority was in wild boar[67]. Therefore, currently the possibility of wild boar populations maintaining ASFV without reintroductions from domestic pigs is being considered (scenario vi?).

Southern and Eastern Africa

There is a sylvatic cycle in warthogs and ticks. The ticks inhabit the burrows of warthogs and feed on their blood, transmitting the virus in the process. Adult warthogs do not develop viraemia* and do not act as a source of infection for ticks. By contrast, if young suckling warthogs are infected, although they do not develop clinical disease, they develop a short period of viraemia sufficiently high to infect naïve ticks during blood meals[43, 44, 72, 91]. Warthogs remain asymptomatically infected for life, but due to the absence of transmission between warthogs, the maintenance of infection is dependent on ticks[43, 75]. In this scenario the transmission to domestic pigs is mainly caused by the occasional bites of infected ticks and following recirculation among domestic pigs population[23, 43, 87]. The possible role of bushpigs in the maintenance and dissemination of ASF in this region remains unknown and will ultimately require further investigation. However at the moment, most outbreaks in domestic pigs in this area are caused by spread of ASF through domestic pigs themselves.

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The role of wild boar

Can wild boar spread ASF?

Wild boar can become infected with ASFV and spread the virus[23, 99]. Infected wild boar have been reported in the Iberian Peninsula[18, 77], Sardinia[45], Russia[11], Iran[80], Belarus, Lithuania, Poland, Latvia, Estonia, Ukraine and the Czech Republic[67].

The spatial spread of ASFV within wild boar subpopulations appears to be slow: 1-2 km/month[114]. In Poland during the initial 18 months of outbreaks, the total area of the infected region was only ≈1.500 km². This may be associated with the social behavior and site fidelilty of wild boar in the affected area. Only a small proportion of the population (5-10%) disperses away from their birth site, and only up to 20–30 km[113]. Therefore, long-distance dispersal of the virus through infected wild boar is assumed to be unlikely, unless human-mediated[113].

Can wild boar populations maintain ASF?

Different situations have been reported. The data from Spain and Sardinia (ASFV genotype 1) have suggested that the persistence of ASFV in wild boar populations in the absence of cohabitation with infected domestic free-ranging pigs is unlikely[45, 55, 77, 85]. Indeed, occurrence of disease in wild boar in Sardinia and Spain was often associated with the occurrence of disease in domestic pigs[31, 77, 100], and it has been observed that ASFV tended to disappear from wild boar populations when there was no contact with free-ranging infected pigs[45]. Therefore, in Sardinia (as in Spain in the past) wild boar are not considered to play a major role as a virus reservoir in the absence of free-ranging infected domestic pigs or other sources of infection[26, 77, 88]. The data from Russia (ASFV genotype 2) also supported this epidemiological scenario: the occurrence of this virus in wild boar was typically associated with the occurrence of ASF in domestic pigs[102], and analysis of spatiotemporal patterns of wild boar cases did not suggest that the disease was endemic in the wild boar population despite presence in southern Russia for eight years[103].

Other insights are obtained as the epidemic progresses in Eastern Europe (ASFV genotype 2). In different regions of the Baltic States, outbreaks have occurred and re-occurred in wild boar populations in absence of known outbreaks in domestic pigs[104, 113, 114]. While the virus is highly virulent (cf.§ 2), it is not highly contagious[113]. Therefore, most infected specimen in an area will die, but susceptibles also remain. The main source of "re-infection" is unclear. If not a re-introduction, a probable local source could be infected carcasses or the environment contaminated by the carcasses[109], without excluding at this stage other less likely sources such as the excretion from protracted disease cases/survivors, or ticks where present. In a study in Northern Germany, wild boar had direct contact with carcasses in about one third of the visits to their dead fellows, sniffing and poking the carcasses[109]. It is supposed that such contact can represent a risk of transmission. Given the lengthy survival of virus outside of the host (cf. § 3), rapid detection and removal or destruction of wild boar found dead is an important control measure[109]. Collectively, these recent findings indicate the situation requires close monitoring and taking appropriate wild boar population management measures.

Photo 4 and 5. Clinical disease in wild boar experimentally infected with ASF.

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8. Clinical findings and pathology

Susceptibility to ASFV[43, 51], quantities of viral excretion[88] and clinical signs[33, 34] are similar for wild boar, feral and domestic pigs.

Depending on the virulence of the virus strain, infection can lead to a wide range of clinical syndromes, from almost inapparent disease to peracute illness with high lethality[33, 34].*

Clinical findings

Upon experimental infection with a virulent ASFV strain, clinical signs in pigs develop after an incubation period of 3 to 15 days[14, 88].

Highly virulent viruses can cause either peracute disease with few clinical signs and sudden death 3-4 days after infection[68], or acute disease, characterized by high fever (41-42°C), depression, loss of appetite, hemorrhages in the skin (tips of ears, tail, distal extremities, chest and abdomen), and death in 4-10 days (up to 20 days). Lethality rates may be as high as 100%[33, 68, 69].

Moderately virulent strains typically lead to subacute disease with mild clinical signs including mild fever, reduced appetite, depression and abortion in pregnant sows. Death may occur within 15–45 days and lethality rate varies around 30–70%. This form of the disease may be confused with many other conditions in pigs, not raising suspicion of ASF[68, 69].

Low virulent strains produce subclinical infection; occasionally some animals may show weight loss, irregular peaks of temperature, respiratory signs, skin lesions, and arthritis. The disease develops over 2–15 months and the lethality rate is low[46, 68, 69]. Subacute and chronic forms of the disease may result from insufficiently attenuated vaccine, as have been used in the 1960s in the Iberian Peninsula[15].

Photos 6 to 8. Gross pathological findings in organs of pigs infected with virulent ASF virus (the strain currently circulating in the Caucaus).


Photo 6. Kidney - small scattered hemorrhages

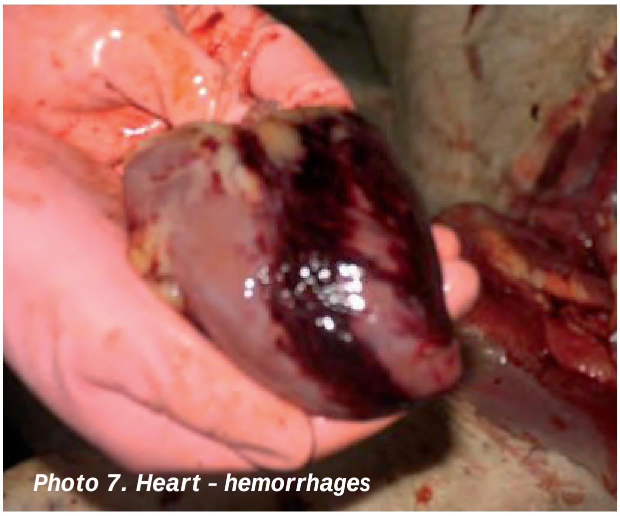
Photo 7. Heart - hemorrhages

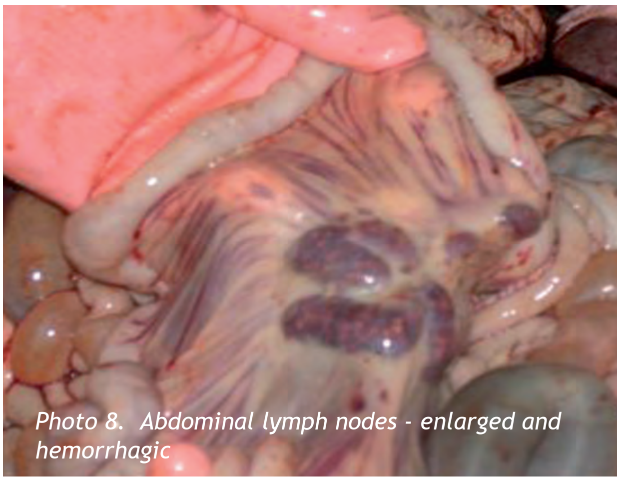
Photo 8. Abdominal lymph nodes - enlarged and hemorrhagic

Photo 9 - 12. Gross pathological findings in organs of Florida wild boar experimentally infected with ASF virus (Haiti strain).

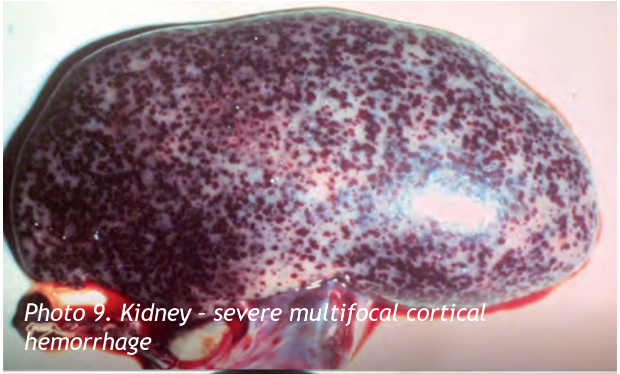

Photo 9. Kidney - severe multifocal cortical hemorrhage

Photo 10. Kidney - severe diffuse acute renal hemorrhage

Photo 11. Abdominal cavity - severe massive retroperintoneal hemorrhages

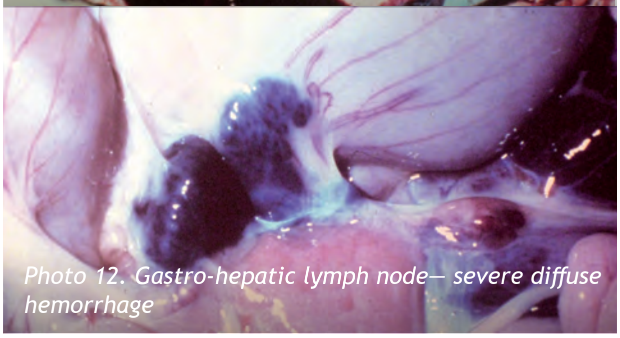

Photo 12. Gastro-hepatic lymph node— severe diffuse hemorrhage

Gross and microscopic pathology

Gross and microscopic findings may also vary with strain virulence[38, 94].

In cases of acute disease, carcasses are typically well-muscled with good fat reserves[33]. Some of the following lesions may be seen:

- Widespread hemorrhages in organs,
- some abdominal lymph nodes which may resemble blood clots,
- small scattered hemorrhages in the kidneys, bladder and stomach lining,
- accumulation of blood in the vessels of multiple organs (spleen, lungs, intestines, and other abdominal structures),
- accumulation of blood-containing fluids in the chest and abdominal cavities[33, 68].

Subacute forms may show the following changes:

- Fluids in body cavities (due to heart failure),
- enlarged and often hemorrhagic lymph nodes,
- signs of inflammation of the surfaces of the lungs and the heart,
- firm lungs with a mottled appearance, due to pneumonia,
- swollen and inflamed joints[33].

Chronic forms may present the following characteristics:

- Areas of severe lung damage,
- enlarged and firm lymph nodes,
- signs of inflammation of the surfaces of the lungs and the heart[3, 33, 68].

9. Diagnosis

Clinical diagnosis requires laboratory confirmation

In pigs and wild boar, the clinical signs of ASF are similar to those of other hemorrhagic diseases. At clinical or post-mortem examination, ASF can not be reliably differentiated from other bacterial and viral pig diseases such as Classical swine fever, Erysipelas, Salmonellosis, Pasteurellosis, Aujeszky's disease and other septicaemic conditions. Laboratory diagnosis is therefore required for differentiating these conditions[68, 87, 88].

Laboratory tests

Different tests are available to detect ASFV in blood and tissue samples. There are Polymerase Chain Reaction (PCR) tests, which may detect ASFV DNA even in tissues samples that are not fresh tissue[68, 88].

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Efforts are ongoing to develop assays for use in the field.

The detection of antibodies to ASFV - i.e. serological testing - can indicate ongoing or previous infection[25]. Different versions of these serological tests are available. The most commonly used is the Enzyme-linked Immunosorbent Assay (ELISA). However, in acute disease, the death may occur before the animal has time to produce antibodies, and serological testing may fail to detect the disease in an early stage[69, 74].

Sample collection

For laboratory diagnosis of ASFV, blood samples and various tissue samples, such as spleen, kidney, lung, liver, lymph nodes, tonsils and bone marrow (long bone) may be submitted. The spleen and visibly affected lymph nodes are the predilection samples to collect[4, 68] (for details, cf. to the OIE Manual of Diagnostic Tests and Vaccines for Terrestrial Animals)[69]. However, for active and passive surveillance of hunted or dead wildlife, blood swab samples[111] and long bones have operational advantages in the field (cf. § 10). For sampling live specimens, a chewing rope may offer a non-invasive method suitable for ASFV DNA[112] and antibody[108] detection in saliva.

Collaboration with hunting associations has been an effective means of obtaining samples for surveillance of the disease in wild boar populations[43, 77]. As mentioned previously (§ 5), ASFV infection is often lethal in wild boar; therefore in affected areas there is a greater likelihood for a carcass of a wild boar found dead to be infected, than a live or a hunted wild boar or a traffic victim. Consequently, for early detection, the focus is on passive surveillance (detection of virus in samples from carcasses of wild boar found dead, except traffic victims) rather than active surveillance (samples of hunted wild boar)[113, 114].

10. Management and control

Medical prophylaxis

To date, no vaccine or treatments are available[68, 88]. In the future, vaccines may be added to the control options. Although ASF vaccines are not yet available, a European Directive currently prohibits the use of ASF vaccines in the territory of the European Union[62].

Sanitary prophylaxis

The measures taken vary according to the epidemiological situation.

Countries or areas free of ASF

National and international policies aim at guaranteeing that neither infected live pigs nor pig meat products are introduced to areas free of ASF. At a national level, preventive measures include a Contingency Plan (cf. § 11), strict regulation of the import of animals and animal products, proper disposal of waste food from aircraft or ships, and efficient sterilization of domestic waste[68].
Individuals also have the responsibility to apply measures to prevent import and spread of disease.
Though some of the measures have a legal basis, such as not feeding suid offal (swill) to pigs, others are based on common sense such as not visiting a pig farm after hunting wild boar and other biosecurity measures (cf. § 12).

Outbreak situation in previously ASF-free countries or areas

When only domestics pigs are involved, sanitary prophylaxis includes the following measures in case of outbreaks, or suspicion of disease: rapid diagnosis[35]; designation of the area as an infected zone, with zoning and control of pig movements; a survey of all pigs within the infected zone and the surrounding area to identify all infected animals/ populations; the rapid culling of all animals on infected premises, proper disposal of cadavers and litter, and thorough cleaning, disinfection and acaricide treatment; detailed epidemiological investigation, with tracing of possible sources (up-stream) and possible spread (down-stream) of infection[3, 68, 88].

The situation is more complex when wildlife is involved. In the EU, there is a strategy for the control of ASF in the affected countries which focuses on wild boar. This has been designed based on the work of EFSA. So far however, the disease has not been brought under control in any of the countries affected. Rather it continues to spread. There are still many knowledge gaps on the behavior of the disease in this new context, and there is an on-going discussion on the best way forward.

Countries or areas where ASF is endemic

In infected countries or territories, disease control is primarily through the strict implementation of bio-security measures. Consequently, proposed control methods include the separation of domestic pigs and wild suids, and proper disposal of carcasses and offal from domestic and hunted animals[12]. Farmers can take measures to prevent direct contact between domestic pigs and wild suids[43, 68]. For instance, in endemic areas of South Africa, pig producers, whose premises are surrounded by a double fencing pig-proof barrier and who implement bio-security measures, have not experienced ASF during more than 60 years (1951-2016)[67, 73]. The double fence is mainly used to prevent soft ticks from wild suids to come in contact with the domestic pigs. All requirements are specified by the OIE and are stated in the EU legislation (cf. § 11).

11. Current European Union regulations

Since the Treaty of Rome[1], in 1957, which stated the willingness to work out and put into effect a common agricultural policy and the progressive harmonization of national legislations until July 2014 about 440 official documents relating to ASF have been enacted by the European Community. These represent a framework of laws, regulations and administrative provisions, principally concerning domestic pigs, that should be brought into force at national level by Member States. In the laws that also pertain to wild boar or feral pigs, the regulations do not usually differ significantly from those applying to domestic pigs.

These official documents outline different aspects with regard to ASF for the European Union. For example, the preparation and regular updating of national contingency plans, the sanitary requirements for intra- and extra-Community animal trade and for declaring ASF compulsorily notifiable[56, 58]; the adoption of a Community research program and the approval of a diagnostic manual[57, 63]; the rules for scientific measures concerning the control of ASF[61, 62]; and, the financial contribution from the Community for emergency measures such as the culling and destruction of infected animals, disinfection, and the establishment of buffer zones and other measures aimed to prevent the spread of ASF[59]. The Netherlands received such aid in 1986, which amounted to up to 50% of the expenses sustained for the eradication of ASF[60].

In the Netherlands, a National Contingency Plan based on the European directives and regulations is available[82]. This is a strategy document that defines detailed actions to be taken in the event of an ASF emergency. It takes into consideration different scenarios and phases, detailing policy instruments, measures to be taken, organizational aspects and giving legal basis to all activities. More recently, as a result of the rapid spread of the ASF on the European continent, other decisions have been enacted, to reduce the risk of introduction and spread of the disease in the EU. These include measures to prevent the transmission of the ASF virus from east European countries further into the Union[64], the decision to define certain areas as 'infected'[66, 105, 106], and regulation of the financial contribution of the Union towards surveillance[65].

Photos 13 and 14. Double fencing pig-proof barriers in Sardinia (Photo 13) and South Africa (Photo 14). The distance between the fences in the left photo may be insufficient to protect from airborne transmission, but this route is unlikely. In South Africa, the distance between the fences takes into account the distance Ornithodoros ticks can travel.

12. Precautionary measures

Areas where ASF has not yet been detected

Biosecurity when hunting wild boar

- Check the disease situation and the specific restrictions, rules and regulations with local authorities and/or hunter associations.
- Use gloves for evisceration and wash hands well with soap and water.
- Clean and disinfect all clothing and equipment (boots, game bag, carcass tray, knife and other materials).
- Avoid contact with livestock premises and, where this cannot be avoided, observe strict biosecurity measures (a full wash, change clothes and shoes, do not bring wild boar products onto premises where domestic pigs are kept).

Report suspect cases

- *Cases with suspect lesions* - If you see signs consistent with ASF such as bleedings in multiple organs, swollen and red lymph nodes, and enlarged spleen, or of others notifiable disease, contact the National authorities. In the Netherlands this is the **NVWA (tel: 045-5463188)**.
- *Unexplained deaths* - Please report wild boar found dead, in particular when there are several cases in a given area on one or successive days. In the Netherlands, hunted sick wild boar and wild boar found dead that are not directly suspected of notifiable diseases may be investigated free of charge for disease and/or cause of death by **DWHC (tel: 030-2537925)**.

Areas where ASF occurs

Comply with regulations

It is recommended that persons from outside defined ASF-areas do not hunt in these areas; if they do, they should comply with the measures prescribed by the national and local authorities. In ASF-infected areas in the EU, authorities will enforce the use of appropriate hygiene measures by all persons coming into contact with wild boar to reduce the risk of ASF virus spreading[62]. In addition, by law, all wild boar or feral pigs shot, found sick or dead in the infected area, including those killed by traffic, will be inspected by an official veterinarian and tested for ASF[62]. It is forbidden to take wild boar meat and products from the infected area. Derogations from this are possible and dependent on decisions by the appropriate authorities.

Additional biosecurity practices

Unless the local authorities indicate otherwise:

- Do not hunt with dogs.
- Clean vehicles inside and out, on-site or at the nearest car wash (including inner part of the mudguard). Consider covering seats in advance with plastic which can later be disposed of.
- All clothes should be washed at 60°C for a complete wash.

13. Glossary

Arbovirus	A term used to refer to viruses that are transmitted by arthropod vectors.
Bio-security	The precautions taken to protect against the spread of diseases.
Contagious	Disease spread from one organism to another.
Enzootic	Disease afflicting animals in a particular locality. The non-human equivalent of endemic.
Epidemiology	The study of the relationships of the various factors determining the frequency and distribution of diseases.
Feral pigs	A domestic pig living in the wild, either having been released or escaped from confinement.
Fomite	An inanimate object that can be contaminated with infectious organisms and serve in their transmission.
Hemorrhagic	With profuse bleeding.
Infective doses	The quantity of virus required to produce infection.
Lethality	Number of death animals over number of infected animals.
Outbreaks	The occurrence of more cases of disease than normally in a specific region.
Septicaemic	When the pathogen invades the bloodstream.
Suids	Pig species.
Transovarial transmission	Transmission of disease-causing agent from parent arthropod to offspring arthropod.
Transstadial transmission	Passage of disease-causing agent from one developmental stage of the tick to its subsequent stage.
Viraemia	Virus in the bloodstream.
Virulence	The relative capacity of a pathogen to overcome body defenses.

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Photo 15. Wild boar

Text
Paolo Pagani and Jolianne Rijks

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