The Evolution of African Swine Fever (ASF) in Europe and Our Country

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Abstract
African swine fever (ASF) is a viral infectious disease specific to domestic and wild swine of all ages, highly contagious and very serious, probably the most dangerous and damaging disease of pigs, able to produce in new outbreaks of domestic swine fever a mortality of up to 100%. This disease is produced by a deoxyribovirus of the genus *Asfavirus*, the family of *Asfaviridae* with at least 22 different genomic types. In Europe, the disease was first reported in 1957 in Portugal, around Lisbon. Although the first outbreaks were declared eradicated, in 1960 others appeared when the disease spread to Spain and after that it could not be eradicated until 1990, after great efforts and huge losses. ASF was also reported in other European countries as: France (1964), Italy (1967), Malta (1978), Belgium (1985), The Netherlands (1986). Of all this, ASF could be eradicated by extremely drastic and costly measures, except in Sardinia, where it would seem to persist in today's endemic form. In the middle of 2007 this disease appeared in countries of the former Soviet Union and in the Czech Republic, then in 2016 in Poland, in 2017 in Romania, Hungary and Belgium. In 2018 ASF spread in Bulgaria and Italy. The updated map of European Union outbreaks of swine fever in the European Union shows that Romania is the country most affected by the virus, with almost half of the counties in the red zone - officially discovered pests.

Keywords: African swine fever, deoxyribovirus, disease, outbreaks

1. Introduction

Our country is experiencing great losses in the livestock sector, a serious situation caused by the confrontation with this disease, which has evolved more and more frequently in recent years in countries close to our borders, where it has also caused great damage. African Pig Pest is also known as African Swine Fever, Montgomery's Disease (after the one who first identified it in 1909), or *Pestis Africana Suum* (Latin). It has been named in different languages, depending on the progressive spread of outbreaks, such as African Swine Fever (African), Africanische Schweinepest (German) or African Swine Fever (abbreviated as ASF). ASF is a disease produced by a virus from the *Asfarviridae* family, the genu *Asfivirus*, with two known genotypes and several serotypes. ASF is a viral infectious disease specific to domestic and wild swine of all ages, highly contagious and very serious-probably the most dangerous and damaging disease of pigs-able to produce in new outbreaks of domestic swine fever a mortality of up to 100%. The first diagnosis of this disease dates back to 1910 when the British occupied Kenya. After the first disease outbreak in Kenya Montgomery in domestic pigs, the presence of ASF was observed in South Africa and in several other African countries, but apparently without leaving the African Continent

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until 1957 when was reported in Portugal, around Lisbon. According to some sources, it would have been introduced here by means of waste from an inland line aircraft from Africa. After all, the spread of the disease would have been done by the household waste from a restaurant carriage, which had arrived in the feed of the pigs [1, 2, 3]. Although the first outbreaks were declared eradicated, in 1960 others appeared when the disease spread to Spain and after that it could not be eradicated until 1990, after great efforts and huge losses. ASF was also reported in other European countries as: France (1964), Italy (1967), Malta (1978), Belgium (1985), The Netherlands (1986). Of all this, ASF could be eradicated by extremely drastic and costly measures, except in Sardinia, where it would seem to persist in today's endemic form. In Brazil and the Caribbean it appeared in the middle of the 8th decade, but was declared eradicated in 1984. In 1971 it was diagnosed in Cuba where it could be liquidated by very drastic measures, including the killing of over 400,000 heads. However, the disease reappeared after a while and was again wiped out in 1980. It followed a long period of time when ASF was no longer signaled, except in the African continent, until mid-2007 when, with everything unexpectedly, has appeared in Georgia, where it spread very rapidly, including 56 of the 61 districts of Georgia. It has also appeared in other localities, in several neighboring countries, former Soviet Union components, but also in the Orenburg region of the Russian Federation, more than 1000 km away, as in other parts of Russia, which in turn continued - probably - the source of the disease in Lithuania, Latvia, Estonia, Poland, Belarus, the Republic of Moldova, Ukraine and more recently in the Czech Republic [4]. The last outbreak of the disease in the 7th country in the European Union where it was reported is our country, the first outbreak being located in a small household on the outskirts of Satu-Mare [5]. A secondary outbreak was also diagnosed, but both were subjected to the radical measures of liquidation, according to the provisions of the Operational Manual, the Contingency Program and the other provisions of ANSVSA for the rapid liquidation and prevention of the spread of the disease [6]. Further, the protection and surveillance zones are carefully monitored by the competent sanitary veterinary authorities. It can be argued that ASF is the greatest threat to the field of pig breeding because of the huge losses it can produce if on the first occurrence in a domestically slaughtered domestic animal population is out of control and diffused into the territory. The losses are due to the total killing of the herd in which the disease is diagnosed (sometimes it was necessary to kill more than hundreds of thousands of heads), the compensation paid to the owners, without the possibility of using the corpses in any way, of the large expenses I am doing for disease sanitation, restrictions on animal movements and trafficking, trade prohibitions, including export, etc. The extent of the damage that ASF produces is also due to the fact that it does not yet have adequate means of specific prophylaxis or treatment. However, it can be said that even if such means would be effective (efforts in this regard are still being done) their use in the process of eradication of disease and the rehabilitation of the territory would be problematic [7]. One thing is certain, however, that no matter how large the costs involved in the intention of prompt and decisive liquidation of the first/first outbreaks of ASF, they would be much lower than the losses that would occur in case of escape from control and of the spread of the disease in the territory [8].

2. Etiology

ASF is produced by a deoxyribovirus, classified primarily on the basis of its physicochemical, biological and morphological characters, as the only member of the *Asfavirus* genus, *Asfaviridae*, but in connection with virulence and place of isolation, several different antigenic types and at least 23 different genomic types could be identified, the latter being able to serve sometimes in attempts to establish the epidemiological traceability of the virus [9, 10]. Genotype I was most commonly identified in Africa and Western Europe, and Type II is the only one identified so far in eastern European countries, except in Ukraine, where both genotypes were identified. It has cubic symmetry and icosahedral shape, with relatively large dimensions (170-220 nm), due to which the viral particles in the cultures and their intracytoplasmic inclusions could be seen even at the usual optical microscope after Giemsa staining or acridine orange. The virus can be cultivated on several types of cell cultures, which produces

acidophilous inclusions. It is the only pathogenic virus for pigs adhering to the surface of cultured pigs, a property used in laboratories to identify the virus by the technique called "hemadsorption", as well as for diagnosis by "inhibiting hemadsorption". Although isolated field strains differ in virulence, multiple attempts to obtain stable modified immunoprecipitated strains in the laboratory have not had the expected success. ASF virus is one of the most resistant viruses to physical and chemical agents, which is of great importance in designing control and recovery programs. Under the usual natural temperature, humidity and pH conditions, it has a remarkable resilience. It is degraded by pH below 3.9 or above 11.5. [11] The temperature of 60°C destroys it in 10 ', but at 37°C it lasts for 15 days. In the blood he finds a few months at the temperature of the laboratory, but in the refrigerator it even lasts for 1.5 years. In various pathological materials, in the climatic conditions of our country, it resists the environment, in various pathological materials, a few months. It also has a remarkable resistance to fridge temperature in meat and bone marrow (5 months). At normal temperature, it was found after 15 weeks in brine, after 5 months in smoked meat and after 6 months in the bone marrow of the smoked ham. In putrefactive bodies, it lasted for at least 2.5 months. Very significant from an epidemiological point of view is the fact that the feces were found viable after 5 months and in urine after two months [12, 13]. Dryness does not destroy it.

3. ASFV infection immune response

ASFV infection is characterized by severe immunosuppression and apoptosis, primarily replicating in monocytes and macrophages, and is likely to enter cells *via* receptor-mediated endocytosis [14-16]. Activated macrophages release IL-1, IL-6, and TNFα, all of these contributing to acute-phase reactions, inflammation, activation of endothelial cells, and apoptosis. Similar cell tropism and organ distribution have been observed across all strains of ASFV. More severe tissue destruction is associated with strains of increasing virulence. Neutralizing antibodies and $CD8^+$T cells and natural killer cells seems to play an important role in the host immune response against ASFV. *In vitro* experiments demonstrated that some cellular mechanisms are regulated by ASFV via the encoding of specific regulatory genes and by interaction with viral and cellular proteins. Unfortunately, most cellular functions altered after ASFV infection remains unknown. Proteomic evaluation showed that ASFV shuts down the majority of protein synthesis, affecting approximately 65% of cellular proteins. Specific cellular proteins were found to be over-expressed after ASFV infection, and most were involved in redox homeostasis, programmed cell death, and coagulation. The role of neutralizing antibodies has been evaluated, and results are variable. Passive transfer experiments performed in domestic swine by Onisk et al. found that 85% of pigs that received the anti-ASFV IgG survived challenge compared to 0% of unimmunized controls [17-20]. Treated animals underwent transient fever but otherwise appeared clinically normal. Viremia in pigs that received the antibody transfer was discovered to be delayed and reduced. Immunized animals were found to have a second day delay in the onset of clinical disease and a reduced viremia, but no effect was registered on disease development, progression, or outcome. The authors concluded that neutralizing antibodies to ASFV proteins are insufficient for antibody-mediated protection. Are required more studies on the characterization of the antibodies role in ASFV infection. In northern Mozambique, a region endemic for ASF, in a population of domestic pigs were found to have high levels of circulating antibodies to ASFV. A group of pigs from this population were collected and were evaluated their offspring through experimental ASFV challenge for the heritability of this resistance to ASF. The offspring were acutely susceptible to challenge with a virulent strain of ASFV, suggesting that the ASFV resistance in the parental population was not heritable. The authors hypothesize that this observed resistance is resultant from prior exposure to a less virulent but antigenically similar field virus prior to exposure to a virulent strain, maternal antibody resistance, exposure to small quantities of infectivity that may result in a sub-lethal infection that confers immunity to a subsequent challenge.

4. Epidemiology

The primary natural reservoir of the virus is represented by some species of wild swine in Africa, such as *Phacochoerus aethiopicus*, but also *Potamochoerus africanus.*, wood giant pig *(Hylochoerus meinertzhageni)* and porcupine *(Histrix)*. They do not make clinical disease, but they become infected and remain carriers and virus-eliminators for life. In Africa three ASF virus circuits are incriminated, which ensures its endemic character: between feces and ticks (most importantly) among domestic pigs and ticks, and third in the domestic pig population, which complicates much, tending to thwart the ongoing efforts to eradicate the virus across Sub-Saharan Africa. In Brazil, the disease could be eradicated relatively quickly, with the killing of only "more than 60.000 pigs" because the virus did not encounter a fauna capable of constituting a natural reservoir of virus, which was not the case in the Iberian Peninsula where, mainly due to interference in the epidemic chain of *Ornithodorus erraticus* ticks, eradication was only possible after more than 30 years and the slaughter of about half a million pigs [21-23]. The source of primary and primary infection in our country is represented by domestic and feral pigs or sick boars, which remain carriers and eliminators of virulent pest for 400 days. Pigs infected with strains with moderate virulence remove the virus only for about a month, although their blood persists a little longer. The elimination of the virus begins just before the fever, 1-2 days, through the secretions of the mucous membranes of the head and the of uro-genital tract. A particular role in the maintenance and diffusion of the virus is also arthropods, mainly the ticks of the genus *Ornithodorus*, more commonly *O. moubata* and *O. erraticus*, which not only can conserve the virus in their bodies for at least 12 months, but also have the ability to multiply and transmit horizontally within the tick population in the area as well as vertically to subsequent generations, their eggs and nymphs being infected and infecting. It appears that not only ticks, but also other arthropods, of the genus *Rhipicephalus* or *Haematopinus* may interfere with the transmission of the disease. *Ornithodoros* ticks have also been found to serve as biological vectors for ASFV, with documented transstadial, transovarial, and sexual transmission [24-26]. In some regions of Africa, ASFV (African swine fever virus) cycles between juvenile common hogs and *Ornithodoros porcinus porcinus* ticks, which inhabit their burrows. In Europe, *Ornithodoros erraticus* have been found to vector ASFV and were involved in the disease epidemiology on the Iberian Peninsula between the 1960s and 1990s; however, *O. erraticus* are not involved in the current ASF scenario in Eastern Europe and Sardinia. Biting flies, particularly *Stomoxys spp*, have been found to be capable of mechanical transmission for ASFV. A great problem is, in our country, wild boars. They have multiplied a lot lately, not only in our country but also in the nearby countries, they can cross unnoticed borders and then be shot by poachers, and obviously consumed without being examined by a veterinarian. It is noteworthy that studies to date from nearby countries have revealed in many cases infection with ASF virus in wild boars than in domestic animals. Domestic pigs (*Sus scrofa*), unlike the wild ones, depending on the virulence of the infective strain, make clinical disease expressed in overactive, acute, sub-acute or chronic forms (on which, as well as on morpho-pathological changes, we do not insist because I am very well-known and described throughout the literature). These are an important source of infection for other domestic pigs through direct or remote contact through passive animated or inanimate vectors (feed, vehicles, humans, hematophagous, but also non-hematophagous artropods etc.). As regards the possibility of people to transport the virus on clothes, footwear, tools, etc. there is no doubt. Meat, products and by-products from pigs infected with ASF virus sacrifices of necessity, without knowing the true cause of the disease, are potentially very dangerous sources and frequent causes of disease spreading [27]. But also the place of slaughter, shelters, utensils, waste water and people involved can generate new outbreaks. It has not yet been possible to establish how the disease first spread from East Africa to the territories of West Africa where neither the *Ornithodorus moubata* ticks were the main agents involved in transmitting the disease. The epidemiological dynamics of ASF with a virulent strain possesses common elements with other highly contagious viral diseases. When they appear for the first time in a population, they usually diffuse rapidly, clotting the most serious clinical forms that characterize it. Over time, the offspring of the receptive animals gain a certain degree of resistance, which causes the infective

strain forced to evolve on such organisms to become less aggressive until it reaches the situation where it produces only atypical or inappropriate clinical infections, phenomenon found in some ASF virus strains in Africa. Strains with so temperate pathogenicity will not produce typical outbreaks. Thus, not all infectious strains generating new outbreaks of disease produce an alarming epidemiological evolution, which may confuse the diagnosticians, at least in the first phase of the epidemic, during which there is a risk of spreading the disease due to the delay in introducing appropriate measures. From this point of view, attenuated strains can sometimes be more dangerous than very virulent ones.

5. Clinical evolution

As the main sources of infection can be mentioned contaminated wild boars that can eliminate the virus by secretions and excretions two days before the appearance of clinical signs of disease as well as the domestic animals, the surviving animals that have been cured eliminate the virus over one year of days. The incubation period may take up to 72 hours. The disease may develop overactive, acute, sub-acute or chronically depending on the age of the outbreak or virulence of the etiologic agent strain. Generally, the clinical signs of the disease are fever up to 42°C, atonia, anorexia, mucosal cyanosis, incoordination in walking and death in severe forms within 1-2 days. In less severe forms, sometimes haemorrhagic, vomiting, conjunctivitis, leucopenia, thrombocytopenia (decreased leucocytes and platelets), congestion of the skin (red coloring), abortion in pregnant and dying females in 6-13 days in 100% of animals infected with virulent viruses. The infection can persist for several months without obvious clinical signs in the infected animals [15]. Sub-clinically infected, chronically infected, or surviving pigs have an important role in the epidemiology of the disease, for example resulting in disease persistence in endemic areas or in sporadic outbreaks of ASF into previously ASFV free zones. The relevance of this is sustained by the observation that under experimental conditions, viremic pigs that survived from sub-acute infections were able to shed virus from their oropharynx for at least 70 days [16]. Other experimental studies have identified porcine tissues as a source of infectious virus at up to 180 days post infection during persistent infections with moderately virulent isolates [20]. Animals that remain persistently infected for months, such as survivors or sub-clinically or chronically infected pigs, may play a role in disease persistence in endemic regions. Also, it has been speculated that these animals may contribute to sporadic outbreaks and introductions to ASFV-free zones. At the necropsy of the corpses, there is a large enlarged spleen, colored from red to black, the kidneys with hemorrhagic foci and the increase in volume of lymph nodes, sometimes with bleeding, exudated in the abdominal cavity. These symptoms and injuries must be distinguished from similar ones, such as classical swine fever, pasteurellosis, swine reproductive and respiratory syndrome, intoxication. For certainty, laboratory tests are indicated by the OIE (International Office of Epizootics) with samples collected from the spleen, lymph nodes, blood, and bone marrow. As a means of combating, the disease is declared and been applied quarantine measures under these conditions, reducing the number of wild boars to a density of 0.5/km^2, destroying the carcasses, restrictions on the movement of humans, animals, products obtained from meat, already known from the Operations Manual for Intervention in African swine fever. In countries where the disease has not yet appeared, according to the Technical Disease Cards issued by the OIE, imports of animals or their products from countries where the disease develops should be avoided as much as possible, the destruction of all food scraps with adequate sterilization of garbage from trains, boats, planes that have traveled from countries where disease is developing. In the countries where the disease develops, everything will be done to limit the spread of existing outbreaks, and in the outbreaks of disease all animals will be sacrificed with the destruction of corpses, rigorous disinfection of shelters, vehicles, utensils, equipment of any kind from the outbreak. It will attempt to detect thorough epidemiological investigations of possible sources of infection and spread of the virus in the outbreak. In the event of the disease, it shall be declared first degree quarantine and apply rigorously the measures provided for by the Sanitary Veterinary Law, Zoo-Veterinary Code and Anti-Epizootic Headquarters [22]. To prevent

the outbreak of ASF in the outbreak in around it there are two areas:
-The first threatened area, with a depth of 5-20 km around the disease outbreak. In this area there are severe restrictions on the movement of everyone categories of animals and persons; it prohibits the operation of fairs, bases of purchases, exhibitions and other places agglomeration of animals, movement of pigs in the interior of the area, as well as the free cutting of a by the owners [27].
-The second threatened area, with a depth of 100-150 km, starting from the limit of the first zone or from the border with a neighboring country ASF. The cartography of all the pigs is done complements immunization against swine fever classical and homemade. In the case of some illnesses with symptoms of pest, pigs being immunized against PPP, the measures will be applied provided for ASF. The disease is considered as extinct and measures quarantine rises 30 days after the killing all the pigs in the outbreak, performing the disinfection final and verifying its effectiveness. The introduction of healthy pigs in the former outbreak is allowed only after 6 months after raising quarantine measures. Against ASF no vaccine is available because of a number of key factors, including the lack of identification of protective antigens, incomplete understanding of virus–host cell interactions, and inadequate knowledge relative to the diversity of viral strains currently circulating in natural reservoirs. Many types of vaccines have been tried but none of them provide complete protection against this disease. Much more work is needed to determine whether immunization with viruses with altered immunomodulatory proteins could be harnessed to assist the host immune response against virulent challenge. Researchers from many countries are working for elaborating a vaccine against ASF but have been hindered by gaps in knowledge on the virus and the variation of strains.

6. ASF in Europe and in Romania

This disease, as it is called, has its origins in Africa, can trigger in short time epidemic, with great economic losses and almost 100% mortality when it first appears in the outbreak. In the past, our country has not been reported [17]. The ASF diffusibility in Europe is based on the virulence and high resistance of the virus in the environment and the high susceptibility of the domestic pig. These properties make it very easy to achieve the amplification phenomenon and to create many secondary outbreaks shortly. ASF epidemics are not spontaneously extinguished because of the virus's inability to cause the immunization of the animals over the disease, but also by the fact that the surviving animals become virus-carrying and eliminating the virus. In 2007, African swine fever reached to the Caucasus when a cargo ship disposed garbage, containing meat on shore in the Georgian harbor city of Poti. Wild boar probably found the garbage and got infected. From there it spread within a few years via Russia to the wild boar populations of the Baltic States, Poland and other Eastern European countries (Table 1). The cases in Belgium were the first to be reported west of the river Oder. The EU African swine fever (ASF) regionalization laid down in Commission Implementing Decision 2014/709/EU 1 without prejudice to the provisions of Council Directive 2002/60/EC [28, 29]. Decision 2014/709/EU sets a series of additional animal health movement restrictions and control measures applicable to the dispatch of pigs, pig meat, certain pig products and wild boar meat and products thereof. Based on an analysis of the epidemiological data from 2014 to 2018 (up to November) from Member States affected by ASF virus genotype II, the 2018 EFSA report on ASF2 puts forward the following findings relevant for regionalization:
- ASF continued to spread slowly through the wild boar populations (the median speed of propagation of ASF infection in certain areas was estimated to be between 8 and 17 km/year);
- the spread of the disease in the wild boar populations seems to be not directly related with the density of the wild boar populations;
- ASF has been introduced into nine EU MS, through two distinct spread processes: continuous wild boar-mediated spread through wild boar populations and meta-populations, for which the speed of propagation is notably slower than for some other infectious diseases in wild boar; and human-mediated translocations leading to the establishment of new ASF clusters distant from areas of previous ASF occurrence. Main criteria for demarcating Parts I, II, III and IV of the Annex to Implementing Decision 2014/709/EU:
Part IV: occurrence of ASF in both domestic pigs and wild boar.

Table 1. The epidemiological situation of ASF in Europe (UE and other countries) between 2009-2014

Year	Country	No. of outbreaks	Species	No. of suspected pigs	No. cases of illness	No. of dead pigs	No. of killed pigs	No. of pigs slaughtered by necessity
2009	The Russian Federation	65	domestic pigs	14645	1195	931	6496	154
			boars	495	21	19	53	0
			total	15140	1216	950	6549	154
2009	Armenia	15	domestic pigs	150	37	25	125	0
			boars	2	2	2	0	0
			total	152	39	27	125	0
2010	The Russian Federation	302	domestic pigs	83625	1691	1368	67919	5086
			boars	21	61	48	34	0
			total	83646	1752	1 416	67953	5086
2011	Armenia	15	domestic pigs	22	22	0	22	0
			total	22	22		22	0
2011	The Russian Federation	302	domestic pigs	89743	2362	1814	87664	0
			boars	608	324	315	270	0
			total	90351	2 686	2129	87 934	0
2012	The Russian Federation	302	domestic pigs	69101	1150	796	68284	0
			boars	375	115	100	168	0
			total	69476	1 265	896	68452	0
2012	Ukraine	1	domestic pigs	5	3	3	2	0
			total	5	3	3	2	0
2013	Belarus	2	domestic pigs	20627	27	22	20605	0
			total	20627	27	22	20605	0
2014	Lithuania	2	boars	-	2	0	2	0
			total	-	2	0	2	0
2014	Poland	2	boars	-	2	2	0	0
			total	-	2	2	0	0
2014	The Russian Federation	10	domestic pigs	58706	1165	970	57736	0
			boars		34	19	15	0
			total	58706	1199	989	57751	0
2014	Ukraine	2	domestic pigs	26	5	5	0	0
			boars	0	1	1	0	0
			total	26	6	6	0	0

The disease control presents specific challenges due to the systemic and high level non-compliance by stakeholders (e.g. the farming sector) with the relevant EU requirements, in particular in relation to identification, registration and traceability of pigs and there are certain difficulties for the veterinary authorities to ensure the conformity with those requirements.

Part III: occurrence of ASF in both domestic pigs and wild boar (or in domestic pigs only provided the lack of surveillance data to justify the absence of ASF infection in wild boar). Part II: occurrence of ASF only in wild boar. Part I: higher risk area with no cases, nor outbreaks, of ASF and where higher surveillance (in particular passive) is applied adjacent to a Part II, III or IV (Figure 1).

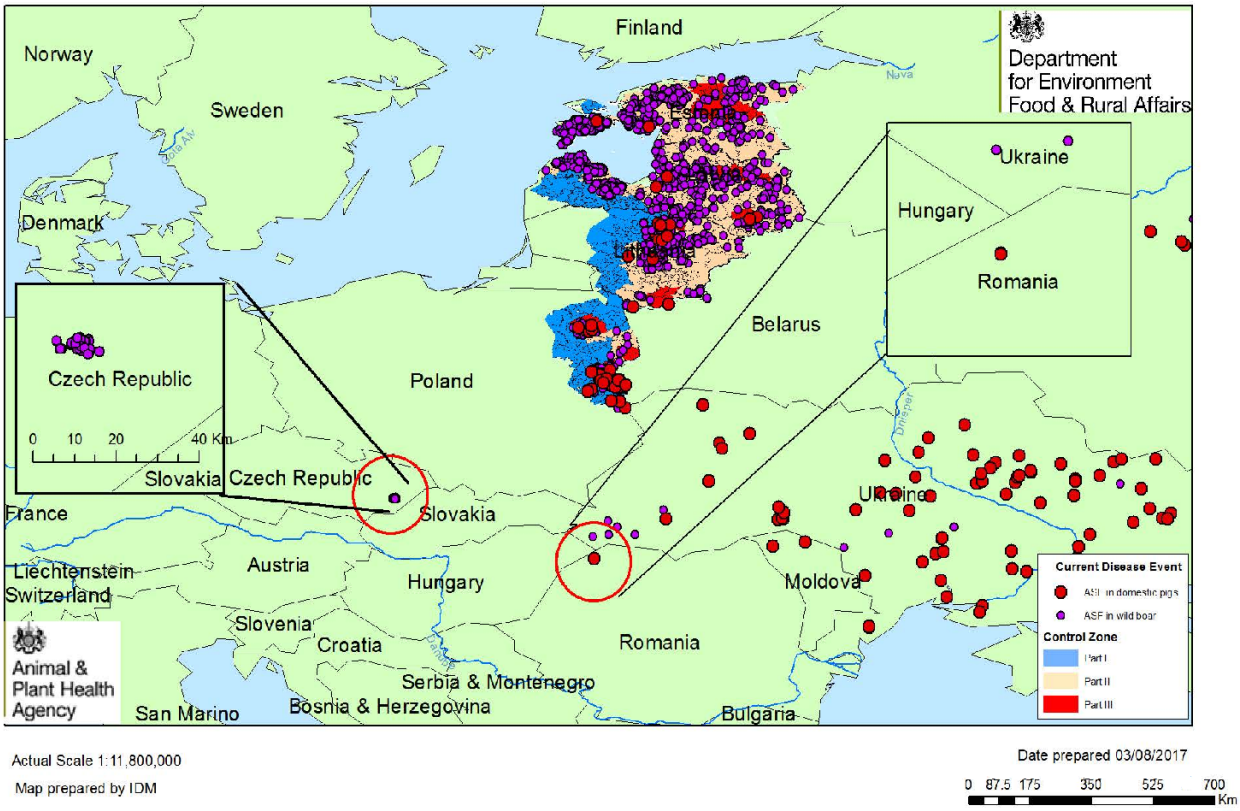

Figure 1. RecentAfrican Swine Fever outbreaks domestic pigs and wild boar in 2017 [Insets: wild boar cases in Czech Republic and backyard outbreaks in Romania]

The updated map of European Union outbreaks of swine fever in the European Union shows that Romania is the country most affected by the virus, with almost half of the counties in the red zone - officially discovered pests. Among the countries where there are outbreaks of farms, there are also Poland, Lithuania, Estonia. In Eastern Europe the disease has become endemic in two regions of southwest and central Russia [21] and both domestic pigs (mainly free-range domestic pigs) and wild boar populations are widely affected recording 40% and 60% of ASF notifications respectively (2007-2016). Domestic pigs appear to play the primary role in the subsequent disease transmission that seems to have been influenced by factors such as contaminated swill, garbage and vehicles, and/or free-range farming. These factors contributed to ASFV transmission within domestic backyard farms and wild boar populations. Wild boar appears to play a secondary role in disease transmission.

Nevertheless, the fact that wild boar can transmit the virus even in the absence of domestic pig [24] implies that they can maintain infectivity and provide positive feedback that sustains virus circulation between wild boar and free-range pigs (Table 2). The presence of the virus in Romania was first reported on July 31, 2017, in Satu-Mare County (Figure 2). The map made by the European Commission on the basis of new information collected at Community level shows that south-east and north-west of Romania are practically red areas in 2018 (Figure 3). Red area includes many areas around Bucharest and many counties: Constanța, Satu-Mare, Tulcea, Bacău, Bihor, Brăila, Buzău, Călărași, Dâmbovița, Galați, Giurgiu, Ialomița, Ilfov, Prahova, Sălaj, Vaslui, Vrancea. Blue area (cases of sickness in wild boars) includes forest areas from counties: Alba, Arad, Argeș, Bistrița-Năsăud, Brașov, Cluj, Covasna, Harghita, Hunedoara, Iași, Maramureș, Neamț, Teleorman. Over 365,000 pigs affected by the disease were eliminated at national level due to swine fever. The National Sanitary Veterinary and Food Safety Authority (ANSVSA) has announced that up to now, 319 outbreaks have been extinguished, of which: in Ialomita County, most of Romania, 76 in Brăila County, 58

Table 2. Outbreaks of ASF in Europe between 2015-2017 (Veille sanitaire internationale Plateforme ESA–France)

Country	2015		2016		2017	
	domestic pigs	boars	domestic pigs	boars	domestic pigs	boars
Belarus	0	0	0	1	0	0
Estonia	18	723	6	1052	0	249
Latvia	10	752	3	865	2	186
Lithuania	13	11	19	303	1	122
Moldavia	0	0	2	0	1	0
Poland	1	53	20	80	0	81
The Russian Federation	45	40	214	77	5	6
Ukraine	36	4	79	7	51	4

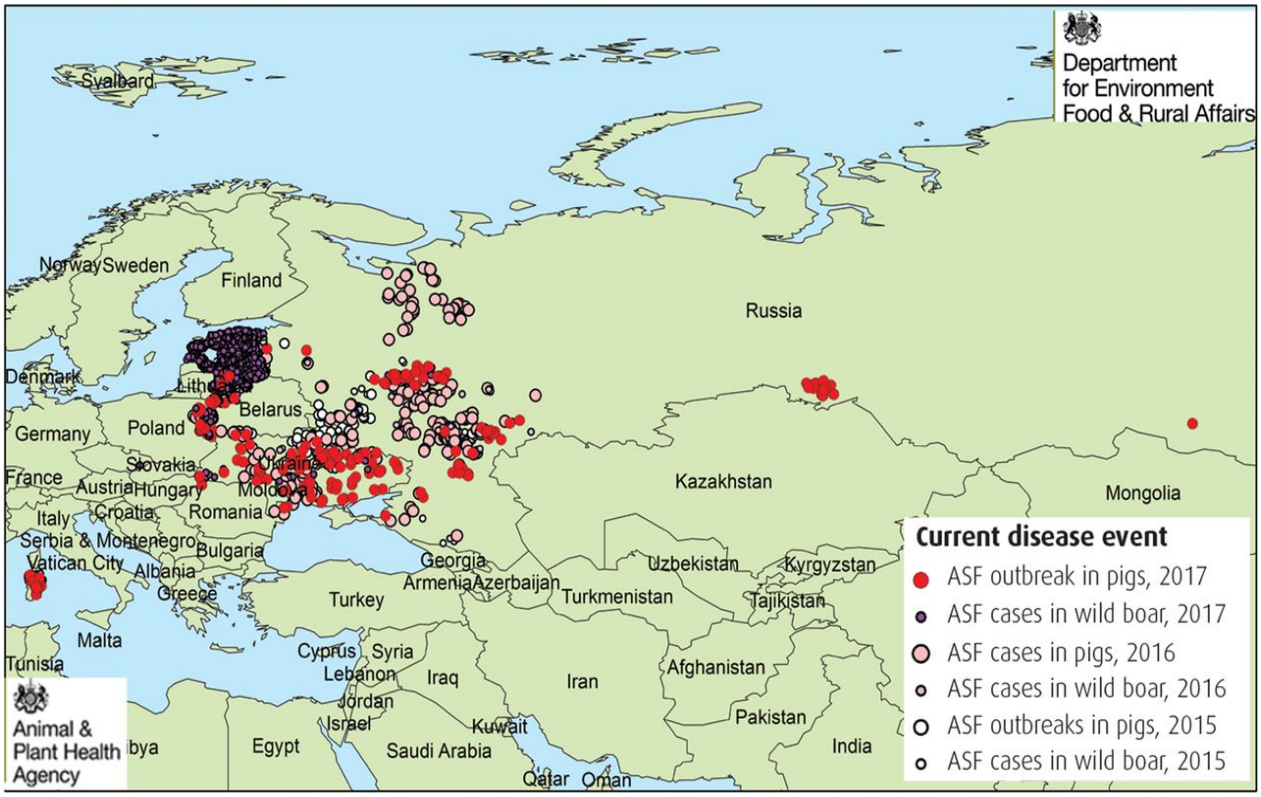

Figure 2. ASF outbreak during 2015-2017 in Eastern Europe

Constanța County, 32 in Bihor, 20 Satu-Mare, 13Galați, 8 Ilfov, 7 Buzău, 5 Giurgiu, 5 Olt, 3 Maramureș, 2 Dâmbovița, 2 Teleorman, 1 Argeș, 1 Dolj Counties.

To prevent the spread of the disease, all suspicious animals must be sacrificed and neutralized, while owners will be compensated by the state under the conditions laid down by law. In October 2018, an overview of ASF situation in UE reported a number of 10 outbreaks 4,155 cases of illness in wild boar and 1,168 in domestic pigs (Table 3). The African swine fever epidemic in Romania expanded in mid-November 2018 in 287 localities in 18 counties. Were reported a total of 1,092 outbreaks (16 of them in commercial holdings) and 167 cases in wild boars, according to data from the National Sanitary Veterinary and Food Safety Authority. African swine fever (ASF) evolves in 297 localities in 16 counties, with 1,127 outbreaks sent to ANSVSA in January 2019. In March 2019 The African Pig Pest is currently developing in 227 localities in 20 counties, with 914 outbreaks, 12 of them in commercial farms, while in other two counties only wild boar cases

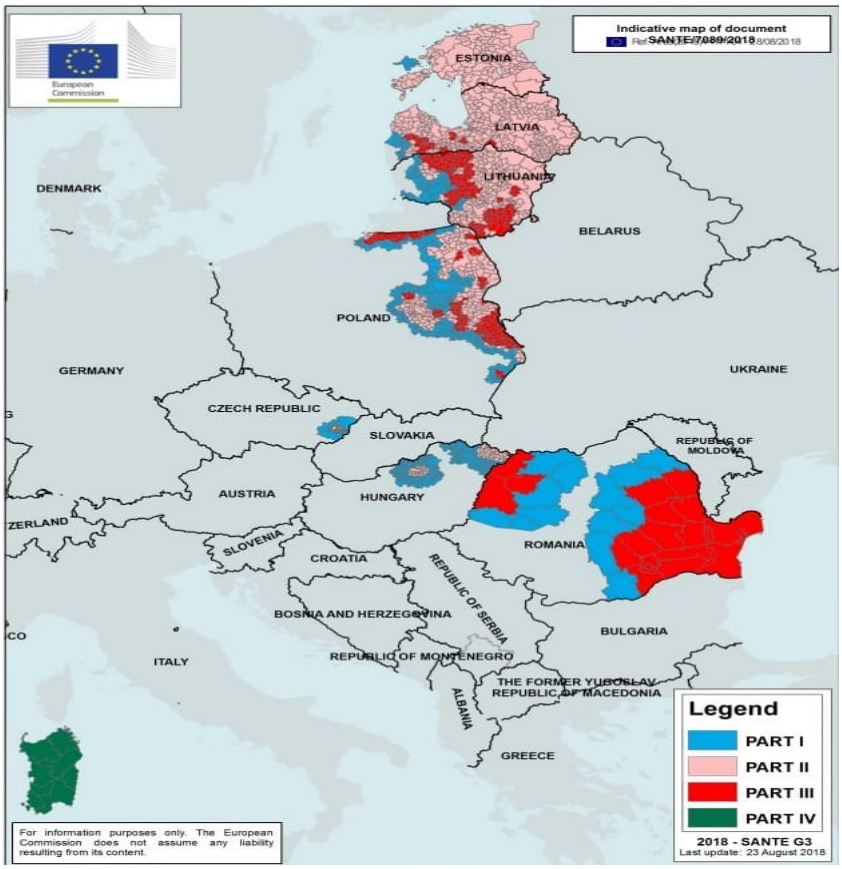

Figure 3. Updated map of outbreaks of swine fever in the European Union carried out by the European Commission

Table 3. Outbreaks of ASF in Europe in October 2018 according to GF-TADs (Global Framework for the Progressive Control of Trans boundary Animal Diseases)

Country	Wild boar	Domestic pigs
Poland	1966	109
Lithuania	1258	50
Latvia	561	10
Estonia	198	0
Czech Republic	28	0
Romania	56	988
Hungary	35	0
Bulgaria	0	1
Belgium	12	0
Italy	41	10
Total	4155	1168

have been reported, the Authority National Sanitary Veterinary and Food Safety. According to data centralized by the Authority, in total, 365.479 pigs affected by the disease were eliminated and 1,219 cases of wild boar. Also, 319 outbreaks have been extinguished to date, out of which: 83 in Ialomita county, 76 in Brăila County (of which seven in commercial farms), 58 in Constanța County, 32 in Bihor County, 20 in Satu Mare County, 13 in Galați County, eight in Ilfov County, seven in Buzău County, five outbreaks in the Giurgiu and Olt counties, three in Maramureș County, two outbreaks in the Dâmbovița counties (of which one on a type A holding) and Teleorman, respectively an outbreak in the counties Argeș and Dolj. According to ANSVSA,

most of the outbreaks are in the following counties: Tulcea-576 (of which 5 outbreaks in commercial farms and one outbreak at a holding A and 161 cases in wild boar), Călărași-with 103 outbreaks (one outbreak at a commercial exploitation and 94 cases of wild boar), Brăila-with 57 outbreaks (of which 4 outbreaks in commercial farms and 19 cases of wild boar), Ialomița-with 44 outbreaks in the households and 153 cases of wild boar, and Constanța-35 outbreaks in households and 23 cases in wild boar. In the remaining affected counties there are one to 28 outbreaks. The situation continues to be serious in Romania regarding the evolution of this serious pig disease (Figure 4).

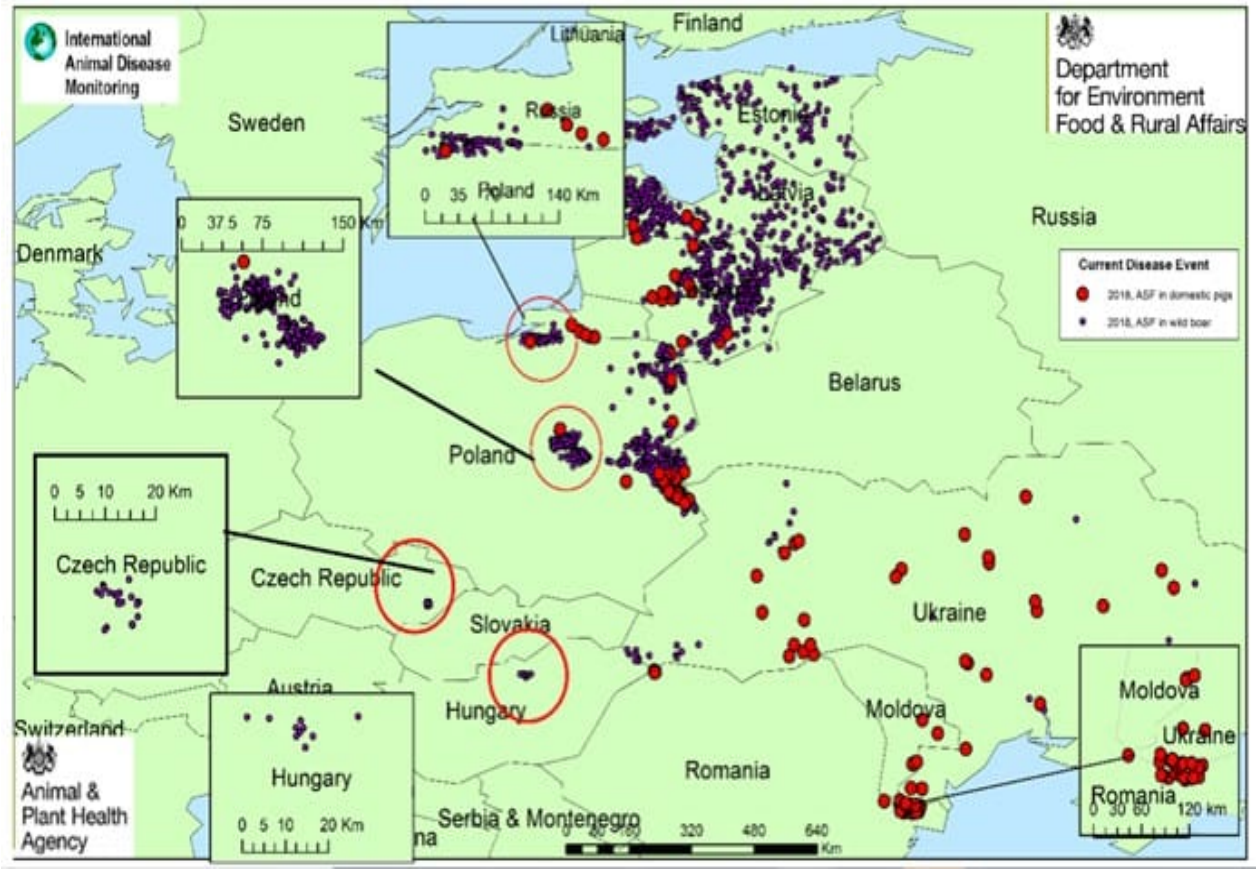

Figure 4. The number of reported incidences of ASF in domestic swine and wild boar since 2018 (The Animal and Health Agency is continuously updating their epidemiological map of African swine fever)

4. Conclusions

Highly contagious hemorrhagic disease, African swine fever (ASF) causes great rates of death among domestic pigs causing huge economic damage in countries where they are evolving and are not a few, including entire continents. In infected areas, control is done through slaughtering of all pigs and destruction of cadavers and litter, cleaning and disinfection, designation of infected zone and control of pig movement, as well as epidemiological investigation (tracing of sources and possible spread of infection). There is currently no treatment or vaccine against African swine fever [28]. A major roadblock to the development of a new vaccine is the lack of convenient genetic tools to study this pathogen. Unlike other viruses, the ASF virus induces more complex immune responses that require intricate virus manipulation prior to the design and development of a vaccine. In the absence of an effective vaccine against ASF virus, prevention in countries free of the disease depends on stringent import policies, ensuring that neither infected live pigs nor pork products are introduced into areas free of ASF. This includes ensuring proper disposal of waste food from aircraft, ships or vehicles coming from infected

countries and enhances biosecurity measures in particular in backyard or non-commercial pig farms [29]. In Romania, African swine fever has raged over the past two years and ANSVSA announced a devastating balance sheet. And yet the authorities also have good news. It seems that for the first time, a year and a half after the official appearance in Romania, the number of outbreaks and affected localities is decreasing. In the epidemiological context of African swine fever in Romania, one of the recommendations of NGE for ASF is the emergency depopulation of at least 10 km around commercial farms, without prejudice to the provisions of Directive 60/2002/EC laying down specific provisions for the control of the disease African swine, by slaughtering for own consumption, under veterinary control and/or slaughtering of pigs from backyards in approved designated slaughterhouses. Also, a plan for the eradication of ASF in wild boar population in Romania has been developed. This plan comprised measures for wild boars and domestic pigs from affected areas and for wild boars from non-affected areas. The last report, number 11 for the period February 15- March 1 2019 of OIE, World Animal Health Information and Analysis Department communicated that all losses reported in Europe (117) were notified by Romania. Also the report shows that are 8 European countries (Belgium, Hungary, Bulgaria, Latvia, Moldova, Poland, Romania, Ukraine) with ongoing outbreaks of ASF. In Europe, this report emphasizes that the situation remained stable.

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