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AFRICAN SWINE FEVER IN POLAND AND EASTERN EUROPE. CURRENT EPIZOOTIC STATUS AND PERSPECTIVES FOR ITS ERADICATION.

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Abstract

Animal production is of major economic importance in a number of European countries, including Poland. In terms of swine production, there are over 1.3 billions of swine worldwide. The EU is the second largest pork producer with over 186 millions of swine. In Poland, according to the data from EUROSTAT, in June 2020, the number of pigs exceeded 11.43 million, showing an increase of 6.0% compared to the same period in the previous year. The observed international fluctuation in the produced pigs' number is mainly related to the lack of profit in production due to the occurrence of infectious diseases, with African Swine Fever (ASF) amongst them. ASF in Poland has been a major threat for pig production for the eight years. The main problems in ASF eradication in Poland are due to the high density of wild boar. Other factors, responsible for long-distance ASF spread are related to human-mediated activity and lack of awareness of pig producers. The observations from the eight years of ASF epizootic in Poland indicate that the disease could not have been effectively controlled in wild boar population and could only be restricted in domestic pig population following stringent biosecurity measures. The only solution for future sustainable pig production in Poland seems to be strict collaboration between pig producers, veterinary inspection, and hunters.

Swine production in Europe

Production of meat as a direct source of well-assimilable proteins and exogenous amino acids represents one of the most crucial agricultural branches of all European countries' economies. In the context of meat production, the European livestock industry is worth an estimated 100 billion EUR per year (1). Regarding the production of meat, the most profitable species showing high feed conversion are swine (2,3). The estimated swine production reaches over 1.3 billion heads worldwide (1). Europe is the second largest pork producer with over 186 millions of swine. Therefore, the factors influencing production, profitability, and sustainability are of crucial importance in providing the sufficient work outcome to the local and international markets. In Poland, according to the data from EUROSTAT, in June 2020, the number of pigs exceeded 11 million 432,6 thousands, showing an increase of 6.0% in comparison to the same period in the previous year. The increase in the number of pigs occurred in all production and utility groups of pigs. The number of pigs in 2020 was higher by 6% than in an analogous period in 2019 (1).

Impact of ASF on pig production in the world

The observed fluctuation in the number of produced pigs is related to the lack of profit in production mainly due to the occurrence of infectious diseases, the most important of which is the African Swine Fever (ASF) (5-7). The most noticeable decrease in pork production has been identified in Germany and reached 4.2% in comparison between 2016 and 2020 (1). The more considerable impact of ASF epizootics has been observed in China and other Asian countries, where production at the same reporting period decreased by over 20%. Since there is no effective vaccine against ASF, the only way to limit the influence of its emergence is the strict implementation of biosecurity measures at all levels and kinds of swine production (8-12). African swine fever (ASF) represents one of the most important swine epizooties in Europe, Russia, and Asia (13-16). This disease has a significant impact on the profitability of pig production, triggered mainly by restrictions influencing the international trade in animals and meat of pork origin (2,4).

Potential vectors of ASF in Europe

ASF is a viral, contagious disease of swine and wild boar as well as other species of *Suidae* family (5). ASF has been officially controlled and compulsorily notifiable by the International Organization for Animal Health (OIE). The ASF virus (ASFV) is highly infectious, which results

in the possibility of infecting pigs with a very low dose of the virus, even with 5 viral units expressed as HAU (haemadsorption unit/milliliter) (17). Despite the high mortality during ASF in domestic pigs, the disease is characterized by low contagiousness and is slowly spreading among infected animals in the herd (5,8,17). Among the infected wild boar, there is a certain percentage (app. 1% in Poland) of animals that survive the infection (8). During ASF, four clinical forms may be distinguished – hyperacute, acute, subacute or seldomly chronical (14,17). However, this disease type has not been observed in Poland or in other European or Asian countries where ASF has occurred in domestic pigs. Characteristic pathological changes in acute ASF are splenomegaly and severe spleen hyperemia, and due to the haemolysis the colour of the spleen turns to dark purple. Additionally, it is common to observe lymphadenopathy, necrotic foci and ecchymosis on the surface of the kidneys (17).

ASF was first recorded in 1921 in Kenya and its subsequent „wave" epizootics occurred in Africa, the Iberian Peninsula (Spain and Portugal) since 1957, and then in Western Europe, namely in France (1986), Italy (1967-1969, 1993), Malta (1978), Belgium (1985), the Netherlands (1986), Cuba (1971, 1980), Brazil and the Dominican Republic (1978). Since 1978, the virus has become endemic in Sardinia in wild boars and free-living, often unregistered pigs, commonly known as *brado* (3,5,11).

The new era of ASF, critical for the international production and trade of pigs, began in 2017 in Georgia (5). The likely sources of the ASF virus are pigswill contaminated with the virus, transported on a ship carrying pigs from Mozambique to the Poti dock on the Black Sea Coast. Then, in the next few years – in 2012, ASF appeared in Belarus and Ukraine, and then in 2014 in Estonia, Lithuania, Latvia and finally also in Poland (7,10,18).

European wild boars (*Sus scrofa scrofa)* were the source and reservoir of the ASF virus in Russia and European countries, where this disease appeared, including Poland. According to the data on the course of ASF, prepared by the European Food Safety Authority (EFSA), the current course of the disease in Lithuania, Latvia and Estonia indicates a change during the endemic form of the disease, which is not the case e.g. in Poland (4,13). The countries in Europe where ASF was successfully eradicated in wild boar during the „new era" of ASF are the Czech Republic and Belgium. Disease control in those countries was possible due to the hot-spot nature of the disease introduction and the measures implemented to combat ASF by applying electric fence repellents for wild boar as well as wild boar trapping.

ASF in Poland and implications in pig production

For the first time in Poland, ASF was found in a dead wild boar in February 2014, in Podlaskie voivodeship, within the immediate vicinity of the border with Belarus (8). Since then, ASF spreads in the wild boar population in a slow but consistent rate of app. 10 to 12 square km per year. Unfortunately, as a result of human activity, in 2016, the ASF spill over to the Moniecki county of Podlaskie voivodeship has been observed. Another human-mediated spread episode was the introduction of the virus to the wild boar population in the area of Warsaw and Piaseczno, more than 120 km away from ASF-affected areas in Poland (4). Similarly, in 2018, ASF has been confirmed among wild boar in Warmian-Masurian voivodeship near the Kaliningrad District (Russia). Application of solid fencing along with repellents to wild boar were the first measures introduced to limit ASF spread in wild boar populations in the newly affected area During 2020, in total 4,028 and in 2021 over 2,100 ASF outbreaks in wild boar were notified (4).

In 2020 and 2021 in Poland, in spite of the introduced measures, ASF has been introduced in pig farms of different sizes and types of production. Based on the experience from the eight years of ASF in Poland, it may be stated that the majority of outbreaks have been caused by the neglection of the basic principles of biosecurity in pig holdings (8). The current epizootic situation in Poland related to the outbreaks in wild boar and domestic pigs is presented in Fig. 1.

In Poland, pork meat presents the most important source of protein just after poultry meat and reaches 37% of total meat consumption. The total number of pigs in 2018 reached 11 million 700 thousands with 900 thousands of sows, 6.1 millions of imported piglets, and a lack of exported pigs to the third country. In 2020, the total number of pig holdings decreased by 26 thousands.

Presumed sources of infection and risk factors for the spread of the ASF in Poland

The analysis of potential sources of virus introduction to pig farms in Poland allows for formulating a hypothesis of virus-contaminated agricultural machines and agricultural equipment in the area of ASF occurrence in the wild boar population. The other observation relates to the larger concentration of outbreaks in the areas of a high number of small pig

farms, ranging from a few to a dozen pigs (8). Such a density, unfortunately, provokes the occurrence of ASF outbreaks, when even just one of them has confirmed the presence of the ASF virus. In connection to the incidence of the intense outbreaks occurrence in domestic pigs in July 2020, a hypothesis was also established regarding the possibility of virus transmission by rainwater running down from the fields containing wild boar carcasses, which led to a subsequent ASF transfer to the pig holdings (4). Recent reports on ASFV persistence in different fomites and environmental conditions showed that the virus' survival period in contaminated water is up to 2-3 times longer compared to the survival of the virus in soil, hay, or straw (19). Another potential cause of ASF outbreaks in Poland was demonstrated on the basis of studies of stable flies (*Stomoxys* sp.) and representatives of *Tabanidae* family from ASF outbreaks in the provinces of Lubelskie, Podkarpackie and Warmian-Masurian, which occurred in 2019-2020, however, it has not been found that they could be a vector for the virus spread in Poland (20).

The future of pig production in Poland seems to be directly dependent on human activity, awareness, and compliance of pig producers with the basic biosecurity rules at the farm level. The data from epizootic analyzes show that the main reason behind the occurrence of ASF outbreaks in 2020 was an insufficient understanding of these principles by farmers. It is necessary to appeal to hunters and other structures responsible for wild boar hunting to find and remove all wild boar carcasses from the environment.. The problem of the occurrence of ASF cases may be limited by intensive hunting of wild boar in the areas surrounding the infected area at a distance of 50-100 km and individual shooting in the immediate epicentre of the infection, i.e. 5-10 km around the place where the dead wild boar was found. The other crucial issue is the development of more precise methods of wild boar density estimation. Only on the basis of reliable data may it be guaranteed that the estimated number of animals included in the hunting bag will not deviate as much from the actual situation. It is known that in 2020 the population of wild boar, like other species of wild deer in Poland, significantly increased, which is the direct effect of suspension of hunting during the COVID-19 pandemic.

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