Pseudorabies Virus

Subjects: Zoology

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Pseudorabies, or Aujeszky's disease, is a notifiable worldwide infection of domestic and feral swine that causes economic losses for the swine industry. In domestic pigs, the virus is responsible for nervous and/or respiratory symptoms; in pregnant sows, it is one of the major causes of stillbirth, mummification, embryonic death, and infertility (SMEDI). It is known that PRV infection in wild boar is associated with low pathogenicity and attenuated or absent symptomatology, but limited information is available about the ability of the virus to infect the foetuses of infected wild boar pregnant sows. Due to scarce information about the reproductive consequences, we investigate the possible intrauterine vertical transmission of the virus in wild boar pregnant sow living in a highly infected area. A number of 54 hunted wild boar were sampled during 2018–2019, and blood, genital and nasal swabs, placenta, and fetuses were collected for serological and molecular investigations. A seroprevalence of 74% (40/54) was detected, while 1/24 pregnant sow and 1/24 pooled foetuses tested positive by PCR (gene gB). This is the first evidence of viral detection in foetuses from seropositive pregnant wild boar. This finding suggests the possible pathogenetic role of PRV on pregnancy in wild boar and the existence of an additional transmission route.

pseudorabies virus | wild boar | Italy | foetus | Suid alphaherpesvirus 1 | transmission route

1. Introduction

Pseudorabies (PR) or Aujeszky's disease is a notifiable worldwide infection of domestic and feral and wild swine that was first described in the early twentieth century [1][2]. The disease is characterised by neurological and reproductive porcine disorders causing economic losses for the swine industry.

The causative agent is Suid herpesvirus 1 (SuHV-1), also known as pseudorabies virus (PRV), or Aujeszky's disease virus (ADV), a member of the family Herpesviridae, subfamily Alphaherpesvirinae, genus Varicellovirus [2].

PRV can infect many species, but despite its wide host range, which includes nearly all mammals, the natural hosts for PRV are members of the Suidae family, in particular domestic pigs and wild boar. In these animals, the virus is able to establish a lifelong latent infection in neuronal and non-neuronal cells, so swine and wild boar survive the infection and behave like a reservoir of PRV [3][4].

2. PRV in Pigs

In pigs, PRV transmission mainly occurs by an oro-nasal route due to the high density of swine in farms, which allows for nose-to-nose contact and disease shedding. The venereal transmission has been suggested as the main route in feral swine and wild boar [2][5][6]. Higher viral seroprevalence in females, along with the presence of viral DNA in nasal secretions, suggests that PRV is mainly transmitted oro-nasally within female groups throughout the year, whereas venereal

transmission is limited to the mating season [3][6][7]. Secondary routes of transmission are through contact with fomites or by ingestion of contaminated carcasses of other infected animals, such as feral swine, wild boar, rodents, or carnivores [2][8][9].

Due to great economic impact on the swine industry, most of the European countries have implemented eradication programs with the purpose of eradicating PRV and guaranteeing free trade within Europe[10].

Since the 1980s, PR has spread globally due to the changes in swine management with the rise of intensive farming and to the appearance of highly virulent strains of PRV[2][11]. Therefore, infection, prevention, and control plans including large-scale vaccination with gE-deleted vaccines have been put in place in farmed pigs. To date, the disease has been eradicated within the domestic pig population in several European nations such as Denmark, Finland, Austria, France, Germany, Hungary, Switzerland, Sweden, Slovakia [2]. Canada, New Zealand, and the United States have been declared as “Aujeszky’s Disease-free” [12][13].

On the other hand, in countries where domestic pigs are PRV free, the virus is almost always present in an endemic form in wild boar [10]. In fact, the PRV seroprevalence in wild boar in European countries ranges from 4% to 66%, and therefore it is important to understand the epidemiology of the virus in this species in order to avoid the possibility of relapses in pigs or infection of other susceptible animals [2][6][10][14][15][16][17][18][19][20][21][22].

To gain information concerning the epidemiology of the virus, genetic characterisation of circulating PRV genotypes can be helpful.

PRVs are classified by the Restriction Fragment Length Polymorphism (RFLP) analysis in four major types and several subtypes[4] : genotype I, found mainly in the USA and in Central Europe; genotypes II and III, circulating in Northern Europe and Central Europe; and genotype IV, which is limited to Asia [2][23].

In Europe, while genotype 1 mainly circulates in wild boar, both genotype 1 and 2 have been detected in domestic pigs even if the latter is much more widespread [20].

In Italy, although the National Authority has implemented an eradicating program adopting severe and restrictive measures, the virus has undergone a substantial reduction in circulation in pig farms but has not yet been eradicated; furthermore, it is widely spread within the wild boar population [10][24].

In adult domestic pigs, the virus is responsible for respiratory symptoms of different severities that can determine the worsening of the general health condition, loss of weight and appetite, and therefore a decrease in production performance. While in adult pigs morbidity is very high and mortality is around 1%–2%, in piglets, there are nervous symptoms, including tremors, convulsions, and paralysis, leading to death in 100% of cases. In pregnant sows, the infection, as well as the reactivation of the virus, leads to stillbirth, mummification, embryonic death, and infertility (SMEDI) with embryo resorption, foetal mummification, abortion, or stillbirth based on the month in which the virus reaches the placenta [25][26][27][28][29].

Unfortunately, little is known about the symptomatology of the disease in wild boar. So far, it is known that PRV infection in free-ranging wild boar is associated with low pathogenicity and attenuated or absent symptomatology with only mild respiratory symptoms. Limited information is available about the ability of infected wild boar pregnant sows to carry out the pregnancy[2][15][17][30].

Due to scarce information about the reproductive consequences of PRV infection, we investigate the implications of the virus in wild boar pregnant sow living in a highly infected PRV area.

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