Sero-surveillance of wild boar in the Netherlands, 1996-1999

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Summary
From 1996 to 1999, blood samples were collected from wild boar shot during the hunting season in Crown properties, national parks and the free wildlife belt in the Netherlands. Sera were screened for the presence of antibodies against classical swine fever virus (CSFV), swine vesicular disease virus (SVDV), Aujeszky's disease virus (ADV) and Trichinella spiralis. The results of the sero-surveillance system indicate that CSFV, SVDV and ADV are uncommon within the wild boar population. Hence, the wild boar population is not thought to be an important reservoir of these viruses in the Netherlands. Infection with ADV and CSFV is endemic in the wild boar population in Germany. Since contact between the wild boar populations of Germany and the Netherlands cannot be excluded in the southern part of the Netherlands, continuation of the sero-surveillance system seems appropriate.

In the decade before 1998, no antibodies to Trichinella spp. were found in the wild boar population of the Netherlands. The detection of some seropositive animals during the hunting season of 1998-1999 corresponds to the previous findings in wild boar before 1988. However, the recent data do not have consequences for the pig industry of the Netherlands, since the country has been considered Trichinella-free for many decades.

Keywords

Introduction

Disease control among wild boar is of concern to those interested in wildlife and domestic livestock because the wild boar population is susceptible to, and may serve as a reservoir for, diseases of domestic pigs.

Aujeszky's disease virus (ADV), classical swine fever virus (CSFV) and Trichinella spiralis have been reported in wild boar populations in Europe and the United States of America (USA) (1, 2, 5, 7, 11, 15, 17, 22, 23, 24, 30). To the knowledge of the authors, swine vesicular disease virus (SVDV) has not yet been detected in wild boar, but another vesicular disease, vesicular stomatitis virus, has been detected in wild boar in the USA (25).

In the Netherlands, the wild boar (Sus scrofa) population lives in a restricted number of areas: in completely fenced areas such as Hoge Veluwe and the Crown dominions in the central-eastern part of the Netherlands, or in the so-called 'free-wildlife belt', consisting of the national parks of De Veluwe (in the central Netherlands) and De Roerstreek (in the southern Netherlands) in which wild boar live in partly fenced areas (Fig. 1). The estimated number of wild boar living in these areas was approximately 100, 500, 2,860 and 170 respectively (in the spring of 1998), indicating that the wild boar population is fairly small in the Netherlands, with a total of approximately 3,600 animals.

Since 1994, a sero-surveillance system has been set up in co-operation with associations and trusts that manage the areas in which the wild boar live. A collection of blood
sampling and sent by mail or courier service to the laboratory of the Animal Health Service, Deventer. Blood samples were centrifuged at 2,500 g, and stored at -20°C until examination. An aliquot of the sample was sent to the reference laboratory of the Institute for Animal Science and Health (ID-Lelystad) in Lelystad for investigation of antibodies to CSFV.

Serum samples were tested for the presence of neutralising antibodies against CSFV using the neutralisation peroxidase-linked assay (27). The presence of antibodies against SVDV were tested with a liquid-phase blocking enzyme-linked immunosorbent assay (ELISA) (9). Sera were tested for the presence of antibodies to glycoprotein E (gE) of ADV by a commercially available ELISA, as described by Van Oirschot et al. (34). Sera were examined for the presence of antibodies against T. spiralis with an ELISA, as described by Van Knapen et al. (33).

Results
Sero-surveillance of wild boar between 1996 and 1999 revealed no evidence for CSFV, SVDV or ADV within the wild boar population (Table II). During the hunting season of 1998-1999, antibodies against T. spiralis were detected in nine out of 163 samples examined: five samples from area 1 (t Loo), three samples from area 3 (de Veluwe) and one sample from area 4 (de Roerstreek).

Discussion
According to the classical epidemiological sampling theory (3), if CSFV, SVDV or ADV infections were established in the wild boar population, the probability of failing to detect infection using the sampling scheme applied between 1996 and 1999 is very low. However, a continued sero-surveillance system is required as an early warning system to detect introduction and establishment of these viruses in the wild boar population of the Netherlands in the future.

The occurrence of certain diseases in wild animal species in the recent past has had a major influence on the existence and nature of wild animal disease surveillance programmes in many countries of Europe (14). Of particular importance in this respect is classical swine fever (CSF). The pig is the only animal which can perpetuate CSFV in nature, and hence the
Table II
Proportion of wild boar with antibodies against swine vesicular disease virus, classical swine fever virus, Aujeszky's disease virus and *Trichinella spiralis* in a sample of wild boar shot during the hunting season in the Netherlands

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<tr>
<td>Swine vesicular disease virus</td>
<td>0/71</td>
<td>0/133</td>
<td>0/164</td>
<td>0/368</td>
<td></td>
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<tr>
<td>Classical swine fever virus</td>
<td>0/71</td>
<td>0/133</td>
<td>0/164</td>
<td>0/368</td>
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<td><strong>List B diseases</strong></td>
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<td></td>
</tr>
<tr>
<td>Aujeszky's disease virus</td>
<td>0/71</td>
<td>0/133</td>
<td>0/164</td>
<td>0/368</td>
<td></td>
<td></td>
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<tr>
<td><em>Trichinella spiralis</em></td>
<td>0/89</td>
<td>0</td>
<td>9/163</td>
<td>9/232</td>
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* Number of samples with antibodies/total number of samples

survival of the virus depends ultimately on domestic pigs and wild boar. The importance of CSF for domestic pigs and international trade in pork and pork products has caused many national veterinary organisations to include wild boar in sero-surveillance programmes (2, 16, 17, 19). Classical swine fever has occurred in wild boar in many parts of the European Union, including Germany, France, Italy and Austria (35), and also recently in Switzerland (20). In the case of a sudden occurrence of a CSF outbreak in these areas, the wild boar population should always be considered as a possible virus reservoir (1, 4, 13, 22). Since contact between the wild boar populations of Germany and the Netherlands cannot be excluded in the south of the Netherlands, continuation of the sero-surveillance system for CSFV seems appropriate.

In the Netherlands, an ADV eradication campaign in domestic pigs commenced in 1993, employing a nation-wide compulsory vaccination programme with gene-deleted marker vaccines (26). The programme has been very successful, and is currently approaching the final stage of ceasing vaccination (10). Identification of any lingering ADV infections in the wild boar population is therefore important for the eradication programme. The results of the sero-surveillance system in wild boar between 1996 and 1999 indicate that, if present, ADV is uncommon within the wild boar population. Thus, it seems that ADV infection in the wild boar population is not an important wildlife reservoir in the Netherlands. Therefore, the risk of reinfestation of Aujeszky's disease-free herds by the wild boar population is probably negligible, especially as outdoor housing of pigs is uncommon in the Netherlands. However, ADV is present in the wild boar population in Germany. In the Federal States of Brandenburg, Mecklenburg-Vorpomern, Niedersachsen, Sachsen-Anhalt and Nordrhein-Westfalen, ADV-seroprevalence in wild boar was found to be 9.8% (18), 0.3% (8), 1.7% (7), 0.9% (22) and 7% (16), respectively. In the Federal State of Brandenburg, where the prevalence of ADV in wild boar is reasonably high, ADV was eradicated from the domestic pig population in 1985. Infection with ADV in the wild boar population appears to be endemic in this area and to persist completely separately and, as yet, without affecting the domestic pig population.

Since contact can occur between the wild boar population of Germany and the Netherlands, continued sero-surveillance for ADV is recommended. Eradication of SVDV in the Netherlands was achieved in 1975, although minor outbreaks of SVDV occurred in 1992, 1993 and 1994 (28). The isolate responsible for the outbreak in 1992 was identical to a strain isolated in 1987 in Eastern Europe, and the infection is assumed to have been introduced from that area. Regular transport of weaners and slaughter pigs occurs from the Netherlands to Italy. In 1997, 80,000 weaners and 570,000 slaughter pigs were transported by truck to Italy (Productboard for Livestock and Meat, Rijswijk, the Netherlands). Swine vesicular disease is endemic in Italy (21), and therefore a risk of introduction of SVDV into the Netherlands is presented by trucks returning from Italy. Swine vesicular disease is an important Office International des Epizooties List A disease and inclusion of SVDV in the sero-surveillance system for wild boar is therefore warranted (2).

Results of sero-surveillance of the wild boar population between 1988 and 1998 indicated that *Trichinella* infections were uncommon within the wild boar population of the Netherlands (12, 31). However, low infection rates were found occasionally. In the period from 1976 to 1980, sero-surveillance of 993 wild boar revealed 1.8% positives and detected a low rate of infection with *Trichinella* in two animals, using artificial digestion of diaphragm tissue (32). The detection of nine wild boar with antibodies to *Trichinella* during the hunting season of 1998-1999 again indicates that low infection rates are occasionally present in wild boar. Whether these positive reactions to the ELISA represent wild boar infected with *T. spiralis* is not certain because of the serological cross reactivity between the different species of *Trichinella*. *Trichinella britovi* has also been identified in wildlife in the Netherlands (29). Future studies should therefore also attempt to isolate *Trichinella* larvae from wild boar, by peptic digestion of *Trichinella*-related muscles, and eventually identify these to species level. However, the low
infection rates of *Trichinella* in wild boar have not had any consequences on commercially raised pigs in the Netherlands (12).

**Conclusion**

No antibodies against CSFV, SVDV or ADV were detected in the wild boar population of the Netherlands between 1996 and 1999, and the authors conclude that wild boar in the Netherlands are not infected with these viruses at present. Currently, the domestic pig population of the Netherlands is also free of SVD and CSF. Therefore, the wild boar population does not appear to be an important wildlife reservoir of CSFV, SVDV or ADV in the Netherlands and constitutes a negligible threat for the commercial pig industry. The threat is diminished to an even greater degree because outdoor housing of pigs is uncommon in the Netherlands.

Between 1988 and 1998, no antibodies to *Trichinella* were detected in the wild boar population of the Netherlands. The identification of some seropositive boar during the hunting season of 1998-1999 corresponds to the previous findings in wild boar before 1988. However, the recent data have no consequences for the pig industry of the Netherlands which has been considered *Trichinella*-free for many decades.

The continuation of this sero-surveillance system in the wild boar population is important for the pig industry of the Netherlands and the international trade of pork and pork products. The presence of CSFV and ADV in the wild boar populations in neighbouring Germany increases the importance of this sero-surveillance, since the possibility of contact between the wild boar populations of Germany and the Netherlands cannot be excluded.
Serovigilancia del jabalí en los Países Bajos, 1996-1999

Resumen
Entre 1996 y 1999 se recogieron muestras sanguíneas de jabalíes abatidos durante la temporada de caza en propiedades de la Corona, parques nacionales o zonas de protección de la fauna silvestre de los Países Bajos. Una vez extraídas las muestras, el suero se sometía a pruebas de detección de anticuerpos contra Trichinella spiralis y contra los virus de la peste porcina clásica, la enfermedad vesicular porcina y la enfermedad de Aujeszky. Los resultados de este programa de serovigilancia ponen de manifiesto que ninguno de los tres virus citados es frecuente en la población de jabalíes salvajes, lo que da pie a pensar que este animal no es un reservorio importante de esas enfermedades en los Países Bajos. Las infecciones por los virus de la enfermedad de Aujeszky y la peste porcina clásica son endémicas entre las poblaciones de jabalíes de Alemania. Dado que no cabe excluir la posibilidad de contacto entre poblaciones de jabalíes de Alemania y de los Países Bajos en la zona meridional del país, parece conveniente seguir aplicando el sistema de serovigilancia.

Durante el decenio 1988-1998 no se detectaron anticuerpos contra Trichinella spp. entre la población de jabalíes de los Países Bajos. La detección de algunos ejemplares seropositivos durante la temporada de caza de 1998-1999 corresponde a la situación observada antes de 1988. Aun así, los nuevos datos no tienen por qué afectar a la industria porcina neerlandesa, pues el país goza desde hace muchas décadas del estatuto de libre de la enfermedad.

Palabras clave

References


