

PSEUDORABIES VIRUS INFECTIONS IN EUROPEAN WILD BOAR - A POTENTIAL DANGER FOR DOMESTIC PIGS ?

Müller T.¹, Teuffert J.², Zellmer R.¹, Staubach C.², Klupp B.³,
Otte M. J.⁴, Conraths F.J.¹

Pour assurer le succès des programmes d'éradication de la MA et le maintien de ce statut indemne, il faut étudier le rôle éventuel des sangliers dans l'épidémiologie de la maladie. La zone étudiée est considérée comme indemne de MA chez les porcs, mis à part quelques foyers sporadiques, depuis 1985. Par des méthodes sérologiques, virologiques et épidémiologiques, nous avons démontré que l'infection par le virus de la MA existe de façon enzootique chez le sanglier, indépendamment des porcs. Les analyses moléculaires suggèrent que les virus, et donc les cycles épidémiologiques de ces deux types de souches sont indépendants.

INTRODUCTION

Aujeszky's Disease (AD) is an infection caused by a herpesvirus (pseudorabies virus, PrV) and represents one of the most dangerous diseases of domestic pigs which results in high economic losses. AD is considered eradicated in Eastern Germany already since 1985, and the respective German federal states possess a PrV-free status according to regulations of the European Union. Due to its high impact on animal health and the economy of porc production, efforts are being undertaken to control PrV by eradication programmes using gl-deleted PrV marker vaccines in the western parts of Germany, (PITTLER and ROHJAHN, 1990). However, especially in the final phase of eradication and in view of the protection of a PrV-free status, some epidemiological questions will require particular consideration.

From an epidemiological point of view, it is important to characterize the susceptibility and reservoir function of wildlife animals for economically important diseases. Only limited data exist, however, about natural infections of wildlife animals with PrV. Due to its evolutionary relatedness with the domestic pig, the European wild boar may serve as a reservoir for PrV (VAN DER LEEK et al., 1993). Reports on PrV-infections of European wild boar in Europe are scarce. By contrast, natural infections of feral swine with PrV have been reported from the USA (NETTLES, 1991), where the overall seroprevalence amounts to 19% (NETTLES, 1989). Although the extend of clinical disease and the prevalence of latent infections among these populations is unknown, PrV-infected feral swine may represent a potential source of infection for domestic pigs in North America (CRESWELL, 1989).

MATERIAL AND METHODS

In the course of a wildlife disease monitoring project in the German Federal State of Brandenburg the indigenous wild boar population was investigated for PrV infections using different serological methods (ELISA, serum neutralisation test, immunoblotting). To include potential outbreaks of AD in domestic pigs in the study area in the analysis, the records of the national animal disease reporting system (Tierseuchen-Nachrichtensystem, TSN) were examined. Possible correlations between the seroprevalence in the wild boar population, the incidence amongst domestic pigs, infected pig farms, pig density and the total number of piggeries in the study area were examined using the Pearson and Spearman rank correlation analysis (statistic software, SAS).

Virus isolations were carried out by co-cultivation of organ materials from wild boar on cell cultures. Virus isolates were investigated by restriction fragment length analysis of viral DNA with the endonuclease *Bam*HI as described by HERMANN et al., 1984.

RESULTS AND DISCUSSION

Between 1991 and 1995, a total of 3.506 serum samples were investigated in an ELISA licensed for routine diagnose in domestic pigs for the presence of PrV-specific antibodies. The mean seroprevalence in the wild boar population of Brandenburg was estimated as 9.92% (Table I). An apparent increase of the seroprevalence in 1995 is due to an enforced sampling in regions where the seroprevalence is higher.

¹ Federal Research Centre for Virus Diseases of Animals, Institute for Epidemiological Diagnostics, D-16868 Wusterhausen, Germany

² Federal Research Centre for Virus Diseases of Animals, Institute of Epidemiology, D-16868 Wusterhausen, Germany

³ Federal Research Centre for Virus Diseases of Animals, Institute for Molecular and Cellular Virology, D-17498 Insel Riems, Germany

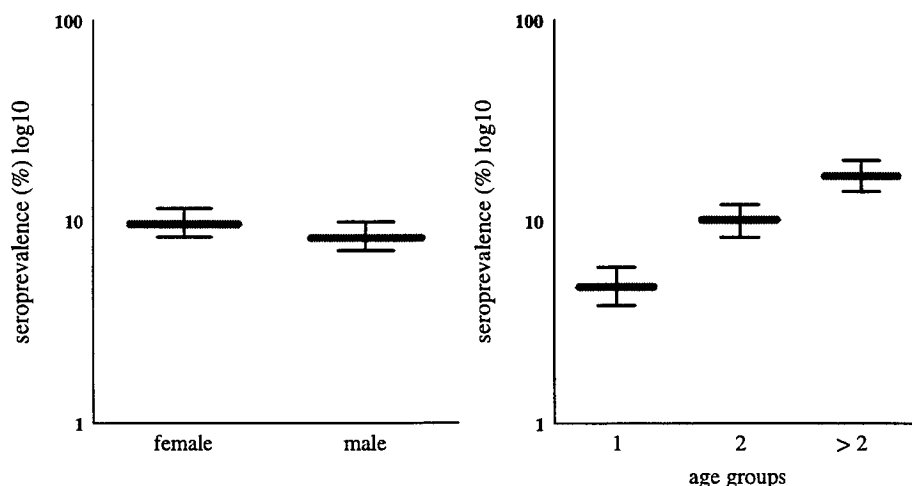
⁴ VEERU, Department of Agriculture, Reading University, Earley Gate, Reading Berkshire, RG6 2AT, United Kingdom

Table I
Calculated 97.5%- confidence intervals of the true PrV seroprevalence (1991-1995)

Year	97.5 %-confidence interval [%]
1991	2.5 - 11.7
1992	6.5 - 12.9
1993	7.6 - 10.8
1994	8.2 - 11.4
1995	14.3 - 22.61
total	8.9 - 11.1

The seroprevalences of males and females did not differ significantly. Thus there is no indication that the sexes are differently exposed to an infection with PrV. However, statistically significant differences between age groups (Figure 1) indicate a higher risk of older individuals (> 24 month of age) in contracting a PrV infection.

Figure 1
Estimated seroprevalences in sex and age of wild boar



These results agree with findings of VAN DER LEEK et al. (1993) and PIRTLE et al. (1989), who found up to 70 % or 28.5 %, respectively, of adult animals seropositive. Our serological results suggest that a considerable proportion of the wild boar population in Eastern Germany must have had contact with pseudorabies virus over a number of years. Similar results have been observed in North-Rhine Westphalia (LUTZ and WURM, 1996). A long term study indicates an increase of the seroprevalence within the last 10 years. In the endemic region in the most eastern part of Brandenburg the seroprevalence can reach 20% or even higher levels in some places. In other German regions no or very low seroprevalences were found (DAHLE et al., 1993, OSLAGE et al., 1994). To some extent, however, these findings may have been impaired by inadequate sampling strategies.

During 1991 and 1994 a total of 49 outbreaks of Aujeszky's Disease (PrV) were registered in the area under study. Correlation analyses showed no statistically significant relationship between the seroprevalence in wild boar and the variables tested. Furthermore, tracing back showed that in nearly 90% percent of the outbreaks animal trade had been identified as the suspected cause of infection.

The hypothesis that the PrV infections in the wild boar population are independent from sporadic outbreaks in domestic pigs is supported by the results of molecular epidemiological investigations of PrV isolates from free-living wild boar. In 1995 and 1996 we were able to obtain the first PrV isolates from wild boar in the endemic region. When analysed for restriction fragment length polymorphisms, the wild boar PrV isolates were shown to possess identical patterns which allowed to group them into the type I of suid herpes viruses (HERRMANN et al., 1984). Furthermore, the *Bam*HI endonuclease DNA pattern of the wild boar isolates showed considerable differences when compared with reference strains (Kaplan, VA65) and isolates from domestic animals. This pattern is characterized by two extra DNA bands between fragments 3 and 4 and the loss of three smaller

fragments. Such PrV isolates have never been found in Germany so far. Further molecular biological and experimental investigations are in progress.

In conclusion, endemic PrV-infections can occur in the wild boar population without affecting the domestic pig population. However, intensive epidemiological investigations are required to monitor the situation in the wild boar population and to avoid transmission to domestic animals.

REFERENCES

- Creswell A. M. 1989. In Proceedings of the Feral Pig Symposium, Orlando, Florida, Livestock Conservation Institute, Madison, Wisconsin, pp. 44-47.
- Dahle J., T. Patzelt, G. Schagemann, and B. Liess. 1993. Deutsche Tierärztliche Wochenschrift 100: 330-333.
- Van der Leek M.L., H. N. Becker, E. C. Pirtle, P. Humphrey, C. L. Adams, B. P. All, G. A. Erickson, R. C. Belden, W. B. Frankenberger, and E. P. J. Gibbs. 1993. Journal of Wildlife Diseases 29, 403-406.
- Hermann S. C., Heppner, B and H. Ludwig. 1984. In: Latent Herpesvirus infections in veterinary medicine (eds. Wittmann G., R. M. Gaskell and H.-J. Rziha) Current Topics in Veterinary and Animal Science 27, 387-401
- Lutz, W. and R. Wurm 1996. Zeitschrift für Jagdwissenschaften 42, 123-133.
- Nettles V. F. 1989. In Proceedings of the feral pig symposium, Orlando, Florida, Livestock Conservation Institute, Madison, Wisconsin, pp.16-18.
- Nettles V. F. 1991. Proceedings of the United States Animal Health Association 95: 551-556.
- Oslage U., J. Dahle, T. Müller, M. Kramer, D. Beier, and B. Liess. 1994. Deutsche tierärztliche Wochenschrift 101, 33-38.
- Pirtle E. C., M. E. Roelke, and J. Brady. 1989. Journal of the American Veterinary Medical Association 189: 1164.
- Pittler J., and A. Rohjahn. 1990. Berliner-Münchener Tierärztliche Wochenschrift 103, 1-6.