



Review

Pestiviruses in wild animals

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Abstract

Pestiviruses are not strictly host-species specific and can infect not only domestic but also wild animals. The most important pestivirus, CSFV, infects domestic pigs and wild boars, which may cause a major problem for successful CSFV eradication programmes. Mainly BVDV specific antibodies have been reported in captive and free-living animals. Virus has been isolated from some of these animal species, but since BVDV can contaminate cell cultures and foetal calf serum, early reports of BVDV isolation have to be considered with caution. Genetic typing of early pestivirus isolates from wild species revealed that the majority were BVDV-1. Of the pestiviruses identified so far three species (CSFV, BVDV-1, giraffe pestivirus) and three genotypes (BDV-2, BDV-4, pronghorn) appear to circulate in wildlife animal populations. The potential for pestiviruses to spread between farm animals and free-living animals is discussed as are epidemiological and technical problems, and the future direction of research.

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Keywords: Pestivirus; Wild animal; CSFV; BVDV; BDV; Genotype

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1. Introduction

Pestiviruses, which belong to the Flaviridae family, significantly influence cattle, sheep and pig production causing high economical loss. Classical swine fever virus (CSFV) causes a contagious haemorrhagic disease of pigs of worldwide importance. Bovine viral diarrhoea virus (BVDV) causes many respiratory and reproductive problems, for example diarrhoea, mucosal disease or abortion in cattle and sheep. Border disease virus (BDV) infects sheep causing principally reproductive disease. This situation in pestivirolgy was broken when new highly virulent BVDV strains emerged on the American continent to cause a haemorrhagic syndrome and thrombocytopenia with high mortality and morbidity in cattle. More recent findings also indicate that more new pestiviruses are being discovered.

Farm animals have their ancestors in wild animals. Most farm animal species have been domesticated for thousands of years, but some such as the red deer in Scotland and New Zealand have only been farmed for the last 35 years. Once their hosts become domesticated, viruses, including pestiviruses, have evolved in a special environment, which would influence their phenotype and genotype. To better recognise the role of pestiviruses in nature, improve welfare of wild animals and because of the constant danger of an uncontrolled spread of pestiviruses between animal species, surveys for pestivirus specific antibodies and viruses in wild animals are gradually being undertaken. Of necessity these surveys use methods and reagents biased towards pestiviruses from domestic species and may well underestimate antibody prevalence or miss pestiviruses divergent from those now known.

Results on the detection of pestivirus specific antibodies and attempts to isolate pestiviruses from captive and free-living animals have been summarised in two review articles (Nettleton, 1990; Loken, 1995). Since then several exciting findings in pestivirolgy of

wild animals have been recorded. The aim of this review is not only to summarise the available facts in this field but also to critically analyse the data and to address likely early contamination problems in the light of new molecular-genetic methodology available for the characterization of viruses at the genetic level.

2. Serological studies

CSFV specific antibodies have been found not only in domestic pigs but also in wild boars. Serological and antigenic studies carried out between 1989 and 1998 have suggested that CSFV infected wild boars have been identified in Germany, Italy, Austria, Russia, Czech Republic, Slovakia (Laddomada, 2000). An extensive serological surveillance for CSFV antibodies in wild boars in Sardinia in the period 1988–1992 led to the conclusion that of 4752 animals tested 11% were seropositive (Laddomada et al., 1994). In some countries high seroprevalence has been recorded, for example in Croatia, 39% (Zupancic et al., 2002), while in France of 12,025 wild boar sera tested only 80 were positive for CSFV antibodies (Albina et al., 2000). A similar serosurveillance study indicated that the wild boar population in The Netherlands is not an important reservoir of this virus (Elbers et al., 2000). In contrast other studies have suggested that wild boars are a significant source of CSF outbreaks in domestic pigs (Laddomada, 2000; Moennig, 2000). CSFV antibodies have not been reported in other free-living animals.

Early serological examinations provided evidence for the contact of free-living animals with pestiviruses as demonstrated by the occurrence of BVDV antibodies in *Cervidae*, roe deer (Baradel et al., 1988), red deer (Lawman et al., 1978; McMartin et al., 1977), fallow deer (Karstad, 1981; Lawman et al., 1978; Giovannini et al., 1988), mule deer (Couvillion et al., 1980), white-tailed deer (Karstad, 1981) and caribou (Elazhary et al., 1979, 1981). BVDV antibodies were also found in

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