Pestivirus infections in ruminants in Norway

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Summary: Serological surveys in Norway have demonstrated neutralising antibodies against bovine virus diarrhoea (BVD) virus in cattle, sheep and goats. The prevalences were 18.5%, 4.5% and 3.6%, respectively.

Occurrence of pestivirus induced disease in Norway is described. Outbreaks of reproductive failure and mucosal disease have been reported, and the number of persistently-infected animals detected has increased considerably in recent years. Acute BVD occurs rarely. Border disease (BD) in sheep, first diagnosed in 1981, has subsequently been demonstrated sporadically. In goats, typical BD was diagnosed in 1982, with three later occurrences of reproductive failure. Experimental infections in pregnant goats induced a high rate of severe foetopathogenic effect. Signs and lesions in offspring were comparable to ovine BD. Similar findings were demonstrated in goats given a pestivirus contaminated vaccine. In newborn kids, experimental infection had an adverse influence on growth and health. Persistent infection in goats is probably rare.

KEYWORDS: Antibodies Border disease Bovine diarrhoea virus Cattle Goats Mucosal disease Sheep Signs.

INTRODUCTION

The genus Pestivirus includes the viruses causing bovine virus diarrhoea (BVD), mucosal disease (MD) and instances of reproductive failure in cattle, Border disease (BD) in sheep and goats, and swine fever. The BVD/MD virus (BVDV) in cattle has a world-wide distribution, the prevalence of antibodies generally ranging between 50% and 90% (1). Occurrence of BD in sheep has been reported from several countries (24), with an antibody prevalence usually much lower than in cattle. It is noteworthy that in cattle, as in sheep, pestivirus infection is mostly subclinical. So far, little is known about the occurrence of pestivirus infection in goats. Bovine and ovine strains seem to be related intimately, and it has been proposed that they should constitute a single virus species (6).

Transplacental infection of the foetus of a susceptible animal with pestivirus before the development of immuno-competence against the agent induces specific immunotolerance. The virus will therefore persist in those infected progeny which survive beyond this gestational stage. Infection in early foetal life is the major mechanism by which pestivirus persists and spreads in animal populations.
PREVALENCE RATES OF NATURALLY-OCcurring PESTIVIRUS ANTIBODIES

Serological surveys have demonstrated infection with pestivirus in south-eastern and western Norway in cattle and sheep (19), as well as in goats (10). Remarkably, in northern Norway only cattle have been found to be seropositive for pestivirus antibodies, and then only at low prevalence (6.5%). In the country as a whole, the prevalence rate of neutralising antibodies against the National Animal Disease Laboratory (NADL; in Ames, Iowa, United States of America) strain of BVDV was 18.5% in cattle, 4.5% in sheep and 3.6% in goats. In herds with persistently infected animals, the antibody prevalence is always higher than the average in the species. This reflects the epidemiology of the infection, which includes virus carriers. In such herds, the prevalence of seropositive cows has generally been close to 100%, while in sheep and goat flocks the prevalence has ranged between 20% and 50%. These results indicate that dissemination of pestivirus is more effective from a bovine transmitter than from an ovine. This concurs with the occasional observation of presumed virus transmission from infected cattle to sheep on the same farm, inducing BD, while spread of virus from sheep to cattle has never been recognised. Accordingly, transmission of pestivirus from a persistently-infected animal is probably less efficient within a sheep flock than in a cattle herd. This is in accordance with some reports (4, 9), but in some contradiction to a report by Barlow and colleagues (3).

DISEASE INDUCED BY NATURAL PESTIVIRUS INFECTION

In cattle, clinical BVD has been diagnosed with laboratory confirmation only once in Norway, in a severe outbreak including diarrhoea in calves with concomitant coronavirus infection (unpublished findings). The acute BVD form probably occurs only rarely in this country. An outbreak of MD including cases with characteristic signs and lesions has been studied in detail (15). The introduction and spread of the virus to the whole herd by the birth of a persistently-infected calf after its dam has been infected by chance (as found in this outbreak) is assumed to be a common mode of transmission of pestivirus in Norway. Another equally efficient mode of transmission, which has also been seen regularly, is the introduction of a persistently-infected animal into a susceptible herd. In some herds, multiple abortions of pestivirus-infected foetuses and/or cases of early embryonic death have been recorded. Outbreaks of reproductive failure have preceded outbreaks of MD, mostly by six to twelve months. In recent years, atypical signs and lesions of MD have been found in a large proportion of BVDV-infected animals which develop manifest disease (8). In Norway, the number of persistently infected cattle demonstrated annually has increased from less than 10 before 1985 to more than 200 in 1989. This apparent increase has been due mainly to improved virological investigation procedures for non-cytopathic pestivirus (i.e. an immuno-enzymatic method (20) which was introduced in 1984) and better knowledge of the syndrome in general, rather than to any real increase in prevalence. With regard to the pathogenesis of MD, a hypothesis favoured by several authors includes superinfection with cytopathic pestivirus of animals persistently infected with non cytopathic pestivirus (5). On examination of twenty three animals with typical MD, cytopathic pestivirus was isolated from only eight cases (11). These findings indicated that other mechanisms are probably involved in the pathogenesis and that further examination is needed.
In sheep, the first cases of BD in Norway, involving five lambs in two herds, were described in 1981 (12). The lambs in question showed characteristic body tremor at birth ("shakers") and had microscopic lesions in the central nervous system, including hypergliosis and decreased affinity for myelin stains, findings which are typical in BD (2). In the two flocks of origin there were abortions and the birth of weak and malformed lambs, with high prevalence of neutralising antibodies against BVDV (13). Non-cytopathic BD virus was first isolated and detected in Norway by immuno enzyme assay in 1984 (unpublished findings). Subsequently, the disease has been demonstrated annually in a few sporadic outbreaks. In some of these, the birth of persistently infected progeny and abortions occurred in addition to typical "shakers".

In goats, BD was described in a Norwegian kid in 1982 (14). The disease was comparable to typical BD in lambs. This was the first report of natural BD in goats, and is apparently still the only case reported of a kid showing typical signs. In an epidemiological study (10), three goats with reproductive failure from the same herd underwent serological conversion with respect to pestivirus antibodies during pregnancy. Spontaneous pestivirus infection had probably induced the reproductive failure in these cases. However, there was no relationship between pestivirus infection and gestation failure in general in this study, which is in agreement with another study in Norwegian goats (25). In recent years, pestivirus has been isolated from weak and stillborn kids (21, 23) and aborted foetuses (22). So far, however, gestation abnormalities and the birth of affected kids induced by natural pestivirus infection seem to occur less commonly in goats than in sheep. Experimental infection of goats with pestivirus in early pregnancy induced a high rate of severe foetopathogenic effect, including foetal death, abortion, stillbirth and birth of weak progeny (18). Signs and lesions in offspring were comparable to those in ovine BD. Similar findings were recorded in five goat herds affected by severe outbreaks of BD induced by a pestivirus-contaminated orf vaccine (17). In addition, experimental infection with pestivirus in newborn goat kids had an adverse effect on growth and health (16).

Persistently-infected animals are clearly the clue to epidemiology and also to the control of this infection in cattle and sheep (7, 24), and the same seems to be true in goats. However, there may be few excretors of pestivirus in goats.

INFECTIONS A PESTIVIRUS CHEZ LES RUMINANTS EN NORVÈGE. T. Løken.

Résumé : Les études sérologiques réalisées en Norvège ont montré la présence d'anticorps neutralisants dirigés contre le virus de la diarrhée virale bovine (DVB) chez les bovins, les ovins et les caprins. La prévalence était respectivement de 18,5%, 4,5% et 3,6%.

L'article décrit la prévalence des maladies à pestivirus en Norvège. Des cas de problèmes de reproduction et des cas de maladie des muqueuses ont été rapportés et le nombre d'animaux présentant des infections persistantes s'est considérablement accru au cours de ces dernières années. Les formes aiguës de la DVB sont rares. Des cas de border disease ont été reconnus pour la première fois chez des ovins en 1981 et sont survenus, depuis lors, de manière sporadique. Chez les caprins, des cas typiques de border disease ont été diagnostiqués en 1982, et des problèmes de reproduction ont été rapportés trois fois par la suite. Des infections expérimentales réalisées chez des chèvres gravides ont induit une

MOTS CLÉS : Anticorps - Border disease Bovins Caprins Maladie des muqueuses - Ovins Signes - Virus de la diarrhée virale bovine.

INFECCIONES DE RUMIANTES POR PESTIVIRUS EN NORUEGA. T. Løken.

Resumen: Los estudios serológicos realizados en Noruega han demostrado la existencia de anticuerpos contra el virus de la diarrea vírica bovina en vacunos, ovinos y caprinos. Las prevalencias fueron del 18,5, 4,5 y 3,6 por 100 respectivamente.

El artículo trata de las enfermedades provocadas por pestivirus en Noruega, donde se han notificado focos de enfermedad de las mucosas y fracaso reproductivo y el número detectado de animales con infección persistente ha aumentado considerablemente en los últimos años. La diarrea vírica bovina aguda ocurre raramente. La enfermedad de la frontera en ovejas, diagnosticada por primera vez en 1981, ha aparecido esporádicamente desde entonces. En las cabras, la enfermedad de la frontera típica se diagnosticó en 1982 y, posteriormente, se ha declarado en otras tres ocasiones con fracaso de la reproducción. Las infecciones experimentales en cabras preñadas provocaron un alto grado de efecto fetopatogénico grave, siendo los signos clínicos y lesiones en la progenie comparables con los de la enfermedad de la frontera ovina. Se comprobaron hallazgos similares en cabras que habían recibido vacunas contaminadas con pestivirus. En los animales recién nacidos, la infección experimental tuvo consecuencias adversas en el crecimiento y la salud. Las infecciones persistentes en las cabras son aparentemente poco frecuentes.

PALABRAS CLAVE: Anticuerpos - Cabras Enfermedad de la frontera Enfermedad de las mucosas Ovejas - Signos - Vacunos - Virus de la diarrea vírica bovina.

REFERENCES


