Bovine respiratory syncytial virus: infection dynamics within and between herds

T. B. Klem, S. M. Gulliksen, K-I. Lie, T. Løken, O. Østerås, M. Stokstad

Context
Bovine respiratory syncytial virus (BRSV) is an important pathogen in the bovine respiratory disease complex. The prevalence of BRSV infection at herd level or in a population is usually based on the detection of antibodies in serum or milk from animals in the herd. Such screening methods have some disadvantages; animals will remain seropositive for several years after an infection and calves with maternal antibodies will also be positive. In the present study, a serological investigation was performed where a group of animals of a similar age were assessed in order to give a more recent indication of the BRSV status of a herd. The prevalence and geographical distribution of herds with BRSV in Norway was estimated. By repeating the study twice, the dynamics of BRSV were investigated and the distributions were compared to factors such as season and size of herds.

Results
The prevalences at the time of the first and second sampling were 34 per cent and 41 per cent, respectively. The overall prevalence of positive herds was 54 per cent. Prevalence varied greatly between regions. Results of the two samplings in each herd were compared and the rate of new infection and elimination was calculated. Of the herds that initially tested positive, 38 per cent tested negative the second time they were sampled. Of the herds that initially tested negative, 42 per cent tested positive the second time they were sampled.

New infections occurred at the same rate during summer as in winter, but a higher proportion of animals were positive when sampling took place during winter. Within-herd prevalence in the positive herds varied from 10 per cent to 100 per cent, with a mean of 55 per cent. Negative herds were found in close proximity to positive herds, and some herds remained negative despite several new infections nearby. The proportion of herds changing from negative to positive did not differ significantly between large and small herds.

Interpretation
The within-herd prevalence in this study was surprisingly low compared to other studies, probably due to the younger animals tested. This affects the sensitivity of the positive/negative classification at a herd level. However, sensitivity calculations based on the within-herd prevalence and the number of tested animals in the present study show that the level of sensitivity is acceptable.

Herd were classified according to the presence of one or more positive animals. This might lead to both false positive and false negative herds.

The main reason for false negative herds is that animals might have had maternal antibodies at the time of infection with BRSV. This has been shown to inhibit the humoral response, leading to shorter duration of humoral immunity. This might provide a false negative and thereby possibly false negative herds.

The main reason why herds might test positive when in fact they are not, is that some calves could have an unusually long duration of maternal antibodies.

Significance of findings
The rapid shifts in infection status, including the high elimination rates in infected herds, indicate that it should be possible to decrease the prevalence of BRSV in an area by focusing on keeping negative herds free from new introductions of BRSV. A suitable strategy could be to employ close surveillance followed by a high degree of biosecurity to avoid new introductions of virus in these herds.
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