

The Influence of Passive Immunity on Calves Respiratory Disease Associated with Parainfluenza-3 Virus and Respiratory Syncytial Virus

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Introduction. Newborn calves are born agammaglobulinemic and very susceptible to various diseases including respiratory tract disorders. Therefore, to ensure adequate protection against disease exposure, calves rely entirely on the consumption of an adequate amount of quality maternal colostrum [1, 4].

Bovine respiratory disease has a multifactorial aetiology of infectious agents, host factors, environmental stress factors and their interactions [5]. Bovine respiratory syncytial (RS) and parainfluenza-3 (PI-3) viruses are the most important and somewhat underestimated causes of the respiratory syndrome in calves and young cattle [6].

For specific prevention of bovine respiratory diseases, plenty commercial multivalent vaccines have been developed [7]. However, most calves till the age of 3 months may have circulating maternal antibodies against RS and PI-3 viruses acquired via the colostrum. These antibodies do not offer full protection against disease and may inhibit active immunity after immunization with conventional vaccines [2]. Hence the quality of colostral immunity is a very important index for prognosis of the health status of calves and establishing the optimal time for vaccination against respiratory diseases.

The aim of this study was to investigate the dynamics and duration of maternal immunity to bovine PI-3 and RS viruses and influence of passively acquired antibodies on calves' health.

Methods. The passive colostral immunity was investigated via the evaluation of the dynamics of antibody titers and number of seropositive calves. The passive immunity level in calves aged 24-48 hours was determined by semi-quantitative sodium sulphite precipitation method [8]. Total 24 calves from one farm were selected for the trial based on the IgG concentration in the blood serum. The calves were allocated into three groups 8 individuals in each: group I – IgG > 15 g/l, group II – 5–15 g/l and group III – < 5 g/l.

The blood samples of these calves were tested for antibodies to PI-3 and RS viruses by enzyme linked immunosorbent assay according to manufacturer's manual (Institute Pourquier, France). The blood from all groups of calves was taken 1, 4, 8, 12, 16 and 24 weeks after birth. The half-life and the mean lifetime of antibodies were calculated using the appropriate equations [9]. The influence of passive colostral immunity on the health status of calves also was evaluated according to seroconversion of PI-3 and RS viruses 6

months (24 weeks) after birth. Also the number of calves with respiratory diseases, duration of disease, number of treatments and deaths were registered. The difference between the groups was evaluated by Fisher's criteria and Student's t test. The data were regarded as significant when $p < 0.05$.

Results and discussion. The present investigation showed that the duration (age of seropositive calves) of passive immunity and antibody titers depended on the quality of colostral immunity, i.e. on IgG content in the blood serum of calves. The statistical analysis of the passive immunity showed that the half-life of antibodies for PI-3 viruses was 28.55 ± 7.30 days and for RS viruses 35.18 ± 5.80 days. The mean lifetime of maternal immunity for PI-3 and RS viruses was 41.19 ± 10.54 and 50.75 ± 8.38 days respectively.

As it shown in table 1, the effect of maternal immunity level on the morbidity and mortality caused by respiratory diseases was insignificant ($p > 0.05$). Yet in the 1 and 2 group the clinical signs were milder and lasted shorter. Concomitantly a smaller number of treatment courses was necessary ($p < 0.05$).

Table 1. Effect of maternally acquired antibodies on the calves health (* - $p < 0.05$)

| Group | Morbidity, n/% | Mortality, n/% | Duration of disease, d. \pm SD | Number of treatments | Seroconverted, n/% | |
|-------|----------------|----------------|----------------------------------|----------------------|--------------------|---------|
| | | | | | PI-3 | RSV |
| 1. | 6/75 | 0/0 | 3.25 \pm 2.53* | 7* | 4/50 | 3/37.5* |
| 2. | 6/75 | 0/0 | 4.13 \pm 3.18 | 8* | 5/62.5 | 7/87.5* |
| 3. | 8/100 | 1/12.5 | 6.13 \pm 2.25* | 10* | 5/62.5 | 8/100* |

The results obtained by other researchers also confirmed that congenial consumption of colostrum play an important role in the health status of calves [3, 10]. Our investigation showed that depending on the quality of colostral immunity the duration of respiratory diseases ranged from 3.25 to 6.13 days. The researchers from The Netherlands who performed an experimental infection of calves determined that RS virus induced disease lasted for 2.8–4.6 days. The duration of disease depended on the age of animals. The younger ones were ill for a shorter time than the older ones [11]. The mean duration of disease in calves established during the present study was longer than the mentioned experimental RS virus induced infections. Also during the present research, seroconversion was identified not only to RS but also to PI-3 viruses.

Conclusions. The optimal age of calves for vaccination would be about 60 days. In general, the morbidity and mortality rates were insignificant in all groups of animals. The calves who received sufficient amount of colostrum were diseased for a shorter time and suffered milder clinical signs.

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