Effect of prebiotic and probiotic supplements to increase live weight of calves in the diet

Luboš Zábranský*, Naděžda Kernerová, Eva Petrášková, Anna Poborská, Miloslav Šoch, Martin Kantor, Josef Kučera
University of South Bohemia in České Budějovice, Faculty of Agriculture, Department of zootechnical sciences, Czech Republic

Article Details: Received: 2020-11-04      |      Accepted: 2020-11-27      |      Available online: 2021-01-31

Licensed under a Creative Commons Attribution 4.0 International License

Probiotics and prebiotics are effective to modulate optimal conditions in gastrointestinal tract inhabited by diverse microbial population. Probiotics regulate and modulate gut microbial population thus reducing the risk of diarrhea. Positive effect on growth is confirmed. The aim of this study was to evaluate the effect of probiotic (*Lactobacillus sporogenes*) and prebiotic (*Ascophyllum nodosum*) supplements on weight gain in calves. Forty new-born Holstein calves were randomised to control and experimental group. In the experimental group, *Lactobacillus sporogenes* and *Ascophyllum nodosum* were added first to colostrum and then to milk replacer, calves in the control group were fed with colostrum and milk replacer only. The weight gains of animals were found out during the whole experiment. Evidence of animal health and diarrhea was monitored. In the end of experiment, the body weight gains in experimental calves were by 14.4% higher compared to control but without statistical significance (*P* > 0.05). Probiotic and prebiotic treatment tended to diminish diarrhea. The health benefits of monitored treatment were noticed in experimental group.

**Keywords:** calf, dietary supplements, nutrition, health
pathologic condition. Probiotics are widely used as natural additives to force immune response and overall health (Soccol et al., 2010).

Unlike antibiotics, which are used to treat the opportunistic pathogenic flora, probiotics do not diminish natural gut protective flora (Timmerman et al., 2005).

The population of beneficial microbes used as probiotics belong to lactobacillus and bifidobacterium family (Vrese and Schvezenmeir, 2008).

The animals can be supplemented with prebiotics in feed too. Prebiotics are defined as substrates that are selectively used by host microorganisms, providing a health benefit to the host (Cangiano et al., 2020). These substrates are served as nutrients for beneficial microflora. Prebiotic oligosaccharides are used. Mostly, Fructooligosaccharides and Galactooligosaccharides are functional component of nutrition. These prebiotic oligosaccharides help the growth of healthy bacteria and their better colonization in the digestive tract (Rastall and Maitin, 2002). The objectives of this study were to evaluate the effect of probiotic (Lactobacillus sporogenes) and prebiotic (Ascophyllum nodosum) supplements on the weight gains in calves.

2 Material and methods

Forty Holstein new-born calves from the same dairy cows herd were involved in the experiment. The treated group including 20 calves was tested on the effect of probiotic (Lactobacillus sporogenes) and prebiotic (Ascophyllum nodosum) as a natural additives. The other 20 calves were controls. The young animals were separated and weaned from mothers on the first day within 3 hours after birth. Calves were bred during the whole experiment, from the first day to day the 28, in individual littered boxes. For the first four days, all calves received only colostrum and breast milk ad libitum three times a day from a nipple bucket. The milk replacer was fed from day 5. The daily amount 4.5 kg was divided into 3 portions. The starter mixture and alfalfa hay were available ad libitum until weaning.

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Composition of the starter mixture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crushed wheat</td>
<td>20%</td>
</tr>
<tr>
<td>Crushed barley</td>
<td>15%</td>
</tr>
<tr>
<td>Whole maize grains</td>
<td>10%</td>
</tr>
<tr>
<td>Whole oat grains</td>
<td>19.5%</td>
</tr>
<tr>
<td>Extracted rapeseed meal</td>
<td>15%</td>
</tr>
<tr>
<td>Extracted soybean meal</td>
<td>15%</td>
</tr>
<tr>
<td>Tetravit (vitamin-mineral premix)</td>
<td>5%</td>
</tr>
<tr>
<td>Calcium</td>
<td>0.5%</td>
</tr>
</tbody>
</table>

The plastic buckets used for feeding were fitted in the boxes at a height of 40 cm above the ground. The drinking water was available to calves during the whole experimental period. The experiment was conducted from June 2020 to August 2020. The calves in experimental group with probiotics and prebiotics received orally 1 g Lactobacillus sporogenes (4.1 × 10⁷ CFU/g). The daily dose 5 ml of brown seaweeds hydrolyzate was added to colostrum and milk replacer from the first to the fourteenth day of age. Feed supplements were presented to the calves once a day in the experimental group. All the supplements were administered to the experimental groups during the first fourteen days of the experiment. In the control group, the calves received a feed ration without feed supplements. Daily milk replacer input of 4.5 kg was devided into three doses, starter mixture and alfalfa hay were available ad libitum. All calves were observed from birth to day 28 of their age.

The data were analyzed using a General Linear Model ANOVA (four ways with the interactions) of the statistical package STATISTIC 12.

3 Results and discussion

The influence of probiotic and prebiotic supplements on the body weight gain of Holstein calves during the first 24 days of age were investigated. The differences between groups were observed. The experimental group achieved...
higher gains in weight especially in the 1$^{\text{st}}$ and 4$^{\text{th}}$ week after birth as Table 2 and Figure 1 demonstrate. In the end of the experiment, average body weight gain of calves in the experimental group was higher by 14.4% than in the control group. The average gain in weight in 28 days from birth was 18.52 kg in the experimental group and 16.27 kg in the control group during the same time period. The results suggest the positive effect of probiotics and prebiotics on the digestive tract. The probiotic and prebiotic substances contained in the feed ration of the experimental group demonstrably increased the live weight gain. A number of studies are described which report the positive effect of the use of probiotic feed supplements on the health and live weight gain of calves (Zhang et al., 2016; Raabis et al., 2019; Renaud et al., 2019). These results agree with the findings of Timmerman et al. (2005) and Frizzo et al. (2010). Morrell et al. (2008) demonstrated in his study that selected species of probiotic strains have a positive effect on the health of calves and can be also applied as diarrhea prevention. The low mortality and morbidity rate of new-borns are noticed when probiotics were included in the diet. According to Gaggia et al. (2010) the positive effect of probiotics and prebiotics in both groups with healthy and stressed animals was demonstrated. This effect was demonstrated not only on ruminants, but also on pigs and poultry.

### Table 2  
Weight gain during the first 4 weeks after birth

<table>
<thead>
<tr>
<th></th>
<th>Ø Weight gain 1$^{\text{st}}$ week (g)</th>
<th>Ø Weight gain 2$^{\text{nd}}$ week (g)</th>
<th>Ø Weight gain 3$^{\text{rd}}$ week (g)</th>
<th>Ø Weight gain 4$^{\text{th}}$ week (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental group</td>
<td>4,752.62</td>
<td>3,821.52</td>
<td>4,125.68</td>
<td>5,235.74</td>
</tr>
<tr>
<td>Control group</td>
<td>4,145.85</td>
<td>3,658.88</td>
<td>3,959.82</td>
<td>4,483.65</td>
</tr>
</tbody>
</table>

### Figure 1  
Weight gain during the first 4 weeks after birth

4 Conclusions

The effect of probiotic and prebiotic feed supplements was not statistically proven, but the results indicate a positive effect on the increase in live weight gain. If probiotics and prebiotics are included in the feed ration, a positive effect on health, increased immunity and better weight gain can be expected.

Acknowledgments

This study was supported by grant projects NAZV QK1910438.

References


