

Study on the Impact of Antibiotics on the Microbiota, Feed Intake, and Growth of Calves

Soler J. ¹, Lopes E. R. ², Heittiarachchi A. ³

¹ *Irodservet SL, Barcelona, Spain – irodservet@gmail.com;*

² *Huvepharma NV, Antwerp, Belgium – rui.lopes@huvepharma.com;*

³ *Pathosense, Ghent, Belgium - amanda.hettiarachchi@pathosense.com*

Objectives

The use of antibiotics to treat diarrhea in calves, while necessary, can have significant effects on the intestinal microbiota. This delicate ecosystem plays a vital role in digestion, immune development, and protection against pathogens. Altering this balance with antibiotics may cause short- and long-term issues, affecting both the health and productive performance of calves.

The main objective of the study was to analyze the influence of antibiotics on the intestinal microbiota, feed intake, and weight gain in calves.

Materials and methods

The study lasted 42 days and involved a total of 24 calves distributed into four homogeneous groups, each consisting of six individuals. The impact of three different oral antibiotic treatments (paromomycin [Parofor®], apramycin [Apravet®] and neomycin) for diarrhea cases was evaluated, and compared to a control group that received no oral antibiotics.

The intestinal microbiota was assessed using two key metrics: alpha diversity, which measures the variety of microbial species within each sample, and beta diversity, which evaluates differences in bacterial composition between groups.

Feed intake data were tracked throughout the study period, and growth performance was evaluated through regular measurements of weight gain.

Results

Impact of antibiotics on the intestinal microbiota

- The control group and the group treated with paromomycin maintained high levels of alpha diversity, especially at the end of the study (day 42), indicating a healthy microbiota. This suggests that paromomycin has a limited impact on microbial balance, preserving bacterial diversity.
- The bacterial compositions of the control group and the paromomycin group were very similar, reinforcing the hypothesis that paromomycin has a minimal effect on the microbiota. Conversely, the group treated with neomycin exhibited a significantly different bacterial composition, indicating a greater disruption of the microbiota.
- The control group and the paromomycin group displayed a higher abundance of beneficial bacteria such as *Lactobacillus johnsoni* and *Megasphaera elsdenii*, particularly after treatment (day 7). These bacteria are essential for intestinal health, contributing to carbohydrate fermentation and the production of short-chain fatty acids, a key energy source for intestinal cells 1,2.

Evolution of feed intake is a crucial indicator for evaluating the general condition of calves:

- Paromomycin group showed a total feed intake of 239.50 kg, with a stable and consistent pattern throughout the trial. This indicates sustained recovery and good digestive efficiency, with the highest feed efficiency.
- Control group achieved the highest total feed intake (244.60 kg). However, despite the high feed intake, this group exhibited the lowest feed efficiency.
- Neomycin group recorded the lowest total feed intake (158.80 kg).
- Apramycin group with a total feed intake of 212.70 kg, this group showed intermediate performance, though it was less consistent than the paromomycin and control groups.

Weight gain is another key indicator of the performance and health of calves. The results aligned with observations on the microbiota and feed intake:

- Paromomycin group achieved the highest average weight gain (27 kg), with low variability among individuals. Additionally, only one calf experienced diarrhea, highlighting the effectiveness of the treatment.
- Although the control group calves experienced diarrhea in the first week, they achieved an average weight gain of 23.25 kg. Variability among individuals was high, possibly due to individual factors.
- Neomycin group with an average weight gain of only 16.5 kg, this group showed the worst performance.
- Calves treated with Apramycin demonstrated intermediate performance, with an average weight gain of 23.25 kg but greater variability in results.

Conclusions

- Treatment with Paramomycin demonstrated effectiveness by preserving intestinal microbiota diversity, supporting beneficial bacteria and promoting efficient digestion. Calves in this group achieved the highest weight gain (27 kg) with minimal variability. This treatment has shown both short-term health and long-term productivity.
- The recovery of calves in the control group without antibiotics allowed the natural evolution of the microbiota to be observed, serving as a reference for evaluating the effects of the treatments.
- Treatments should be selected not only for their clinical efficacy but also for their ability to preserve the balance of the microbiota, which is essential for short- and long-term productive performance. Positive results during the suckling phase will also have a beneficial impact on the subsequent fattening phase.

References

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