

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

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Objectives

The use of antibiotics to treat diarrhoea 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 analyse the influence of antibiotics on the intestinal microbiota, feed intake, and weight gain in calves.

Material 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 [Parofo[®]], apramycin [Apravet[®]] and neomycin) for diarrhoea cases was evaluated, and compared to a control group that received no oral antibiotics.

Results

Impact of antibiotics on the intestinal microbiota

- Alpha diversity.** The control group and paromomycin treatment group showed a similar alpha diversity, which was higher compared to the other treatment groups, especially at the end of the study (day 42). This suggests that paromomycin has a limited impact on microbial balance, preserving bacterial diversity.

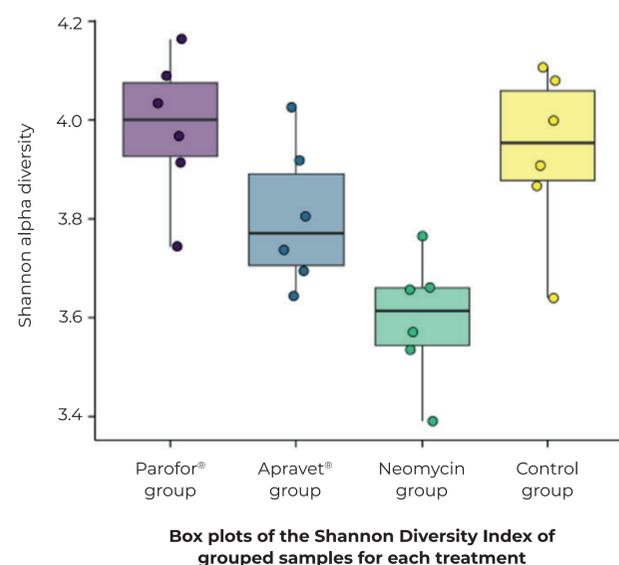


Figure 1. Alpha diversity

- Beta diversity.** The bacterial compositions of the control group and the paromomycin group were 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.
- Abundance of beneficial bacteria.** The control and the paromomycin group displayed a higher abundance of beneficial bacteria such as *Lactobacillus* and *Megasphaera*, 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.

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

- Paromomycin group.** This group had a total feed intake of 239.50 kg, and showed the highest feed efficiency with a stable and consistent pattern throughout the trial.
- Control group.** Despite experiencing diarrhoea during the first week, this group achieved the highest total feed intake (244.60 kg). However, this group exhibited the lowest feed efficiency.
- Neomycin group.** This group recorded the lowest total feed intake (158.80 kg).
- Apramycin group.** This group showed intermediate performance.

Weight gain

The results aligned with observations on the microbiota and feed intake (Figure 2).

- Paromomycin group.** This group achieved the highest average weight gain (27 kg), with low variability among individuals. Additionally, only one calf experienced diarrhoea, highlighting the effectiveness of the treatment.
- Control group.** Although the control group calves experienced diarrhoea in the first week, they achieved an average weight gain of 23.25 kg.
- Neomycin group.** With an average weight gain of only 16.5 kg, this group showed the worst performance.
- Apramycin group.** The average weight gain of this group was 23.25 kg but with greater variability in results.

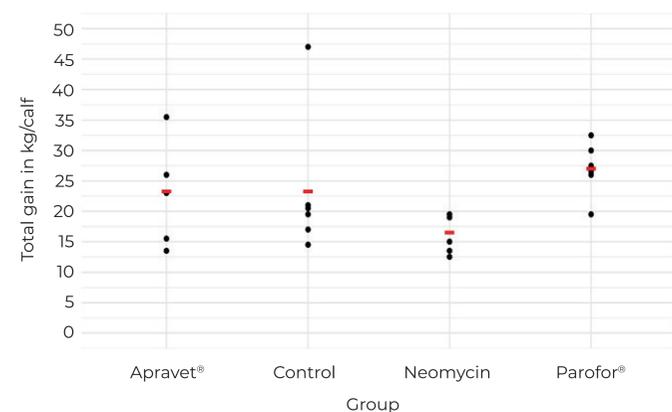


Figure 2. Gain in kg/calf

Conclusions

- Effectiveness of paromomycin.** This treatment demonstrated superior effectiveness by preserving intestinal microbiota diversity and composition, supporting beneficial bacteria and promoting efficient digestion. Calves in this group achieved the highest weight gain (27 kg) with minimal variability, highlighting consistent recovery.
- Relevance of the control group.** 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.
- Practical implications:** 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.