II ANDALUCIA AGRO HUB

*Granada, march 11-12th 2025*

# Effects of feed additives on blood parameters and rumen microbial fermentation in male dairy beef calves pre- and post-weaning

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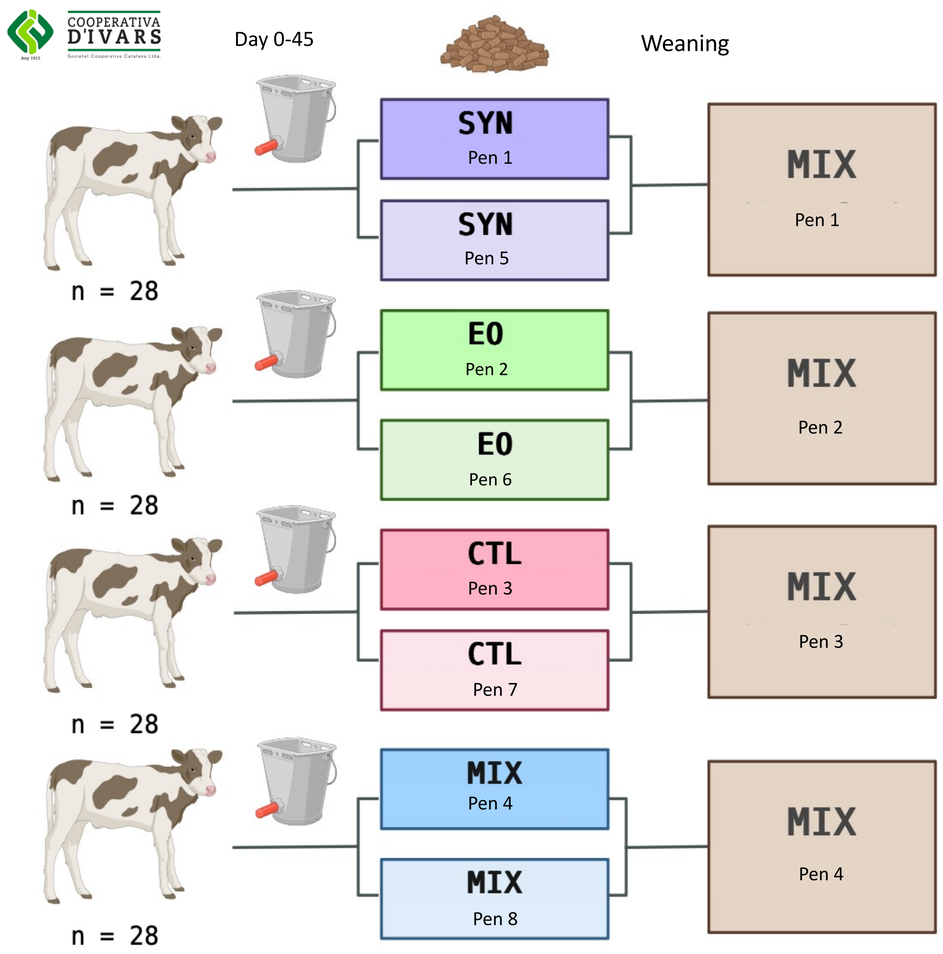
## Introduction

- In intensive beef calf breeding, **early separation from mothers** impacts rumen microbial colonization. The rumen of calves is sterile at birth, and proper colonization is essential for their development.
- In Spain, 3-week-old calves face health challenges during long-distance transport to fattening farms, exacerbated by their **immature immune systems** and und**erdeveloped digestive tracts**.
- Recent improvements in farm management focus on **nutritional strategies** and the use of **additives** to promote intestinal development and long-term health [1-3].

## Materials and methods

- **112 male suckling calves** were classified into **4 diet groups**: CTL (no additives), EO (essential oils from plants), SYN (yeast probiotics) and MIX (mixture of probiotics and essential oils).
- Calves received their respective diet with additives in the concentrate feed **for 45 days (until weaning).** After weaning, all calves **were switched to the MIX diet.**
- Rumen content and blood samples were collected at **days 35 (pre-weaning) and 105 (post-weaning).**




## Results

*Table 2.* Ruminal fermentation parameters and microbial population (qPCR) in suckling calves fed commercial additives.

| | Mean | | | | | |
|---|---|---|---|---|---|---|
| **Pre-weaning** | **CTL** | **MIX** | **EO** | **SYN** | **SEM** | ***P-values*** |
| *Total VFAs (mM)* | 92.9 | 104 | 101 | 90.8 | 5.38 | 0.222 |
| *Beta-Hidroxybutyrate (mg/dL)* | 2.33$^{c}$ | 2.88$^{ab}$ | 3.20$^{a}$ | 2.51$^{bc}$ | 0.18 | 0.004 |
| *pH* | 6.13 | 5.94 | 6.19 | 6.49 | 0.17 | 0.169 |
| *Microbial population* | | | | | | |
| *Total Bacteria* | 9.27 | 9.26 | 9.35 | 9.32 | 0.04 | 0.273 |
| *Archaea* | 5.65 | 5.47 | 5.63 | 5.60 | 0.07 | 0.260 |
| *Protozoa* | nd | nd | nd | nd | | |
| *Fungi* | nd | nd | nd | nd | | |
| **Post-weaning** | **CTL** | **MIX** | **EO** | **SYN** | **SEM** | ***P-values*** |
| *Total VFAs (mM)* | 76.0$^{b}$ | 93.8$^{a}$ | 102$^{a}$ | 94.4$^{a}$ | 4.72 | 0.002 |
| *Beta-Hidroxybutyrate (mg/dL)* | 3.07$^{b}$ | 4.56$^{ab}$ | 3.93$^{b}$ | 4.68$^{a}$ | 0.23 | <0.001 |
| *pH* | 6.83$^{a}$ | 6.42$^{b}$ | 6.61$^{ab}$ | 6.41$^{b}$ | 0.11 | 0.019 |
| *Microbial population* | | | | | | |
| *Total Bacteria* | 10.5 | 10.6 | 10.5 | 10.6 | 0.31 | 0.997 |
| *Archaea* | 6.33 | 6.39 | 6.43 | 6.34 | 0.17 | 0.973 |
| *Protozoa* | nd | nd | nd | nd | | |
| *Fungi* | 3.20 | 3.22 | 3.19 | 3.14 | 0.04 | 0.387 |

## Conclusions

- Dietary additives increased total volatile fatty acids (tVFAs) and β-hydroxybutyrate levels post-weaning, **enhancing ruminal fermentation**
- Rumen pH increased after weaning, and populations of bacteria and archaea also rose, while protozoa and anaerobic fungi remained mostly absent.
- **The effect of the additives persisted two months later, highlighting the importance of applying such treatments early in the animal's development, when the rumen has greater plasticity.**

## Bibliography

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## Acknowledgments and funding

This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under grant agreement N° 101000213 (**HoloRuminant**).

HoloRuminant
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Horizon2020
European Union Funding
for Research & Innovation

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