MULTI-STRAIN YEASTS: A NUTRITIONAL SOLUTION TO REDUCE ANTIMICROBIAL TREATMENTS IN MALE VEAL CALVES

Giovanni Buonaiuto[1*], Giovanna Marliani[1], Giovanna Martelli[1], Luca Sardi[1], Eleonora Nannoni[1], Marco Tassinari[1] and Damiano Cavallini[1]

[1]Department of Veterinary Medical Sciences, *Alma Mater Studiorum* - University of Bologna, Italy

*Corresponding author email: giovanni.buonaiuto@unibo.it

I. INTRODUCTION

Among the effects of feed additives, the immunomodulatory properties represent a perspective of considerable interest for the ruminant species [1,2,3]. To this aim, multi-strain yeasts, composed of a combination of different *Saccharomyces cerevisiae* strains, are commonly used to improve animal health and performance [4, 5]. The use of multi-strain yeasts in animal nutrition can have several benefits. Firstly, they can improve the digestibility and utilization of nutrients in the feed [6], leading to better growth and feed conversion rates [7]. They can also help maintain a healthy balance of microorganisms in the animal's gut, which is important for overall gut health and immune function [8]. Therefore, the present study aimed to investigate the effects of the dietary supplementation of a multi-strain yeast (*Saccharomyces cerevisiae* and *Cyberlindnera jadinii* fractions) on health parameters (including number of antimicrobial treatments) and growth traits of Italian Holstein male dairy calves.

II. MATERIALS AND METHODS

The experimental trial was conducted from February to July 2019 in a commercial dairy farm located in northern Italy (after the authorization of the Ethics Committee of University of Bologna, n° 1039). A total of 158 Italian Holstein male veal calves was enrolled and divided in two groups: a control group (CTR) of 57 animals (without yeast supplementation) and a treated one (TRT) of 101 animals (yeast supplementation), both balanced for initial live weight (53.83±2.96 kg). Each calf was enrolled in the trial from 17±3 days of age (T0) until 190 days of age (TF), when animals were slaughtered.
Both groups were fed with a mixture of milk replacer (chemical composition %: crude protein 19, ether extract 17, ash 8) from 400 to 2600 g/h/d in 4-16L/h/d, and grain mix with chopped straw (chemical composition %: crude protein 13.5, ether extract 3.2, crude fibre 8.2, ash 4.1, dry matter 88) from 100 to 3500 g/h/d. The TRT group received 5g/h/d of the product through the milk replacer during the first 30 days, then 3 g/h/d until day 90. From day 90 to 190 (slaughter) the diet was the same for both groups. For all animals, individual carcass weight, mortality and morbidity (veterinary treatments) were recorded. Blood parameters (Hg, RDW and MCV; at d30, 73, 115 and 150) and electrophoresis for blood protein characterisation (d47 and 118) were analysed in 23 randomly selected animals (12 CTR and 11 TRT). On the sampled animals, body weights were measured (d0, 47 and 82). All data were tested for distribution and subjected to AOV procedure [9].

III. RESULTS AND DISCUSSION

Calves' health was improved, but no difference was observed on mortality. Morbidity was reduced from 56% in CTR to 38% in TRT ($P<0.05$), with a lowered number of chronically ill animals (≥2 treatments per animal) by 50% ($P<0.05$, table 1). The numeric reduction of veterinary treatments in TRT (-26%) was mainly due to a lower prevalence of enteric diseases. ADG in TRT was 263 g/day from day 0 to 47 and 321 g/day from day 47 to 82, significantly higher ($P<0.01$) than in CTR. Our results are consistent with those reported by Davies *et al*. [10]. No differences were observed on carcass weights at slaughter and carcass classification. Content of total proteins was higher in TRT ($P<0.01$), with higher percentage of γ-globulins ($P<0.01$) and α1-globulins ($P<0.01$). These results

indicate a better activation of the immune system in TRT veal calves. No differences were observed on RDW and MCV. No differences were observed in Hg average concentration, but a lower variability in TRT was highlighted. Similar results were observed by other authors [8,11] who reported an improvement of animals' resistance to pathogens (especially during periods of high stress, such as weaning) leading to a lower incidence of digestive disorders [8].

Table 1. Veterinary treatments administered during the trial.

	CTR	TRT	P-value
% healthy calves (0 treatments)	43.9[b]	63.4[a]	
% animals treated once	26.3[a]	21.8[b]	<0.05
% animals treated twice or more (chronically ill)	29.8[a]	14.9[b]	

IV. CONCLUSION

Our results demonstrate that the addition of a multi-strain yeast supplement in the milk replacer during the first 90d of the lifecycle improved the health status of veal calves. These results are in line with the reduction in the use of antimicrobial treatments in farms.

REFERENCES

1. Mammi, L. M. E., Palmonari, A., Fustini, M., Cavallini, D., Canestrari, G., Chapman, J. D., McLean, D. J., & Formigoni, A. (2018). Immunomodulant feed supplement to support dairy cows health and milk quality evaluated in Parmigiano Reggiano cheese production. Animal Feed Science and Technology, 242:21-30.
2. Cavallini, D., Mammi, L. M. E., Palmonari, A., García-González, R., Chapman, J. D., McLean, D. J., & Formigoni, A. (2022). Effect of an Immunomodulatory Feed Additive in Mitigating the Stress Responses in Lactating Dairy Cows to a High Concentrate Diet Challenge. Animals, 12:2129.
3. Giorgino, A., Raspa, F., Valle, E., Bergero, D., Cavallini, D., Gariglio, M., Bongiorno, V., Bussone, G., Bergagna, S., Cimino, F., Dellepiane, L., Mancin, G., Paratte, R., Sáinz De La Maza-Escolà, V., & Forte, C. (2023). Effect of Dietary Organic Acids and Botanicals on Metabolic Status and Milk Parameters in Mid-Late Lactating Goats. Animals, 13:797.
4. Lambo, M. T., Chang, X., & Liu, D. (2021). The Recent Trend in the Use of Multistrain Probiotics in Livestock Production: An Overview. Animals 11:2805.
5. Elghandour, M. M. Y., Tan, Z. l., Abu Hafsa, S. h., Adegbeye, M. j., Greiner, R., Ugbogu, E. a., Cedillo Monroy, J., & Salem, A. z. m. (2020). *Saccharomyces cerevisiae* as a probiotic feed additive to non and pseudo-ruminant feeding: A review. Journal of Applied Microbiology, 128:658–674.
6. Adesogan, A. T., Arriola, K. G., Jiang, Y., Oyebade, A., Paula, E. M., Pech-Cervantes, A. A., Romero, J. J., Ferraretto, L. F., & Vyas, D. (2019). Symposium review: Technologies for improving fiber utilization. Journal of Dairy Science, 102:5726–5755.
7. Frizzo, L. S., Zbrun, M. V., Soto, L. P., & Signorini, M. L. (2011). Effects of probiotics on growth performance in young calves: A meta-analysis of randomized controlled trials. Animal Feed Science and Technology, 169:147–156.
8. Guo, Y., Li, Z., Deng, M., Li, Y., Liu, G., Liu, D., Liu, Q., Liu, Q., & Sun, B. (2022). Effects of a multi-strain probiotic on growth, health, and fecal bacterial flora of neonatal dairy calves. Animal Bioscience, 35:204–216.
9. Pollesel, M., Tassinari, M., Frabetti, A., Fornasini, D., & Cavallini, D. (2020). Effect of does parity order on litter homogeneity parameters. Italian Journal of Animal Science, 19: 1189 - 1195.
10. Davies, S. J., Esposito, G., Villot, C., Chevaux, E., & Raffrenato, E. (2022). An Evaluation of Nutritional and Therapeutic Factors Affecting Pre-Weaned Calf Health and Welfare, and Direct-Fed Microbials as a Potential Alternative for Promoting Performance—A Review. Dairy, 3:648-667.
11. Fomenky, B. E., Do, D. N., Talbot, G., Chiquette, J., Bissonnette, N., Chouinard, Y. P., Lessard, M., & Ibeagha-Awemu, E. M. (2018). Direct-fed microbial supplementation influences the bacteria community composition of the gastrointestinal tract of pre- and post-weaned calves. Scientific Reports, 8:14147.