

Development of alternative “clean label” proposals to the use of preservatives and other additives in meat products

• Teresa Bento de Carvalho^{1,*}, Norton Komora², Joana Bastos Barbosa¹, Paula Teixeira¹

• ¹ Universidade Católica Portuguesa, CBQF—Centro de Biotecnologia e Química Fina—Laboratório Associado, Escola Superior de Biotecnologia, Porto, Portugal

• ² R&D Department, Primor Charcuteria Prima – S.A., Avenida Santiago de Gavião, nº 1142, Gavião, 4760-003, Vila Nova de Famalicão, Portugal.

* s-tmc@ucp.pt

Introduction

Environmental and health concerns over the use and consumption of artificial additives like nitrite have prompted consumer demand and desire for “cleaner” products containing natural ingredients whose names they know and understand what they are used for. In this context, the clean label movement is trending with the goal of offering natural products while having in sight their safety (1; 2). This study aimed to assess if potential clean label solutions to nitrite addition are able to assure microbiological safety and confer a protective role against *Clostridium sporogenes* spores (*C. botulinum* surrogate) in novel ham formulations. In parallel, the impact of these novel formulations on the human gut microbiome for potential consumers was also evaluated through HPLC quantification of Short-chained Fatty Acids (SCFAs) and Branched-chained Fatty Acids (BCFA).

Methodology

Challenge test with *C. sporogenes* spores.



Contamination with clostridial spores
↓
5-week storage period (T0, T7, T14, T21 and T28) under aerobic conditions at 4 °C



Human gut microbiome impact
↓
Simulated gastrointestinal tract
↓
Colonic fermentation (0h, 24h and 48h)

Results

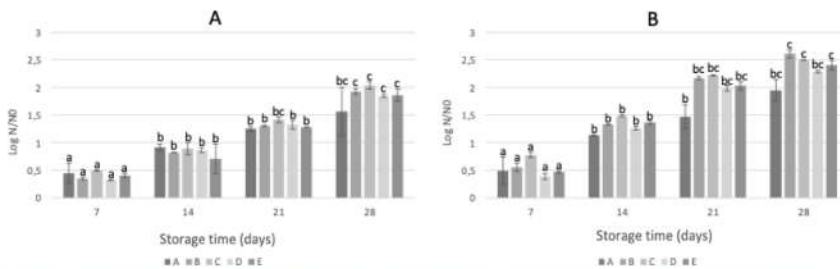


Figure 1. Challenge test with *C. sporogenes* spores at 4 °C (A) and 10 °C (B). Equivalent lower-case letters mean no significant differences between each sample ($p > 0.05$).

• No significant differences ($p < 0.05$) in the concentration of short-chained fatty acids were observed throughout 48 h of colonic fermentation in relation to the control ham.

• No significant differences ($p < 0.05$) in spore germination between ham formulations and the control were found for both temperatures.
• A 2 log and 2.5 log cycle differences were observed between day 0 and day 28 at 4 °C and 10 °C, respectively.

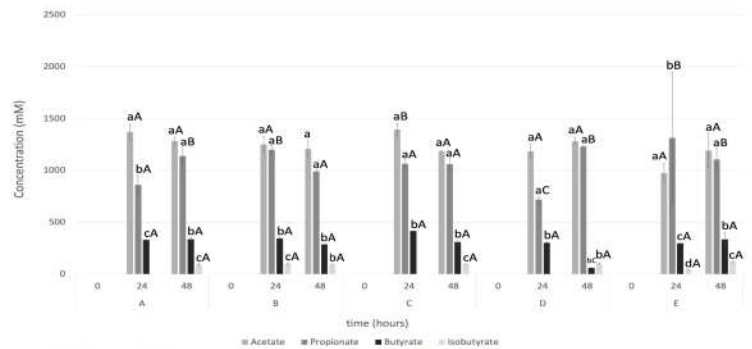


Figure 2. SCFAs and BCFA (Isobutyrate) concentration throughout 48h of colonic fermentation. Equivalent lower-case letters mean no significant differences between each time point ($p > 0.05$). Equivalent upper-case letters mean no significant differences between each condition ($p > 0.05$).

Conclusion

- No differences in spore germination were observed between ham samples and control ham;
- HPLC quantification of SCFAs showed no significant differences for all metabolites tested for all novel ham formulations and ham control, suggesting the absence of a negative impact of these novel products on the human gut microbiome;
- These results demonstrate the potential of using natural sources of nitrates combined with nitrated-reducing starters as a clean label alternative to the use of nitrite in cooked ham, showing the promising application of this technology in day-to-day foods while having food safety in mind;
- Future work with ham storage under modified atmosphere conditions would be important to be carried out due to its possible impact on the germination of the spores.

References

1. Delgado-Pando, G., Ekonomou, S. I., Stratakos, A. C., & Pintado, T. (2021). Clean Label Alternatives in Meat Products. *Foods* (Basel, Switzerland), 10(7), 1615. <https://doi.org/10.3390/foods10071615>
2. Yong, H. I.; Kim, T. K.; Choi, H. D.; Jang, H. W.; Jung, S.; Choi, Y. S. Clean Label Meat Technology: Pre-Converted Nitrite as a Natural Curing. *Food Sci. Anim. Resour* 2021, 41(2), 173–184, doi: <https://doi.org/10.5851/kosfa.2020.e96>