

# The potential of *Carnobacterium maltaromaticum* as a control agent of *Brochothrix thermosphacta* in chilled lamb

Katharine H. Adam

Rhys Jones  
Nicholass Penney  
Gale Brightwell  
AgResearch Ltd,  
Ruakura Research Centre,  
Hamilton, New Zealand  
katharine.adam@agresearch.co.nz



## Aims

- To determine if inoculation of chilled lamb with *Carnobacterium maltaromaticum* (CM) is more effective in reducing *Brochothrix thermosphacta* (BT) spoilage than good manufacturing practice.
- To determine the effects of packaging on the reduction of BT by CM in chilled lamb.
- To ensure that a reduction in BT numbers is not accompanied by an increase in APC numbers.

## Introduction

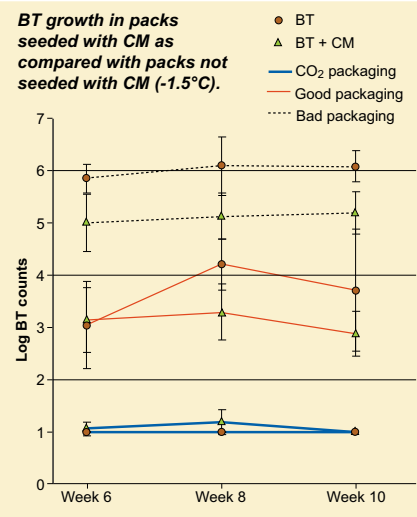
- Due to the geographical isolation and distance of New Zealand from the market place (Europe), it represents some unique challenges with regard to transport of fresh meats. Reliably guaranteed life for hygienically prepared vacuum packaged meat at -1°C is 60 days for lamb<sup>1</sup>. Customer requests for the reliable extension of shelf life lead to the investigation of biopreservation using lactic acid bacteria (LAB) such as CM.
- The presence of BT in vacuum packaged lamb with a pH higher than 5.8 can cause off odours (sweaty sock smell) and lead to its rejection at the market place. The strain of CM used was one previously isolated from New Zealand meat and shown to inhibit growth of BT in agar.

## Methods

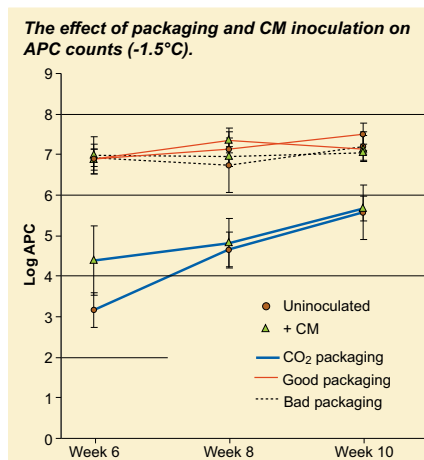
- Boned out lamb shoulders were cut into three pieces each (surface area 200 cm<sup>2</sup>), inoculated, packaged and stored using the following variations:
  - inoculated with BT (100 cfu/cm<sup>2</sup>) and CM (100 cfu/cm<sup>2</sup>)
  - inoculated with BT only
  - inoculated with CM only
  - no inoculu.
- The lamb pieces were packaged in:
  - GP (good vacuum packaging with low oxygen permeability)
  - BP (bad packaging with high oxygen permeability)
  - CO<sub>2</sub> packaging.
- Packs were stored at -1.5 and 2°C.
- After 6, 8 and 10 weeks storage the packs were opened and sampled using the swabbing method described in the MIRINZ manual<sup>2</sup>. One in ten dilutions were plated on PCA (plate count agar, Fort Richard Ltd., NZ) and STAA agar (Streptomycin thallos acetate actidione, Fort Richard Ltd., NZ). BT is oxidase and gram positive and these tests were used to confirm the identity of colonies growing on STAA. The packs were also assessed for off odours.

## Results

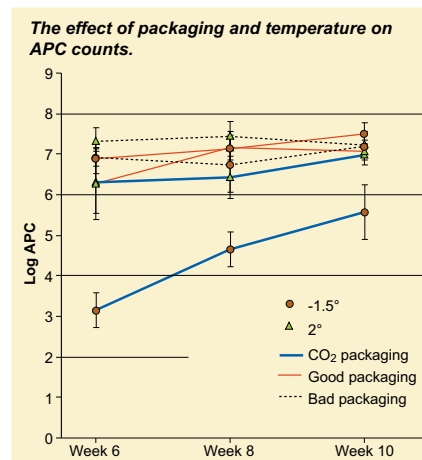
- After 10 weeks at both -1.5°C and 2°C in good vacuum packaging there are less BT in packs inoculated with CM than those not inoculated with CM.
- The most significant reduction in BT numbers occurred in CO<sub>2</sub> packs stored at -1.5°C.



- Following 6, 8 and 10 weeks storage APC counts remained unaffected by inoculation with CM.



- APC counts were lowest where CO<sub>2</sub> packaging was combined with optimal storage temperature.



- The production of off odours was not delayed by the presence of CM in vacuum packs.

## Discussion

- CO<sub>2</sub> packaging combined with optimal storage temperature (-1.5°C) was the only effective means of maintaining BT and APC numbers below rejection levels.
- While there was a reduction in BT numbers, in the presence of CM, after 10 weeks storage, in GP, at -1.5°C, the reduction was not large enough to bring BT down to below rejection numbers (100 cfu/cm<sup>2</sup>) and did not occur until after BT numbers had exceeded rejection levels. At 2°C BT numbers were reduced below rejection numbers; however, the meat was determined unfit for consumption based on smell.
- The reduction in BT numbers in GP was not significant prior to the 8th week of storage. Market place testing usually occurs at around the 6th week of storage. CM's ability to inhibit the growth of BT in meat did not reflect the result of work in agar. This may have been a result of CM being more spread out over the surface of the meat than in media tests or a component of the meat or drip from the meat may have inactivated the inhibitory component of CM.
- Off odours can be produced by a range of bacteria and it is suspected that Enterobacteriaceae were the cause of the off odours produced in experimental packs and are not inhibited by CM.

## References

- Bell, R.G., 1993, Whys and hows of handling chilled New Zealand lamb.
- AgResearch MIRINZ Meat Industry Microbiological Methods – Edition 4 <http://www.agresearch.co.nz/micromanual>

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Te Ahuwhenua, Te Kai me te Whai Ora. Tuatahi