Evaluation of morphological and functional characteristics of *Carnobacterium maltaromaticum* isolated from vacuum-packaged beef with long shelf life

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**INTRODUCTION**

A temperature near the freezing point of meat (≈ −2 °C), associated with vacuum packaging allows the preservation of this product up to several months, which makes possible the meat trade across the planet without resorting to freezing.

*Carnobacterium maltaromaticum* is a lactic acid bacterium (LAB), and many LAB are known for their bactericidal or bacteriostatic activity against other strains, species or genera.

In this way, the presence of certain lactic acid bacteria adapted to a low temperature on fresh meat could extend the shelf life and improve the microbial stability and safety of this product.

**OBJECTIVE**

To perform a morphological and functional characterization of *Carnobacterium maltaromaticum* with a potential bioprotective effect isolated from vacuum-packaged beef with long shelf life.

**MATERIALS AND METHODS**

- **Isolation of *Carnobacterium maltaromaticum***
  - Longissimus dorsi: Australian origin
  - Commercial shelf life ≤ 140 days

- **Microbiological stability of commercial beef inoculated with *C. maltaromaticum***
  - Inoculation of *C. maltaromaticum* 10^6 CFU/mL (1% v/w)
  - Vacuum-packaging (d0)
  - Storage (d7) 1 °C

**RESULTS**

- **Morphological, biochemical and enzymatic profiles**
  - Similar profiles to two reference strains: LMG 11393 and LMG 22902
  - Colonies: circular, convex, entire, α < 1 mm, smooth, translucent, unpigmented and odorless
  - Cells: Gram positive bacillus arranged in pairs, catalase and oxidase negative
  - Substrates: glycerol, D-ribose, D-galactose, D-glucose, D-fructose, D-mannose, D-mannitol, methyl-D-D-mannopyranoside, methyl-D-D-glucopyranoside, N-acetylglucosamine, amygdalin, arbutin, esculin ferro citrate, salicin, D-cellobiose, D-maltose, D-lactose, D-melibiose, D-saccharose, D-trehalose, gentiobiose, D-turanose and potassium gluconate
  - Enzymes: esterase (C4), esterase lipase (C8), valine aryldiamidase, acid phosphatase, naphthol AS-BI-phosphohydrolase and β-glucosidase

- **Influence of different atmospheres**
  - Storage (d7): 1) 100% N₂, 2) 70% O₂, 30% CO₂, 3) 30% O₂, 70% CO₂

- **Morphological stability of beef inoculated with *C. maltaromaticum***
  - Incubation inhibited the growth of *Enterobacteriaceae* and favored the growth of *B. thermosphacta*
  - CO₂ inhibited growth of *Enterobacteriaceae* and *B. thermosphacta* no effect of inoculum
  - For both atmospheres: No effect of inoculum on TVC and LAB. Reduction of *Pseudomonas* sp. (data not shown)

**CONCLUSIONS**

- Morphological, biochemical and enzymatic profiles of the isolated strain similar to two reference strains
- Slower growth of *C. maltaromaticum* under 70% O₂/30% CO₂ and 30% O₂/70% CO₂
- Antimicrobial effect of *C. maltaromaticum* against *Enterobacteriaceae* under N₂
- Perspectives: genotypic characterization of *C. maltaromaticum* and evaluation of its potential bioprotective effect

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