

# Control of *Listeria monocytogenes* on vacuum packaged cooked meat products through bacteriophages

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## Objectives

Ready-to-eat (RTE) cooked meat products (CMP) are prone to contamination with *L. monocytogenes* during slicing and packaging and their substrate properties and storage conditions (vacuum or modified atmosphere packaging at refrigeration temperatures) are adequate for the development of this pathogen. There is an increased interest in the use of bacteriophages (Figure 1) as a strategy to control the growth of food pathogens. At present, the option of using phages to prevent proliferation of post-contaminating *L. monocytogenes* cells on anaerobically packaged CMP has not been reported. Therefore, the objective of this study was to investigate the feasibility of bacteriophage P100 to control *L. monocytogenes* in CMP.

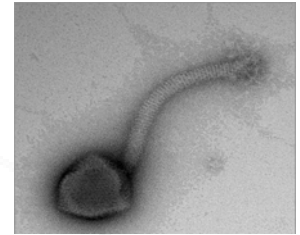


Figure 1. Bacteriophage (Steven Hagens)

## Materials and methods

A preliminary experiment aimed at testing the lytic activity of P100 towards three *L. monocytogenes* strains at 30°C and at 7°C in broth. Further, several application trials on cooked chicken fillet and on cooked ham were conducted to prove the antilisterial action of P100 and to optimise its dose on a real CMP during storage at 7°C under vacuum packaged conditions.

## Results

- Preliminary broth experiments revealed that each of the three *L. monocytogenes* strains under study were susceptible to the action of bacteriophage P100 and this at 30°C as well as at 7°C (Figure 2).
- In the first application test on a cooked poultry product, the presence of phage P100 resulted in a reduction of the *L. monocytogenes* count with 3.32 log<sub>10</sub>(cfu/g) compared to the untreated control after 21 days (7°C, vacuum) (Table 1).

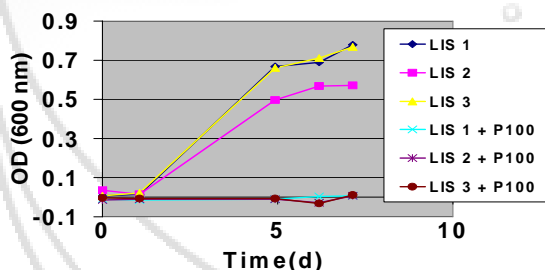


Figure 2. Growth of *L. monocytogenes* in BHI-broth at 7°C without and with P100 (LIS 1 = *L. monocytogenes* LFMFP 45; LIS 2 = *L. monocytogenes* Scott A; *L. monocytogenes* LMG 13305)

Table 1. Growth (log<sub>10</sub>(cfu/g)) of a three-strain *L. monocytogenes* cocktail on vacuum packaged cooked chicken fillet at 7°C without P100 (LIS) and with P100 (LIS+P100) at a dose of 1×10<sup>7</sup> pfu/cm<sup>2</sup>

Time (days)	LIS	LIS + P100
0	1.00	1.00
7	2.46	2.04
14	4.62	1.85
21	4.32	1.00

- Finally, the action of P100 was verified and its dose was optimised by performing challenge tests on a model cooked ham (Figure 3) and on industrially prepared cooked ham (Figure 4). Treatment with P100 at a level of 1×10<sup>7</sup> pfu/cm<sup>2</sup> sufficiently reduced the population of *L. monocytogenes* compared to the untreated control.

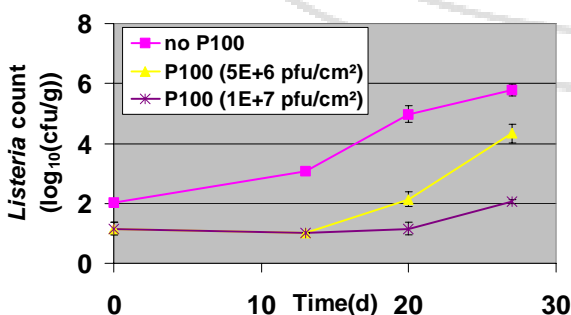


Figure 3. The growth of *L. monocytogenes* on vacuum packaged model cooked ham without and with P100 at 7°C

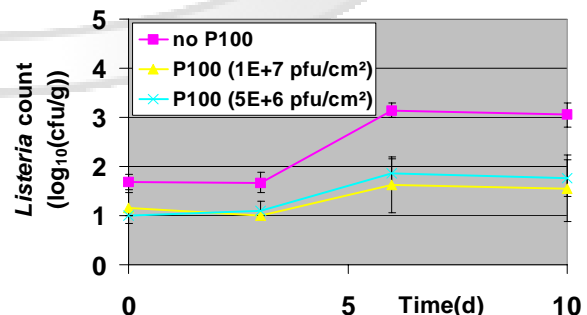


Figure 4. The growth of *L. monocytogenes* on vacuum packaged industrially prepared cooked ham without and with P100 at 7°C

## Conclusion:

This study provides evidence on the usefulness of the lytic *Listeria*-specific phage P100 to control the growth of *L. monocytogenes* on sliced cooked meat products at 7°C under anaerobic storage conditions. The optimal dose is ≥ 10<sup>7</sup> pfu/cm<sup>2</sup>.