

Eliminating low numbers of *L. monocytogenes* on sliced deli meat using bacteriophages

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OBJECTIVE

The objective was to investigate if LISTEX™ P100 bacteriophage was able to eliminate *Listeria monocytogenes* on sliced deli meat, when present in realistic low numbers (< 1 cfu/cm²).

CONCLUSION

The study demonstrated a significant listericidal effect of the LISTEX™ P100 bacteriophage, as *L. monocytogenes* was absent in 34% respectively 70% of the stored samples depending on the number of bacteriophages applied, compared to presence in 100% of the control samples. For the remaining samples, *L. monocytogenes* increased during the 5 weeks storage, but the number was significantly lower (5.3 log cfu/cm² for recommended treatment respectively 4.3 log cfu/cm² for 10 x recommended treatment), compared to control samples (7.1 log cfu/cm²).

BACKGROUND

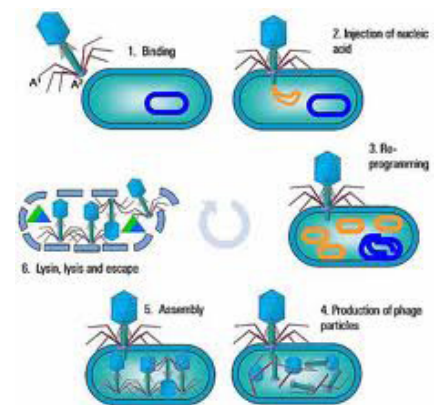
Listeria monocytogenes is still the major contaminant of pasteurised deli meats, due to re-contamination during slicing and packaging. Numerous preventive measures i.e. chemicals as lactate and acetate or natural compounds as essential oils from spices have been used with varying degree of success. A major drawback for using these is the reluctance of the consumer to accept more chemical preservation and an off-taste of the product.

Bacteriophages are highly specific to their target organism, and upon adhesion, the target organism will be eliminated without any side-effects regarding taste, flavour or visual appearance.

MATERIALS & METHODS

4 strains of *L. monocytogenes* were cultured overnight at 37°C in BHI, mixed and diluted in 0.85% NaCl + 0.1% peptone (MRD) to a final inoculum at 2 x 10³ cfu/ml. A meat product (pasteurised pork filet; salt/water 3.6%, 60 ppm nitrite, pH 6.1) was sliced and inoculated by spreading 30 µl on the surface (approx. 60 cm², giving an estimated level of 1 *L. monocytogenes* per cm²). 25 slices were treated with 60 µl of LISTEX™ P100 (Microcos Food Safety, NL) in recommended level (10⁷ pfu/cm²), 25 were treated with 60 µl LISTEX™ P100 in 10 x recommended level (10⁸ pfu/cm²) and 25 slices were left as control.

3 slices were examined for *L. monocytogenes* count immediately after inoculation. After 5 weeks storage at 5°C, all the slices were homogenised in 60 ml of MRD, 10-fold diluted and spread on Oxford agar. The remaining initial suspension was added equal amount of double-strength Half-Fraser broth for qualitative examination according to ISO 11290:2004. The above setup was carried out twice in two different weeks.



The LISTEX™ P100 is manufactured by MICROCOS Food Safety. More information is given on www.microcosfoodsafety.com

RESULTS

The estimated mean inoculation level was 51 respectively 56 cfu per slice in the two identical trials (mean inoculation level at 0.9 cfu/cm²). As seen in table 1, the reproducibility of the test was excellent. The results clearly demonstrate an effect of treating the deli meat with LISTEX™ P100. For the control samples, all slices have a level around 7.1 log *L. monocytogenes*/cm², whereas the level for the treated samples is reduced by 1.8 respectively 2.8 log depending on the number of phages applied. Also a significant number of samples being completely eliminated for *L. monocytogenes* after 5 weeks storage was obtained as *L. monocytogenes* could not be detected in 17 (34%) respectively 35 (70%) of 50 samples when treated with the two levels of LISTEX™ P100

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TABLE 1: *Listeria monocytogenes* in phage-treated and control slices of meat product in two separate trials.

	CONTROL		RECOMMENDED TREATMENT (10 ⁷ pfu/cm ²)		10 X RECOMMENDED TREATMENT (10 ⁸ pfu/cm ²)	
	Trial 1	Trial 2	Trial 1	Trial 2	Trial 1	Trial 2
<i>L. monocytogenes</i> not detected in 1 slice	0	0	8	9	18	17
<i>L. monocytogenes</i> < 100 cfu/cm ²	0	0	2	3	0	0
<i>L. monocytogenes</i> > 100 cfu/cm ²	25	25	15	13	7	8
mean log count for slices having > 100 cfu/cm ²	7.4 ± 0.4	6.8 ± 0.4	5.2 ± 0.4	5.3 ± 0.4	4.3 ± 0.8	4.3 ± 1.1