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DANISH MEAT
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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 *L. monocytogenes* on sliced deli meat, present in realistic low numbers (< 1 cfu/cm^2).

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/cm^2 for recommended treatment respectively 4.3 log cfu/cm^2 for 10 x recommended treatment), compared to control samples (7.1 log cfu/cm^2).

BACKGROUND

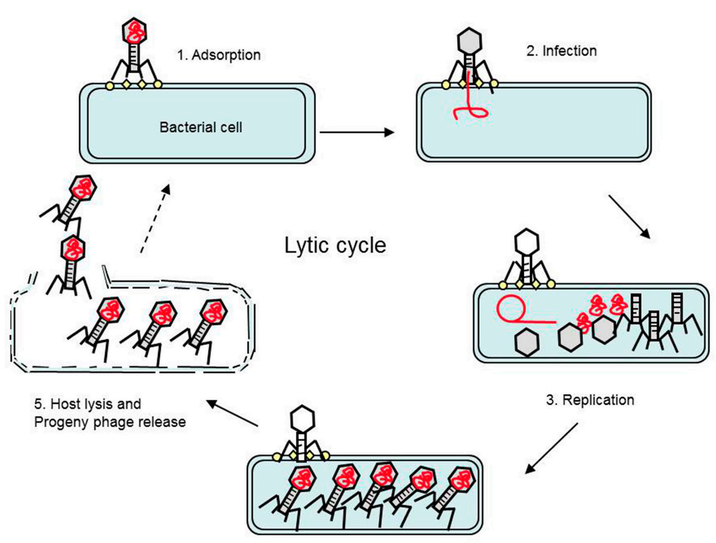
Listeria monocytogenes is still the major contaminant of pasteurised deli meats, due to recontamination during slicing and packaging. Numerous preventive measures i.e. chemicals as lactate and acetate or natural compounds as essential oils from spices have been used with varying degree of success. A 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 10^3 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 cm^2, giving an estimated level of 1 *L. monocytogenes* per cm^2). 25 slices were treated with 60 µl of LISTEX™ P100 (Micreos Food Safety, NL) in recommended level (10^7 pfu/cm^2), 25 were treated with 60 µl LISTEX™ P100 in 10 x recommended level (10^8 pfu/cm^2) and 25 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 homogenate 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 MICREOS Food Safety. More information is given on www.micreos-foodsafety.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/cm^2). As seen in table 1, the reproducibility of the test was excellent. The results clearly demonstrated an effect of treating the deli meat with LISTEX™ P100. For the control samples, all slices had a level around 7.1 log *L. monocytogenes* pr. cm^2, whereas the level for the treated samples was reduced by 1.8 respectively 2.8 log depending on the number of phages applied.

For a significant number of slices (17 slices ~ 34% and 35 slices ~ 70%), *Listeria monocytogenes* was not detected after 5 weeks storage, when treated with the two levels of LISTEX™ P100, indicating complete elimination.

TABLE 1: *Number of slices having different level of L. monocytogenes after 5 weeks storage at 5°C.*

	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
L. monocytogenes not detected in 1 slice	0	0	8	9	18	17
L. monocytogenes < 100 cfu/cm^2	0	0	2	3	0	0
L. monocytogenes > 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

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