



Relative risk assessment of *Listeria monocytogenes* in a ready-to-eat chicken salad using a challenge test after cold stress



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INTRODUCTION

Listeria monocytogenes is the causal agent of human listeriosis, an infection almost exclusively transmitted by food consumption. *L. monocytogenes* may thrive in refrigerated foods reaching unsafe limits during shelf-life. Food challenge testing is useful to provide information on the behavior of potential pathogens during food storage.

Lately, ready-to-eat food products (RTE) consumption has grown steadily around the world, but these foods are commonly associated foods to human listeriosis.



AIM

A challenge test was conducted to establish the maximum concentration of *L. monocytogenes* that may be present at the production stage of ready-to-eat chicken salad (RTECS) to comply with the mandatory limit of 100 cfu/g at the end of shelf-life. Using an exponential dose-response model, the relative risk of different scenarios at packaging and at the end of shelf-life were calculated.

MATERIALS & METHODS

1. Cold stress

- *L. monocytogenes* serotype 1/2a (CECT 4031) strain was kept at 5°C/ 12 days to recreate an adaptation to the industrial refrigerated environment
- *L. monocytogenes* viability was regularly monitored:
- OD_{600nm} and bacterial enumeration by spread plating on BHI agar



2. Challenge testing

- Industrially produced ready-to-eat chicken salad was inoculated with 5 log cfu/g of *L. monocytogenes* and kept at 5°C/ 7 days
- Determinations at day 0, 4 and 7 of shelf-life:
 - *L. monocytogenes* detection and enumeration (ISO11290-1 and 2:1996)
 - Salad's pH (NP 3441/2008) and aw (NP 3441/2008) measurements
- Three independent assays were carried out and negative controls were assessed



3. Data analyses and risk assessment

- ComBase® Predictor used as a predictive model
- R software used for statistical analyses
- FAO/ WHO Exponential Dose-Response model was used to determine the risk of acquiring listeriosis from exposure to contaminated ready-to-eat chicken salad

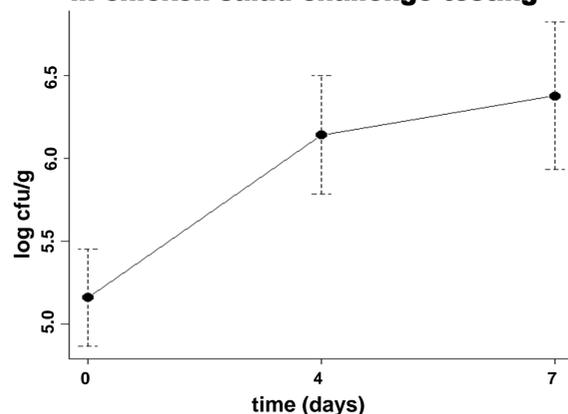
RESULTS & DISCUSSION

Average and standard deviations of pH and a_w during challenge testing

day	pH	a _w
0	6.1 ± 0.1	0.95 ± 0.03
4	6.2 ± 0.1	0.98 ± 0.02
7	6.4 ± 0.3	0.98 ± 0.01

No significant differences (p>0.05) found during challenge testing for pH and a_w

Average and standard error of *L. monocytogenes* 1/2a log cfu/g in chicken salad challenge testing



Average growth in 7 days: 1.22 log cfu/g

Max. log cfu/g at day 7: 2

Average log cfu/g at day 0: 0.78
≈6 cfu/g at day 0

FAO/WHO Exponential dose-response model Risk of listeriosis from exposure to a contaminated portion (200g =1 salad)

Time/ concentration	General healthy population	Susceptible population (risk groups)
Day 0 (6 cfu/g)	9,6 x 10 ⁻¹¹	1,1 x 10 ⁻⁸
Day 7 (100 cfu/g)	1,1 x 10 ⁻⁹	1,2 x 10 ⁻⁷

A portion of 200g of chicken salad contaminated with less than 100 cfu/g during shelf-life, represents an extremely low risk of acquiring listeriosis even for risk groups

CONCLUSIONS

- Based on pH and a_w measurements, RTECS confirmed as able to support the growth of *L. monocytogenes*
- *L. monocytogenes* 1/2a growth in RTECS at 5°C during the 7-day challenge test: lower than the estimated by the predictive model using day 0 parameters
- Considering 100 cfu/g of *L. monocytogenes* by the end of shelf-life, 6 cfu/g at day 0 could be present, although not allowed according to Reg. 2073/2005 and amendments
- Exponential dose-response model: extremely low risk of acquiring listeriosis when consuming RTECS during shelf-life