

# Growth of *Listeria monocytogenes* during germination of mung bean sprouts

Joana Gomes\*, Joana Barbosa and Paula Teixeira

Universidade Católica Portuguesa, CBQF—Centro de Biotecnologia e Química Fina—Laboratório Associado, Escola Superior de Biotecnologia, Porto, Portugal

e-mail: s-jomacagomes@ucp.pt



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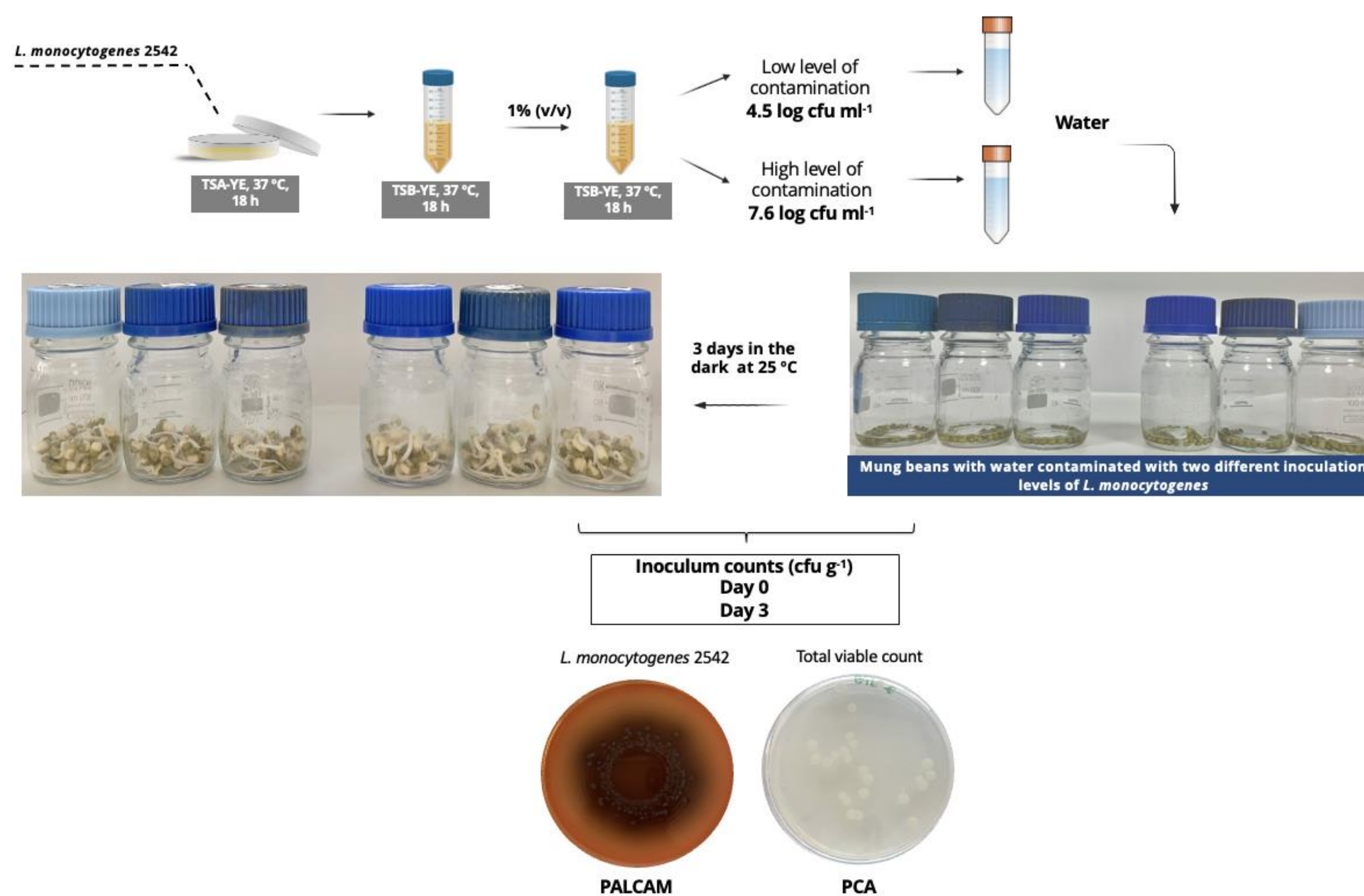
## Introduction

Rising interest in healthier diets has increased demand for ready-to-eat products such as fresh vegetables and sprouts. However, *Listeria monocytogenes*, a foodborne pathogen linked to listeriosis outbreaks from contaminated produce, can adhere to plant tissues and persist there for long periods once it contacts the surface.<sup>1</sup> Because the initial microbial load on seeds or plant surfaces strongly affects survival, spread, and penetration into plant tissues,<sup>2</sup> contaminated sprouts can ultimately carry high levels of microorganisms in the finished product.<sup>3</sup>

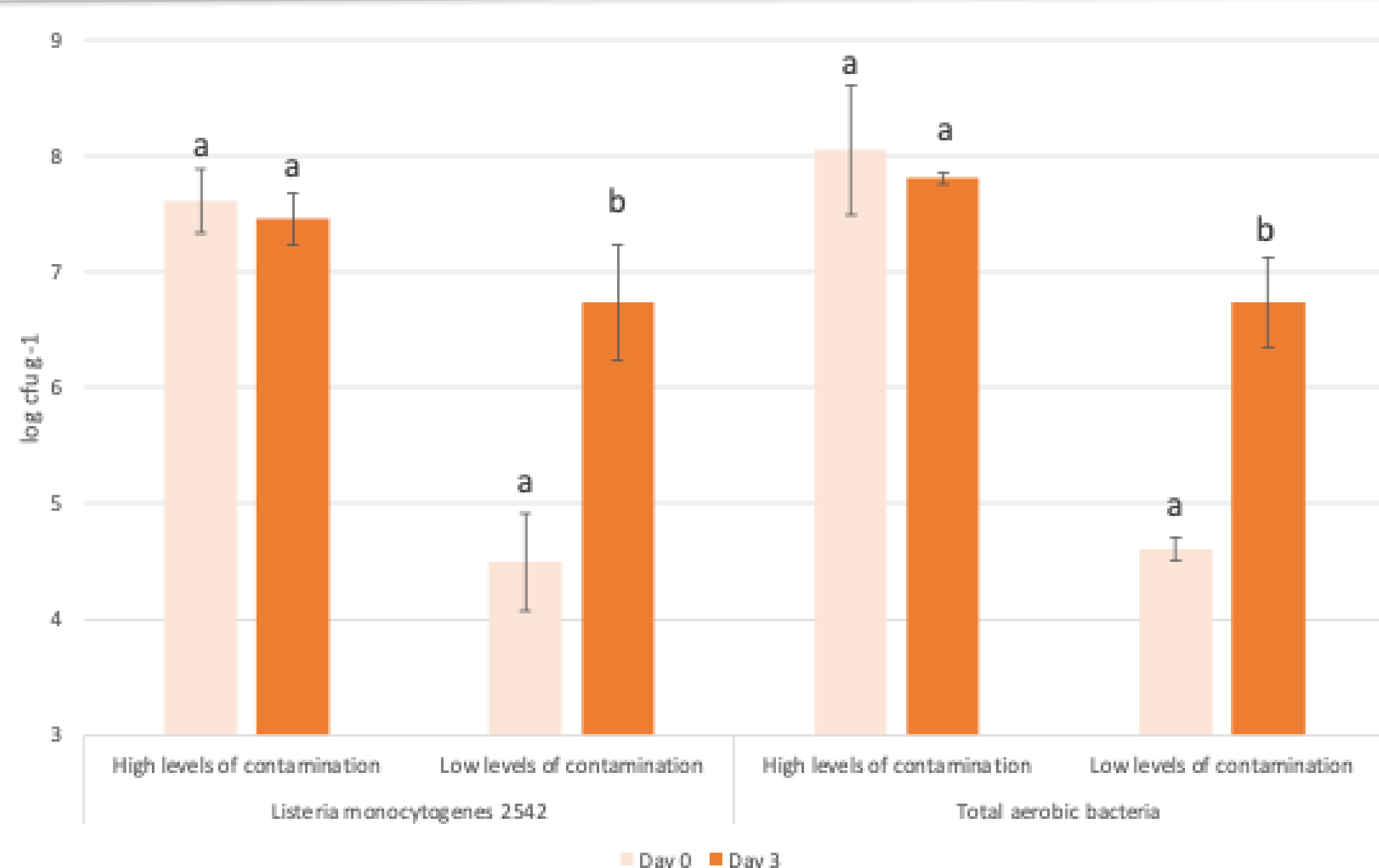
## Objective

This study aimed to assess the risk of using irrigation water contaminated with two levels of *Listeria monocytogenes* (7.6 and 4.5 log cfu g<sup>-1</sup>) in mung bean sprout production.

## Methods



## Results



**Figure 1.** Growth of *L. monocytogenes* 2542 during germination of mung beans at 25 °C over three days, shown for two initial contamination levels. Bars represent the mean log<sub>10</sub> cfu g<sup>-1</sup> of sprouts from three independent trials (n = 3). Sprouts were sampled at Day 0 and Day 3, after the start of germination. Different letters indicate significant differences between Day 0 and Day 3 within the same contamination level (p < 0.05).

## Discussion and conclusions

- Mung bean seeds contaminated with low levels of *L. monocytogenes* showed an increase of approximately 2 log CFU g<sup>-1</sup> over three days at 25 °C (p < 0.01).
- At low inoculum level, *L. monocytogenes* grew during sprouting because the smaller initial population allowed more doublings, with less competition for nutrients and experienced lower metabolic stress.<sup>4</sup>
- These findings demonstrate the potential for rapid multiplication of low levels of *L. monocytogenes* on germinating seeds.
- Sprouting-specific conditions, warm temperature, high humidity, and abundant nutrients, further promote bacterial growth.<sup>3</sup>
- By contrast, seeds inoculated at high contamination levels did not show further increases in *L. monocytogenes* counts (p > 0.05).
- High inoculum can limit net growth through rapid nutrient depletion, accumulation of inhibitory metabolites (the inoculum effect), greater metabolic stress, and stronger competition with the native seed microbiota.

## Significance

- Low-level contamination of mung bean seeds with *L. monocytogenes* can produce a significant increase in pathogen counts during germination (p < 0.01).
- Even low levels of contamination in irrigation water may pose a public-health risk because mung bean sprouts are typically consumed raw and germination conditions favor rapid pathogen growth.

## References

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## Acknowledgements

This work was supported by National Funds from FCT - Fundação para a Ciência e a Tecnologia through project GenoPhenoTraits4Persistence - Genomic and phenotypic traits contributing to persistence of *Listeria monocytogenes* in food processing environment (PTDC/BAA-AGR/4194/2021; <https://doi.org/10.54499/PTDC/BAA-AGR/4194/2021>). We would like to thank the scientific collaboration under the FCT project UID/50016/2025. Financial support for J. Gomes was provided by a doctoral fellowship 2021.06027.BD (FCT) and DOI identifier <https://doi.org/10.54499/2021.06027.BD>.



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