

The effect of slight pH changes in gastric conditions on the survival of *Listeria monocytogenes*

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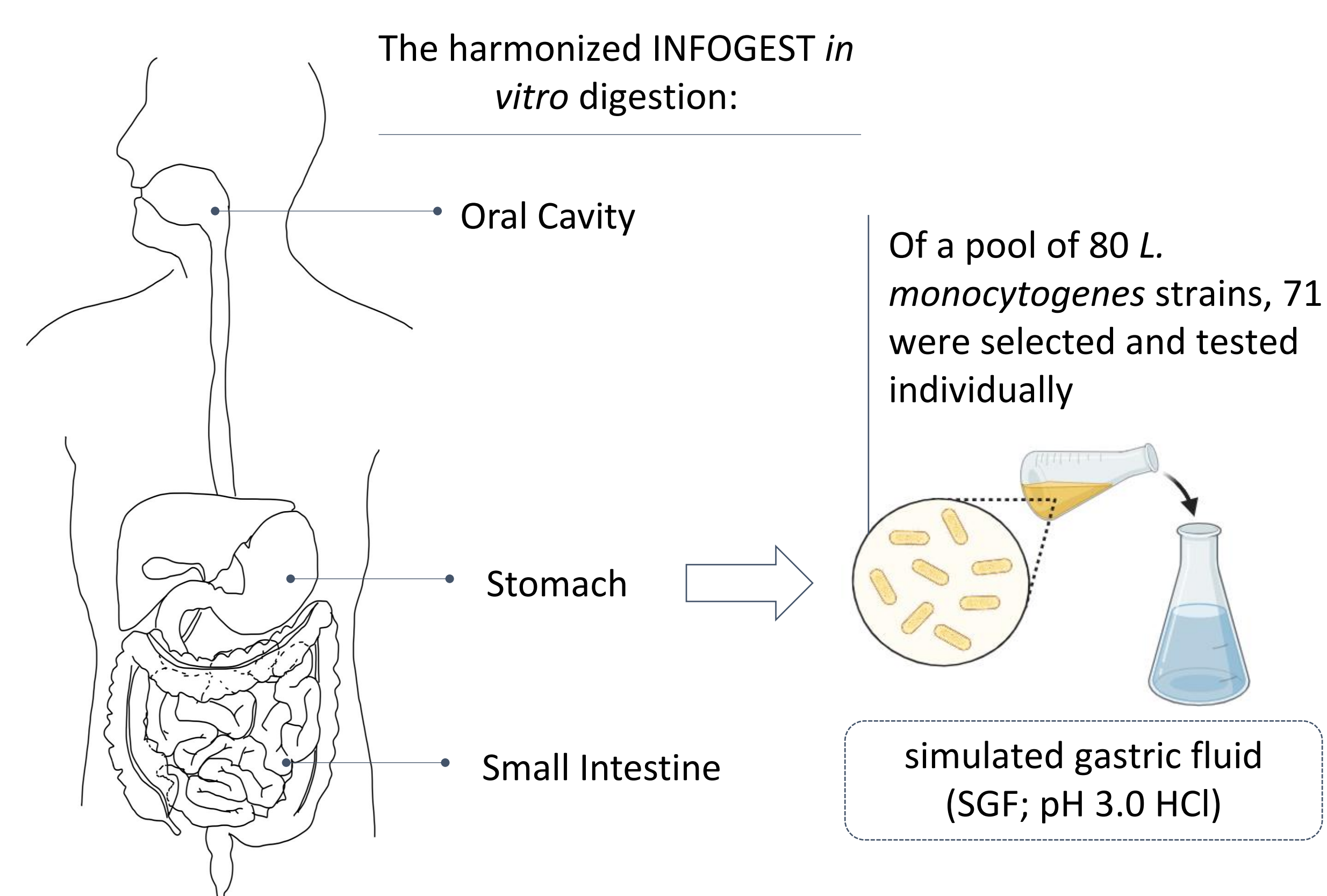
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Introduction and Objectives

Listeria monocytogenes, the etiological agent of human listeriosis, poses a substantial threat as a lethal intracellular pathogen after the consumption of contaminated foods^[1]. Invasive listeriosis is particularly severe in vulnerable populations, including pregnant women, newborns, the elderly, and immunocompromised individuals^[2]. While all strains are conventionally considered equally virulent, acknowledging the inherent variability, the absence of reliable biomarkers hampers the differentiation of strains based on virulence^[2]. However, resistance to the gastrointestinal tract could be viewed as a potential discriminatory factor, as invading strains must endure the challenges posed by the gastrointestinal environment for successful establishment. Upon ingestion, on its passage through the human gastrointestinal tract, *L. monocytogenes* faces multiple hurdles, which can significantly affect its ability to cause an infection. One of the many hurdles is the harsh environment of the stomach. Hydrochloric acid (HCl) secretion in the stomach plays a pivotal role in raising acidity to levels lethal for most bacteria. This work aimed to assess the impact of lowering pH levels on the survival of selected *Listeria monocytogenes* strains.

Methods

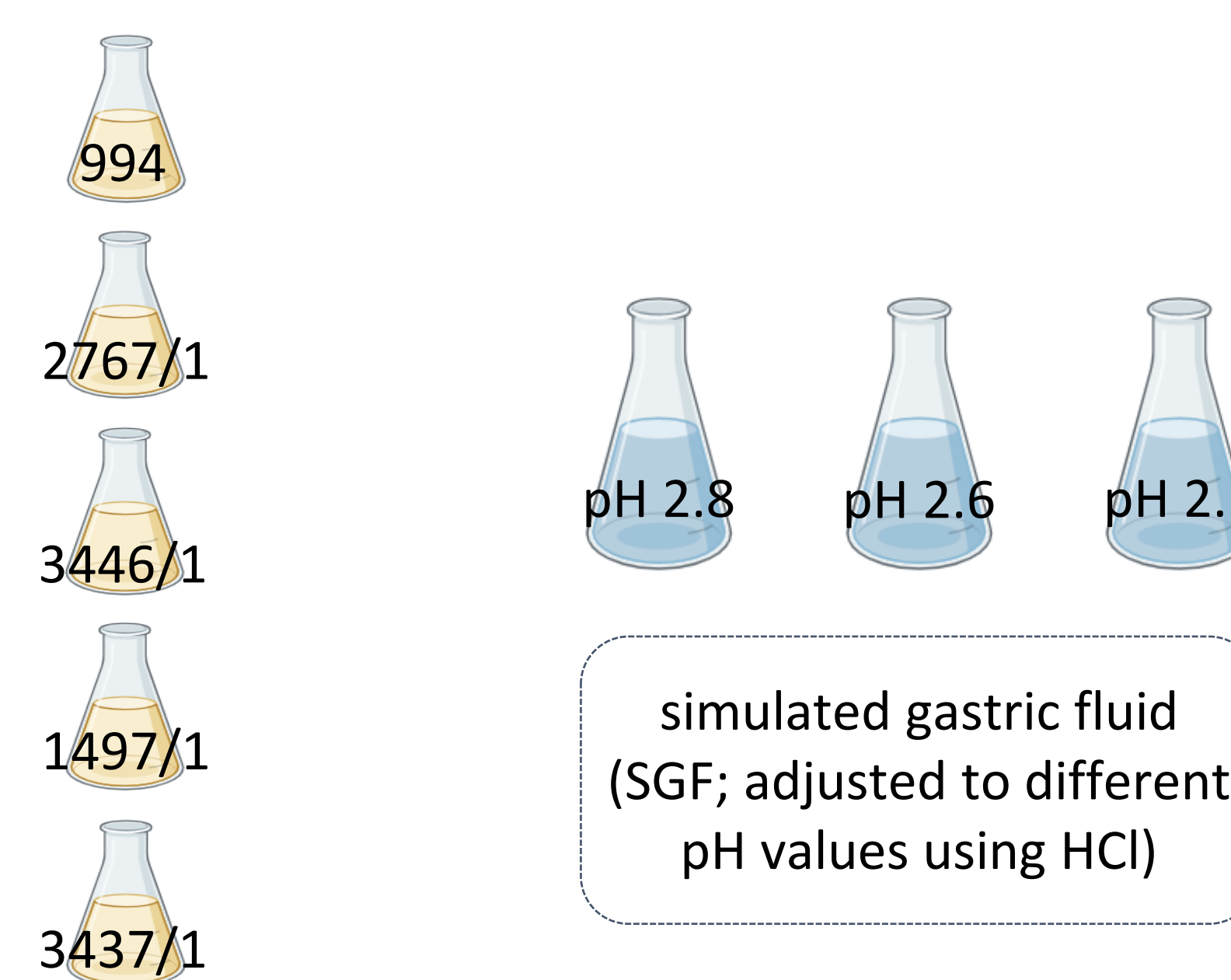
A. Screening for *L. monocytogenes* ability to survive gastric conditions



All isolates proved to be resistant to such pH with no significant differences encountered between isolates (data not shown)

B. Impact of low pH on the survival of *L. monocytogenes*

Selection of 5 strains and evaluation of their ability to survive to pH values of 2.8, 2.6, and 2.1



Evaluate whether reducing the testing pH affects the pathogen's survival and whether this effect varies by strain

Results

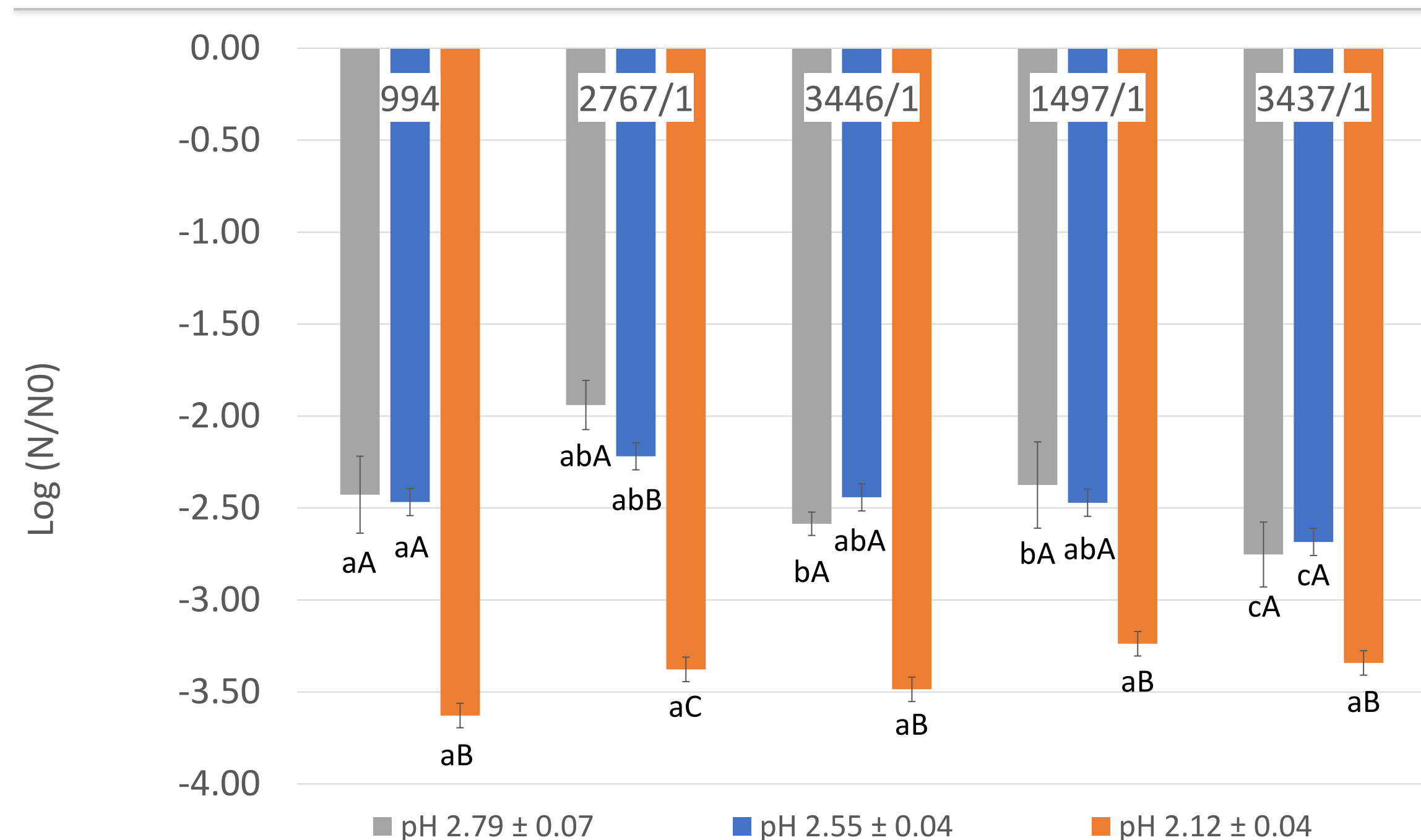


Figure 1. Survival of 5 *L. monocytogenes* strains at three pH values: 2.8, 2.5 and 2.1. The results are means based on data from three replicates, and standard deviations are indicated by error bars. Equivalent lowercase letters and uppercase letters mean no significant differences between each condition and between each isolate, respectively ($p > 0.05$).

- At pH 2.8, a reduction of ca. 2.5 log CFU/mL was observed for four of the five strains tested. The 2767/1 strain proved to be more resistant than the other four ($p < 0.05$) being reduced by ca. 2.0 log CFU/mL.
- A similar trend was observed at pH 2.6. When exposed to a more acidic condition (pH 2.1), all isolates appeared to be more sensitive (reductions between 3.2 and 3.6 log cycles), and differences between isolates were not statistically significant ($p > 0.05$).
- A pH of 2.8 was selected to evaluate the survival of the different *L. monocytogenes* strains through the harmonized INFOGEST *in vitro* digestion

Conclusion and Relevance

Although preliminary, these results suggest that minimal fluctuations in gastric pH can either enhance the survival of pathogenic bacteria (at pH 2.6 and above) or reduce it (at pH as low as 2.1). Furthermore, resistance to simulated gastric conditions is strain-dependent and these differences were better noted at pH 2.8. This study showed that a pH of 2.8 is better suited for screening *L. monocytogenes* in *in vitro* digestion studies.

References

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Acknowledgements

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