Survival and invasion capacity of *Salmonella* cells exposed to simulated UV-C light orange juice processing and gastro-intestinal conditions

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Introduction

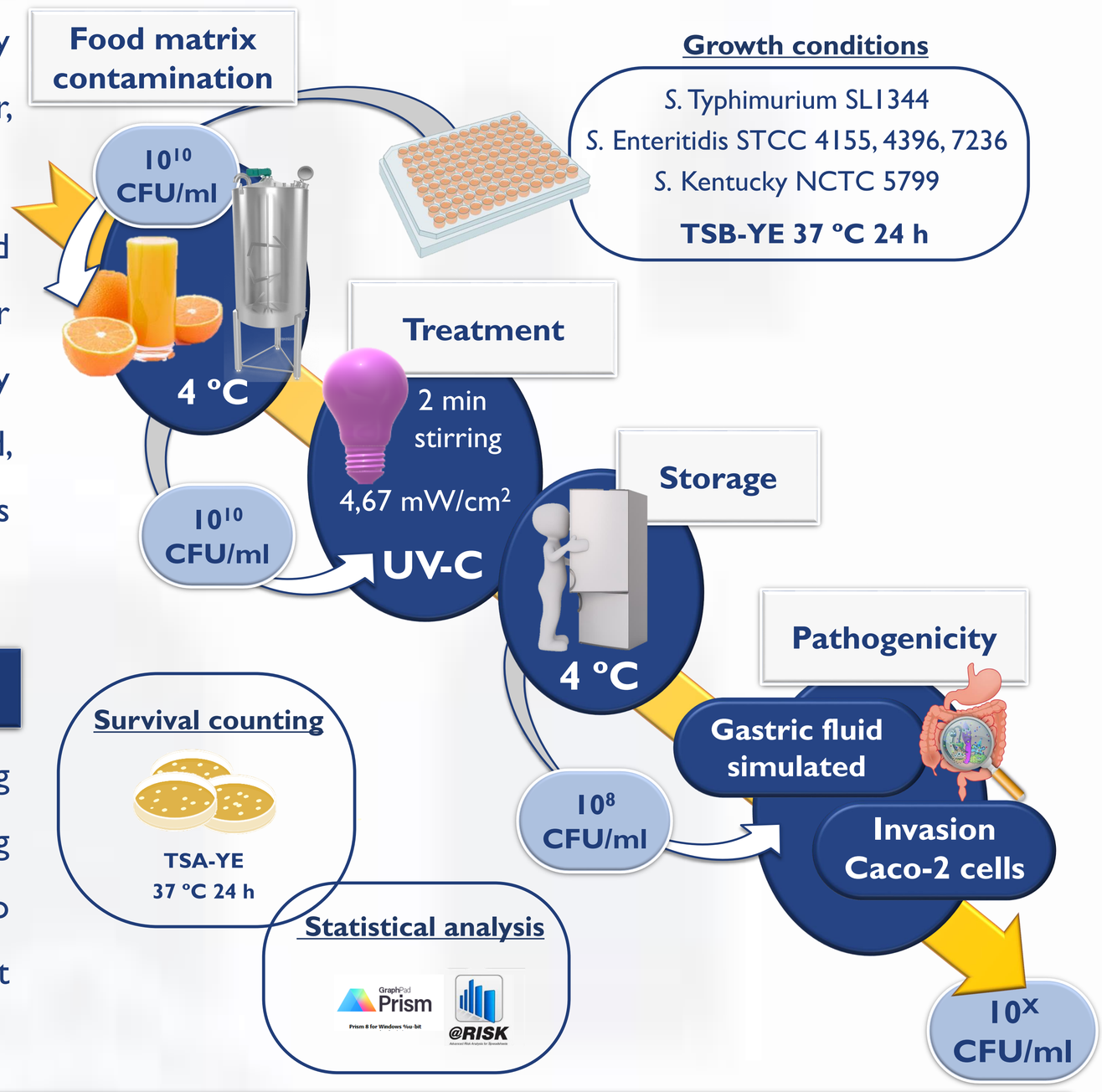
Non-thermal food processing technologies have been extensively explored in order to respond to consumer's demands for safer, healthier and less processed foods.

Among them, **Ultraviolet-C technology** has been proposed, and even used, as an alternative treatment for the pasteurization and/or shelf life extension of fruit juices. However, there are still many aspects regarding the effect of UV-C light on bacterial cells and, consequently, on the safety of the products treated with this technology, that remain to be fully understood.

Objective

The aim of this work was to determine the relative risk of causing disease (measured and the amount of cells capable of invading Caco-2 cells) of five *Salmonella* strains after being exposed to simulated orange juice production (including UV-C light treatments) and gastro-intestinal conditions.

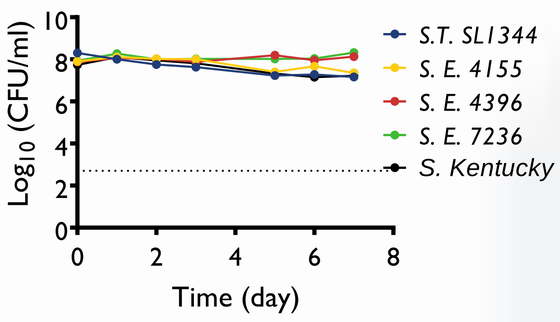
Materials and Methods



Results and discussion

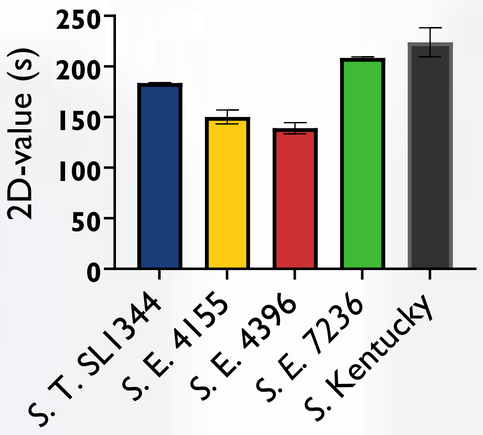
Characterisation of the different *Salmonella* strains studied: resistance to the different agents to which the cells would be exposed along the orange juice production chain (including UV -C) and the gastro-intestinal transit & invasive capacity.

Survival at 4 °C



The incubation in orange juice for up to 7 days under refrigeration conditions hardly caused any inactivation of *Salmonella* cells.

UV-C resistance

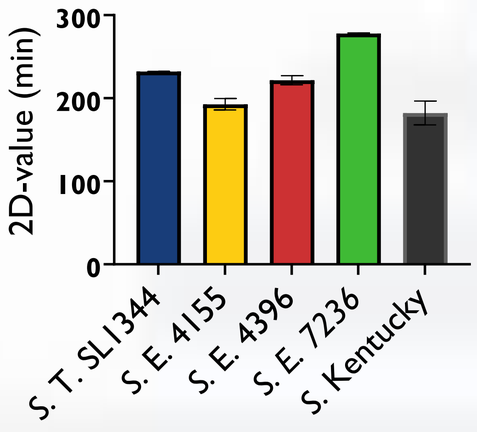


2D-values of *Salmonella* strains to UV-C (5 mW/cm²).

- UV-C resistance +

S. E. 4396 — **S. Kentucky**

Gastric fluid resistance

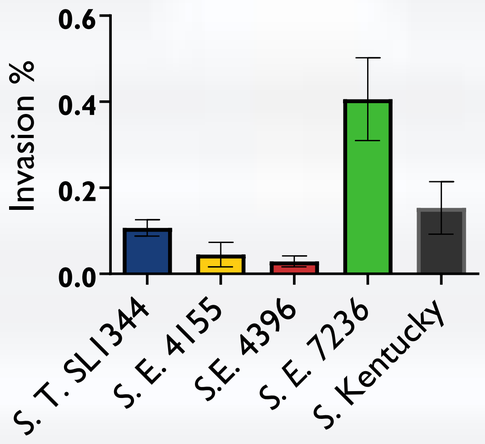


2D-values of *Salmonella* strains to SGF (2 h 37 °C).

- SGF resistance +

S. Kentucky — **S. E. 7236**

Invasive capacity



Invasion capacity to Caco-2 cells of *Salmonella* strains.

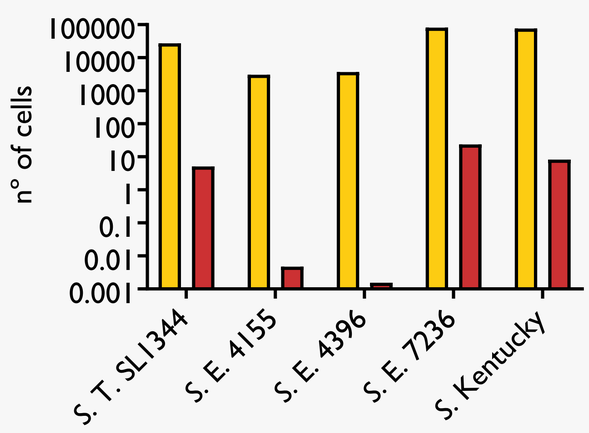
- Virulence +

S. E. 4396 — **S. E. 7236**

Development of resistance or sensitisation responses?

- Prior incubation in orange juice did not affected the UV-C resistance of *Salmonella* cells.
- UC-V treatments did not sensitize *Salmonella* cells to subsequent refrigerated storage conditions
- Neither UV-C treatments nor refrigerated storage influenced resistance to Gastric Fluid
- No influence of dose was found

Simulation of whole orange juice production chain and gastro-intestinal transit



Number of *Salmonella* cells capable of invading Caco-2 monolayers after being exposed to simulated orange juice production (including UV-C light treatments) and gastro-intestinal conditions

Conclusion

The most UV resistant strain was not the one having the highest risk of causing illness (estimated as the amount of cells capable of invading Caco-2 monolayers). These results clearly indicate that definition of microbiological criteria as well as of selection of process parameters should be done from a whole-chain perspective and not only considering the resistance of the most resistant strain or microorganism.

Acknowledgements

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