

## Heat inactivation of *Listeria innocua* in broth and parsley under non-isothermal conditions

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*Listeria monocytogenes*, the cause of listeriosis, is widespread in the environment and has been found in raw and ready-to-eat vegetables, meat, poultry, seafood and dairy products. Several published works referred that *L. innocua* can be used as a biological indicator of *L. monocytogenes* in the food industry, since it provides a margin of safety. Besides *L. innocua* exhibits most of the characteristics of *L. monocytogenes* (except hemolysin production, i.e. pathogenicity), it shares the same natural environments and can be frequently isolated on the same food products, making it an ideal and safe marker organism for the pathogenic specie. Because of the occurrence of *Listeria spp.* in pasteurized products, studies on the evaluation of its heat resistance is of main importance.

In food industry, the production of microbiologically safe food products by the application of suitable thermal treatments is one major concern. Although much work has been done at laboratory scale to clarify the response of such treacherous bacterium during isothermal heat treatments, scarce information of its behaviour throughout real industrial processes is available. Kinetic parameters estimated under isothermal conditions are commonly used to design time-varying temperature processes without validation.

The objective of this work was to study the effect of three different linear temperature histories (from 22 to 65°C, with heating rates of 1.5, 2.0 and 3.0°C/min), on the heat resistance of *L. innocua* in liquid medium (TSBYE). The viability of *Listeria* cells was also analyzed in parsley, applying a heating rate of 2.0°C/min. Parsley samples were artificially contaminated by immersion in a bacterial suspension. They were vacuum-packaged in sealed sterile bags before the heat treatment.

The results of this work clearly demonstrated that, in liquid media, *Listeria* heat resistance under non-isothermal conditions is influenced by the temperature profile used. The lower the heating rate, the higher the thermotolerance accomplished to the microorganism. The bacteria heat resistance was much lower in broth than in the food product. It was also noted that no bacterial inactivation occurred during the heating up periods, until the temperature reached approximately 40°C (if parsley was used) and 55 to 60°C (if broth was used).

This work highlights the importance of studying the influence of dynamic conditions on microorganisms thermal resistance, since the heating up phases may significantly contribute to an increase in cells thermotolerance.

**Keywords** *L. innocua*; Dynamic thermal inactivation; Parsley

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