EFFECT OF TEMPERATURE, PH AND TYPE OF ACID ON THE INACTIVATION OF *LISTERIA INNOCUA*

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Background

Thermal resistance of bacteria is a result of a number of stressing environmental factors. Combined effects of temperature and pH have been proven to affect the survival of microorganisms. Nevertheless, studies on the type of acid used and the influence of all effects on inactivation behaviour are not well exploited. Heat resistance of bacteria should not be merely evaluated on the basis of maximum inactivation rates, but also on the lag and/or tailing phenomena observed, thus contributing to the design and control of efficient inactivation processes.

This work aims at studying the main effects and interactions of temperature, pH and type of acid on the inactivation of *Listeria innocua*.

Methods

L. innocua NCTC 10528 were heated in liquid medium (TSB + 0.6% YE) at different pH levels in an agitated water bath. Samples were taken at given times and placed in a mixture of ice-water until they were serially diluted and plated in duplicate onto TSA + 0.6% YE (incubation at 30ºC for 5 days).

D-values were estimated from the log-linear part of the inactivation curves. When observed, the lag time was also evaluated.

Experiments were carried out according to a 2^3 factorial design (two replicates) in order to assess the effect of temperature (52.5 – 65.0 ºC), pH (4.5 – 6.0) and type of acid (acetic or lactic) on the lag time and on the heat resistance of the bacteria, expressed by D-values (ANOVA procedure).

Results

Results showed that the shape of the inactivation curves greatly depended on the factors used. At the lowest temperature and highest pH, the curves exhibited a lag region, while the tailing phenomenon was observed in all conditions tested.

It was statistically proven that temperature had the most significant effect on D-values, followed by pH and pH/temperature combined effects. Besides the influence of these factors, the lag was also affected by the combined effect of pH/type of acid ($p<5\%$). The highest lag times were observed for lactic acid at pH=6.0.

Conclusions

Although temperature has the major effect on *L. innocua* resistance, the interaction of pH/temperature is also significantly important. The type of acid used combined with pH, influenced the lag time of the inactivation curves. These results showed the importance of a global analysis of the environmental factors in the design of appropriate inactivation processes.