



# Study on the growth and enterotoxin production by *Staphylococcus aureus* spiked in canned meat



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## Introduction

Possible contamination by *Staphylococcus aureus* of the production environment and of the meat of a canned meat producing factory was analysed. To determine how much time can elapse between the seaming of the can and the sterilization in autoclave without any risk of enterotoxin production by *S. aureus* and consequently risk of food poisoning for the consumer, the growth and enterotoxin production of an enterotoxin A and E producing strain of *S. aureus* in canned meat before sterilization was investigated at three different temperatures (37, 20 and 10 °C). Two types of meat were used, one with sodium nitrite (20 ppm) and one without.

## Materials and methods

The production flow chart of a canned meat producing factory was analysed. Nine critical points for the contamination of meat by *Staphylococcus aureus* have been identified. From these points, a total of 108 samples were taken. An ATCC strain of *S. aureus* was spiked in canned meat samples with a pH value of 5.83 and an aw value of 0.971.

The concentration of the starting inoculum was 3.85-3.94 cfu g<sup>-1</sup>. The samples were maintained in sterile glass jars individually put in vacuum bags in order to recreate the conditions of the can. At each time the colony count has been evaluated on Baird Parker Agar and the enterotoxin production was detected with an enzyme immunoassay kit.

## Results

*S. aureus* strains were isolated from five out of nine kind of samples, for a total of 13 strains. Six of those strains were isolated from samples of frozen cooked beef at the reception. None of the *S. aureus* strains was enterotoxin producer. In the canned products the spiked bacteria spread throughout the meat and attained high numbers. Enterotoxin production was demonstrated starting from 10 hours of incubation at 37 °C and from 48 hours at 20 °C with a bacterial load approximately between 8 and 9 log cfu g<sup>-1</sup> of meat. The enterotoxin production was not detected at 10 °C even if the bacterial count reach high value after 28 days of incubation. The statistical analysis of the data showed that the difference between the two different types of meat was not significant (*p* value > 0.05).

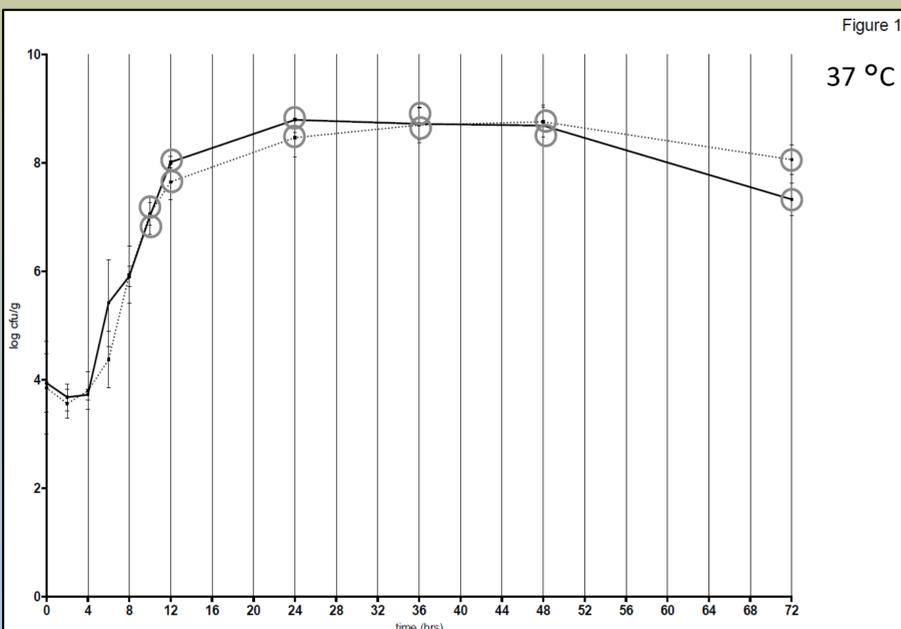


Figure 1

37 °C

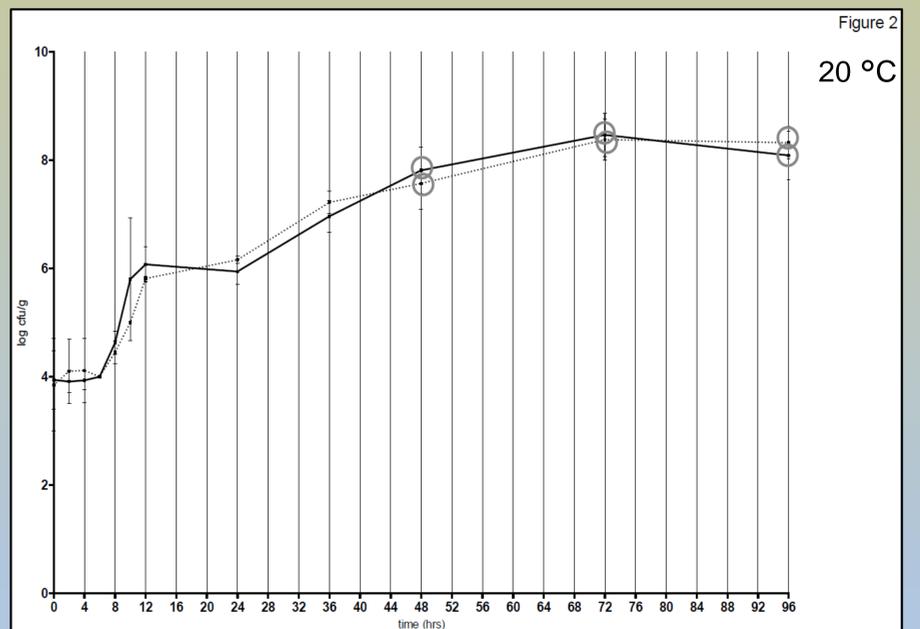


Figure 2

20 °C

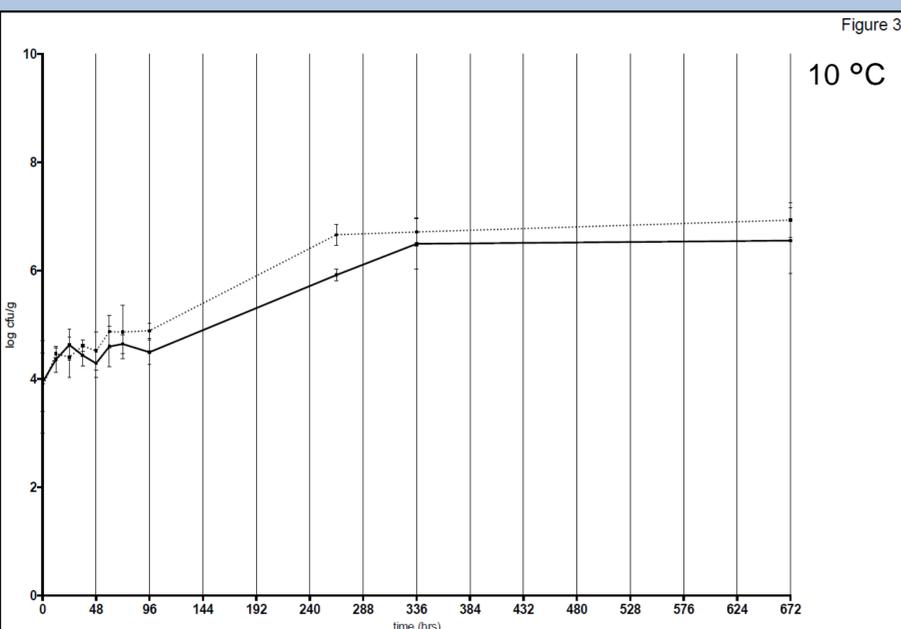


Figure 3

10 °C

Legend. Continuous line: meat with sodium nitrite. Dashed line: meat without sodium nitrite. Circle: enterotoxin production

## Conclusions

Despite the improve of the HACCP system and of the GMP the contamination of canned meat by *S. aureus* is still possible. Our study has demonstrated that a SEA producer's strain of *S. aureus* takes at least 10 hours to produce detectable quantities of toxin at 37 °C and 48 hours at 20 °C under the condition tested, leaving a quite wide range of time for the management of pre-retorting steps after seaming. Considering the fact that in our study SEA was never detected at 10 °C, even if the colony count reached high level, our study has demonstrated once more that the behaviour of *S. aureus* is often different in complex food matrix than in liquid culture broth.