

Possibilities for growth of S.aureus in ground pork, retailpacked in modified atmosphere.

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Introduction

Centralization in the production, distribution and retailing of fresh meat has raised a number of questions regarding the possibility for growth of a number of pathogenic bacteria. One way of solving the question of centralized production has been to distribute and retail ground meat frozen, but another solution has been to pack the fresh meat in modified atmosphere and distribute it chilled. In this way it will be possible to obtain a shelf life of 4 to 7 days. However, when developing this technique it was discovered that extending the shelf life so much could only be achieved if one adhered to a number of strict rules, including hygienic slaughter of the animals, a strict control with the age of the meat to be used for the production, very hygienic processing and packaging, surveillance of the composition of the atmosphere to be used in the packs, and a strict overall temperature control. In Denmark, where retailing of fresh meats in modified atmosphere accounts for up to a third of the total volume in some areas, it is required to maintain a temperature of +2°C throughout production and retailing.

However, under such circumstances the initial total numbers of bacteria in the packs can occasionally be so low that accidental contamination of pathogenic bacteria might be able to grow, even if they normally would be unable to do so because of the antagonistic influence of the saprophylic spoilage flora. Although the temperature requirements are usually adhered to, a recent study (Bøgh-Sørensen, 1980) has shown that storage temperature abuses in the display cabinets do occur. The study referred to also showed that the average total bacterial counts of 11 packages of ground meat packed in modified atmosphere taken at random were c. 5300 per gram. The highest

temperature recorded among these packages was $+7^{\circ}\text{C}$. In the study it was also found that out of 1055 measured temperatures 10 per cent were above $+9^{\circ}\text{C}$ and 5 per cent above $+10^{\circ}\text{C}$.

Further, in unpublished results by the Danish Veterinary Directorate it has been found that *S. aureus* occurs fairly frequently in retail cuts and ground meat packed in modified atmosphere. In the experiments described below it was therefore investigated whether it would be possible for *S. aureus* to grow in ground pork packed and stored in modified atmosphere when one considers that this bacterium has been shown to be able to grow at temperatures as low as $+6.7^{\circ}\text{C}$.

Materials and methods

Bacteriological examinations were made as follows:

Sampling: 40 grams of ground meat was mixed in a Stomacher with 360 ml of diluent containing 0.85% NaCl and 0.1% Bacto peptone.

Determinations: Samples were determined for total bacterial counts on Plate Count Agar, for lactic acid bacteria on Rogosa Agar, and for *S. aureus* on Carters and Biard Parkers media. Typical colonies on Biard Parker Agar were also tested for coagulase activity in rabbit plasma. In an attempt to trace the origin of *S. aureus* samples were also cultivated on Blood Agar. After confirmation by microscopy, haemolytic Micrococci were classified according to type of haemolysis, assuming that *S. aureus* showing α -haemolysis are of human and those showing β -haemolysis are of animal origin.

Experimental

It was first attempted to establish the frequency of occurrence of *S. aureus* in ground meat. In a plant a total of 32 samples of mixed veal and pork were taken from the production line on two different days. The following table shows the results thus obtained:

	Total numbers, av. per g	s.d.	<i>S. aureus</i> in % samples
Day 1			
after grinding	1.3×10^3	9.8×10^2	37.5
after portioning	2.5×10^3	7.1×10^2	-

In a third experiment it was finally attempted to show whether it would be possible for inoculated *S. aureus* to grow in ground meat, retail packed in modified atmosphere, provided the packs were stored at a temperature which would permit growth. Freshly ground pork intended for retailing in modified atmosphere was mixed in a large plastic bag with an inoculum of a culture of coagulase positive *S. aureus* to give a final concentration of approximately 1000 *S. aureus* per gram meat. The ground meat was packed in modified atmosphere comprising 80% O₂ and 20% CO₂. Half of the packages were stored at +10°C, the other half at +2°C. The latter is the required temperature for storage of these products in Denmark. The experiment was repeated, since a temperature decrease to +7°C was observed on the fifth day of storage. In the first experiment the packages were stored for 8 days, in the second for 7 days. Figure 1 and 2 show the results of the bacteriological analyses. It can be observed that although the initial numbers of psychrotrophic bacteria are nearly equal to the numbers of *S. aureus*, there is no growth of the latter bacterium during storage.

Concluding remarks

Although it is known

- that coagulase positive *S. aureus*, both from animal and human sources are found fairly frequently in retail packed meats
- that *S. aureus* will grow at temperatures as low as + 6.7°C and will produce toxin at + 10°C
- that temperature abuses do occur during storage of fresh meat cuts and ground meat packed in modified atmosphere.

the results shown here indicate that, probably due to the competing flora *S. aureus* is unable to grow in ground pork, retail packed in modified atmosphere and stored for up to 7 to 8 days at + 10°C.

References

- Bøgh-Sørensen, L., Proc. 26th European Meeting of Meat Research Workers, Colorado Springs, 1980 p.331-334.
Microbial Ecology of Foods, ICMSF ed., Academic Press, London 1980.