



EFFECT OF THERMAL PROCESSING ON CLOSTRIDIUM PERFERINGENS IN SAUSAGE EMULSION

(With 2 Tables)

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SUMMARY

The effect of thermal processing on *Clostridium perferingens* in sausage emulsion was obtained, the maximum internal temperatures of the samples during the smoking process was 72°C. The heat resistant strains of *Cl. perferingens* tolerated heating processing of frankfurters as well as the addition of the maximum legal limits of the curing agents and developed more rapidly in samples stored at 20°C

INTRODUCTION

Sausage is a food that is prepared from comminuted and seasoned meat flavoured with spices with or without addition of nitrites. Sausages are generally classified according to method used for preservation into fresh sausage, dry and semidry sausage, and smoked sausage. Neglected sanitary measures in sausage manufacture may lead to addition of microorganisms from various sources. Heat stable organisms are the most important types from the health point of view.

Food poisoning strains of *Cl. perferingens* are usually present in raw meat and meat products (STRONG *et al.*, 1963 and FOSTER *et al.*, 1977). HALL *et al.* (1965) have isolated a strain of *Cl. perferingens* from fresh meat. HALL *et al.* (1963) reported that there is a great possibility of food poisoning outbreaks due to the presence of strains of *Cl. perferingens* in contaminated sausages prior to cooking. On the other hand, the observations of McCLUNG (1945) and FRUIN (1977) indicated that the cooking temperature is insufficient for the destruction of *Cl. perferingens* spores.

The present work was planned to find out:

- 1) The effect of thermal processing of frankfurter sausage (a representative of cooked and smoked sausage) on food poisoning strain of *Cl. perferingens*.
- 2) Effect of the maximum legal limit of intrate pickling salt (NPS 2%) and sodium chloride (NaCl 2%) used in the curing process on survival and growth of *Cl. perferingens*.

MATERIAL AND METHODS

The experiments of this work were carried out at the Institute of Meat Technology and Hygiene, Munich Univ.

Meat preparations of frankfurter sausage:

The raw materials for the sausage emulsion were obtained from the slaughter house and kept at -17°C. The obtained samples representing 1 Kg. of lean pork and 0.5 Kg. pork fat were ground after addition of 30 g. Sod. nitrate, 4.5 g. Sod. phosphate, 0.75 g. Ascorbate, 6.0 g. Dextrose and 8.0 g. Spices. Similar batch was prepared by adding 30 g. Sod. chloride instead of nitrate salt.

The emulsion was first tested microbiologically to prove the absence of *Cl. perferingens*. Thereafter, a known strain of *Cl. perferingens* was obtained from the Institute of Meat Technology and Hygiene, Munich University. Cultures from these strains were prepared and mixed with the raw emulsion of frankfurter.

Inoculated emulsion was prepared in a kottler model Dian werk 69050, all components were added to cutter bowl, the mixture was chopped until the temperature of the emulsion was 0°C. After preparation, the frankfurter were cooked in a smoke house for 45 minutes, the maximum internal temperatures of frankfurter sausage recorded by a thermometer inserted into the product was 72°C. The prepared samples were stored at 20°C and at 7°C. Bacteriological examinations were done at 0 time and 1, 2 and 3 days for sausage samples stored at 20°C and 0, 1, 2, 3, 4, 5, 8 and 15 days for sausage samples stored at 7°C.

Detection of Cl.perferingens in frankfurter emulsion:

10 g of the sample were weighed aseptically into a cold sterile waring blender Jar containing 90 ml. sterile peptone water, and the mixture was blended for 1 minute at high speed further dilutions were done.

Estimation of the count of Cl.perferingens was carried out according to ANGELOTTI *et al.* (1962) and THATHER and CLARK (1968) using Sulphite Polymxin-sulphadiazine (SPs) agar (Merk Asit, 10235).

RESULTS AND DISCUSSION

The smoking process was done in the smoke house for 45 minutes with maximum internal temperature 72°C.

The results obtained pointed out that the count of Cl.strain was 4×10^3 /g in raw emulsion cured with nitrate pickling salts and 27×10^2 /g in raw emulsion cured with Sodium chloride (NaCl). Immediately after smoking, the number of Cl.perferingens decreased to 4×10^2 /g and 6×10^2 /g in frankfurter sausage cured with NPS and NaCl, respectively. The data indicated that Cl.perferingens was resistant to the heating processes given to frankfurter, these results agree with the observations of BARNES *et al.* (1963) and HALL *et al.* (1963) who stated that the spores of food poisoning Cl.perferingens were considerably heat resistant and there is a greater possibility of Cl.perferingens food poisoning if meat is contaminated prior to cooking. FRUIN (1977), also reported that cooking temperatures are insufficient for the destruction of Cl.perferingens. Moreover, HALL *et al.* (1965), isolated from 19% market samples of frankfurters and other processed meat, Cl.perferingens.

The counts of Cl.perferingens in the samples stored at 20°C, were ranged from 4×10^2 /g to 25×10^2 /g in frankfurter cured with NPS, while at the other group cured with NaCl the count ranged from 6×10^2 /g to 20×10^4 /g (Table 1).

TABLE (1)

Survival and growth of Cl.perferingens in frankfurter sausage cured with the maximum legal limit of NPS and NaCl and stored at 20°C.

Survival periods in days	Average count of Cl.perferingens hold at 20°C	
	NPs 2%	NaCl 2%
0	4×10^2	6×10^2
1	5×10^2	2×10^3
2	8×10^2	2×10^4
3	25×10^2	20×10^4

In samples stored at 7°C, Cl.perferingens survive the period of storage (15 days) and the count reached from 4×10^2 /g to 4×10^3 /g in group cured with NPS, while in the other group cured with NaCl the count of Cl.perferingens ranged from 6×10^2 /g to 2×10^3 /g (Table 2).

According to the data obtained in Tables (1 and 2), It is evident that the heat-resistant food poisoning strain of Cl.perferingens can tolerate the maximum legal limit of the curing agents used in the curing process of frankfurters. These results agree with the finding of SILLIKER, (1959) and GOUCH *et al.* (1965), who stated that anaerobic Clostridia can survive and grow in the presence of curing salts even at a level above that found in commercial curing operations.

It can be concluded that the heat-resistant strain of Cl.perferingens can survive and grow in frankfurter sausage cured by NPS and NaCl and stored at 20°C and 7°C. These results agree with the observation of SILLIKER (1959), GOUCH *et al.* (1963) and SEGNER *et al.* (1966).

TABLE (2)

Survival and growth of *Cl. perferingens* in frankfurters sausage cured with the maximum legal limit of NPS and NaCl stored at 7°C.

Survival periods in days	Average count of <i>Cl. perferingens</i> held at 20°C.	
	NPS 2%	NaCl 2%
0	4×10^2	6×10^2
1	2×10^4	5×10^2
2	3×10^3	6×10^3
3	1×10^4	3×10^4
4	2×10^2	6×10^3
5	3×10^3	16×10^3
8	3×10^3	6×10^2
15	4×10^3	2×10^3

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