تأثیر حرارة تصنيع خليط السمح على حيوية ومتانة ميكروب الكلوستيريدي ببيرفورماتور

حسن بوسفت

درس تأثیر حرارة تصنيع خليط سمح الغرابيندجي على ميكروب الكلوستيريدي ببيرفورماتور وكانت النتائج أن درجة حرارة التجارب أثّر على حيوية ومتانة السمح. وجدت دراسة أن ميكروب الكلوستيريدي يمكن تحمله السمح المستخدم في تغليف السمح العنبة.

وقد وجد أن ميكروب الكلوستيريدي يمكن تحمله السمح المستخدم في تغليف السمح (27) ووجدت دراسة الأملاح المستخدمة في تغليف السمح (27) ووجدت دراسة ما بعد المعالجة بنسمات مجموعات السمح المصطنع في درجة حرارة 27م من تلك المجموعات المصنعة في درجة حرارة 27م.
EFFECT OF THERMAL PROCESSING ON CLOSTRIDIUM PERFRINGENS IN SAUSAGE EMULSION

(With 2 Tables)

By

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SUMMARY

The effect of thermal processing on Clostridium perfringens 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. perfringens 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 nitrates. 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. perfringens are usually present in raw meat and meat products (STONG et al., 1963 and FOSTER et al., 1977). HALL et al. (1965) have isolated a strain of Cl. perfringens 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. perfringens in contaminated sausages prior to cooking. On the other hand, the observations of McCUN (1945) and FRUN (1977) indicated that the cooking temperature is insufficient for the destruction of Cl. perfringens 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. perfringens.
2) Effect of the maximum legal limit of nitrate pickling salt (NaCl 2%) and sodium chloride (NaCl 2%) used in the curing process on survival and growth of Cl. perfringens.

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. Soda nitrate, 4.5 g. Soda phosphate, 0.75 g. Ascorbate, 6.0 g. Dextrose and 8.0 g. Spices. Similar batch was prepared by adding 30 g. Soda chloride instead of nitrate salt.

The emulsion was first tested microbiologically to prove the absence of Cl. perfringens. Thereafter, a known strain of Cl. perfringens 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 kottor model Dian wark 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, 6 and 15 days for sausage samples stored at 7°C.

Detection of C. perfringens 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 C. perfringens was carried out according to ANGELOTTI et al. (1962) and THATHER and CLARK (1968) using Sulphite Polymin sulphadiazine (SPS) agar (Merk Asit, 16325).

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

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

**TABLE 1**

<table>
<thead>
<tr>
<th>Survival periods in days</th>
<th>Average count of C. perfringens hold at 20°C</th>
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<tr>
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<td>NPS $2\times$</td>
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<tr>
<td>0</td>
<td>$4 \times 10^2$</td>
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<tr>
<td>1</td>
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</tr>
<tr>
<td>2</td>
<td>$8 \times 10^2$</td>
</tr>
<tr>
<td>3</td>
<td>$25 \times 10^2$</td>
</tr>
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</table>

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

According to the data obtained in Tables 1 and 2, it is evident that the heat-resistant food poisoning strain of C. perfringens 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 C. perfringens 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 *Clostridium perfringens* in frankfurters sausage cured with the maximum legal limit of NPS and NaCl stored at 7°C.

<table>
<thead>
<tr>
<th>Survival periods in days</th>
<th>Average count of <em>Clostridium perfringens</em> hold at 20°C.</th>
</tr>
</thead>
<tbody>
<tr>
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<td>NPS 2%</td>
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<td>8</td>
<td>$3 \times 10^3$</td>
</tr>
<tr>
<td>15</td>
<td>$4 \times 10^3$</td>
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</table>

### REFERENCES


