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رؤساء الأقسام : أ.د / على يوسف لطفى ، أ.د / عماد نافع

تأثير حرارة تصنيع اللحم المفرى " الكوفته " على ميكروب السالمونيلا

حسين يوسف ، عبد الخالق التيمماوى

تم حفر أربع محاميع من اللحم المفرى المحتوى على نسبة عالية من الدهن بميكروبات السالمونيلا تيفيموريوم وسالمونيلا سيوبورت
وكررت التحارب مع كل مجموعة ثلاث مرات وقد وجد أن ميكروبات السالمونيلا لم تقتل جميعها عند ما وصلت درجة الحرارة فى
اللحم المفرى لـ ٧٠ م ، بينما لم يمكن عزل هذه الميكروبات عند ما وصلت درجة الحرارة الى أعلى من ٧٠ م . وقد
نت أن نسبة الدهن العالية فى اللحم المفرى لم تحمى ميكروبات السالمونيلا من تأثير حرارة التصنيع .

EFFECT OF THERMAL PROCESSING OF MINCED MEAT "KOFTA" ON SALMONELLAE

(With 4 Figures)

By

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SUMMARY

Four groups of raw minced meat with high fat content were artificially inoculated with *Salmonella typhimurium* and *Salmonella newport*. Experiments with each group were repeated three times. Thermal processing of minced meat up to 70°C does not lead to complete destruction of *Salmonellae*. *Salmonellae* were completely destroyed when minced meat heated internally to much higher than 70°C. The fat content of the samples proved to have no protective effect for *Salmonellae* throughout the heating process given to minced meat.

LITERATURE

Presence of *Salmonellae* are recorded in raw meats (WILSON *et al.*, 1961). In Egypt, the level of contamination of slaughtered carcasses with *Salmonellae* reaching 8.4% result in human infection due to their survival during inadequate cooking (FLOYD *et al.*, 1953). Cooking does not always provide complete protection as has been shown in several outbreaks of food poisoning (NEVOT, 1949). It has been pointed out that the penetration of heat into meat is slow and that the interior often may not reach sterilization temperature (JONES *et al.*, 1948). This fact is of particular importance in Egypt, since some of meat dishes are not thoroughly cooked and outbreaks of food poisoning to meat are not uncommon (SANDIFORD 1943, EL-DIN *et al.*, 1948 and AHMED 1980).

SADEK *et al.* (1962), in an investigation on samples of raw "Kofta" minced meat, collected from old districts of Cairo, isolated a strain of *S. dublin* from 2% of the samples examined.

EL-AGROUDI *et al.* (1963), recorded that the incidence of *Salmonellae* in raw "Kofta" were 7.5%. The isolated strains were *S. typhimurium*, *S. newport* and *S. paratyphi var odense*.

SADEK (1965), isolated a strains of *S. chester* from one sample of marked grilled minced meat "Kofta" (1.33%).

This work was planned to study the effect of thermal processing (Time-temperature) of minced meat "Kofta" on *Salmonellae*.

MATERIAL and METHODS

Lean meat and fat were obtained from butcher shops and were minced and mixed with onion, spices and greens. Fat content was nearly 30%.

A strain of *S. typhimurium* was obtained from the Department of Poultry, Faculty of Veterinary Medicine, Assiut University, while a strain of *S. newport* was obtained from the stock culture of the Institute of Meat Technology and Hygiene of Munich University.

Raw minced meat were mixed thoroughly and artificially inoculated with an appropriate number of *Salmonellae* suspended in nutrient broth. The mixed mass is then turned into finger like cones "Kofta" and then grilled over charcoal for 10 minutes. The maximum internal temperatures of minced meat were recorded at interval period 0, 2, 4, 6, 8 and 10 minutes by a thermometer inserted into the product. The samples were examined at the fore mentioned periods during the grilling process, Viable count of *salmonellae* were carried out on Brilliant green agar. Suspected colonies were subjected to serological examination.

RESULTS and DISCUSSION

Minced meat may play an important role in transmitting *Salmonellae* especially if such raw meat is prepared and handled under sanitation. *S. typhimurium* is the most frequent cause of *Salmonella* type of food poisoning in

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man and its importance to detect the lethal effect of combined time and temperature on *S. typhimurium* destruction due to minced meat processing, because of this importance, the bacteriology of the process was studied in details. The experiments were done using two different concentrations Log 9.9 and Log 6.1, each concentration repeated three times.

Figures 1a + 2a, shows within 10 minutes the variation in the temperatures response of minced meat processing during three experiments (from I to III). The causes of differences attributed to the external conditions of temperatures, humidity ... etc. which could not be controlled under our experimental conditions.

Figure 1b gives survivors curves for *S. typhimurium* in minced meat heated to temperatures Fig. 1a. The decrease of log cycles in number of *S. typhimurium* were 7 and 7.2 in experiments I and III, respectively. Results obtained at Fig. 2b, the decrease of log cycles in number of *S. typhimurium* were 3.2 and 4.3 in experiments I and III respectively, while in experiments III Fig. 1b and 2b, *S. typhimurium* was completely destroyed and the survivors curve reached to 0.

Variation in time required to reach various internal temperatures was observed. PALUMBO *et al.*, (1974) stated that the lethal temperature of Salmonellae was 68.3°C, and no viable salmonellae were detected in products heated more slowly to 65.6°C, on the other hand, Salmonellae were detected in the product heated fastly to 68.3°C, moreover, his results indicated that, incomplete destruction of Salmonellae occurred if the sausage took short time (4 minutes) during the smoking process to reach 68.3°C, while complete destruction of Salmonellae occurred if the product took long time (35 minutes) to reach the lethal temperature. In the present work, high log cycles Killing of Salmonellae were occurred during the normal processing of minced meat. Incomplete destruction of *S. typhimurium* explained by the heating curves. After 8 minutes of thermal processing (Fig. 1a), the internal product temperature were 69°C in experiment I and 70°C in experiment II. The results proved that incomplete destruction of Salmonellae due to the internal product temperature reached to the thermal point within short time. In Fig. 2b, the survivors curves of the first two experiments decreased nearly at the same pattern of Fig. 1b, incomplete destruction of *S. typhimurium* occurred and the rise of internal product temperature go to the thermal point within short time, in experiment I the temperature raised to the thermal point within two minutes, while in experiment II, the rise of temperature to thermal point took four minutes, this explain why the decrease of log cycles is more in experiment II than I. Our results were supported by the observations of SANDIFORD 1943, EL-DIN *et al.* 1948 and PALUMBO *et al.* 1974 that insufficient heat steps of the product as well as short time elapse to rise the temperature thermal point give the chance for incomplete destruction of Salmonellae.

Complete destruction of *S. typhimurium* occurred in experiments III, attributed that the internal temperature of minced meat raised too much higher than the thermal temperature and reached 75°C (Fig. 1a) and 83°C (Fig. 2a).

Raw minced meat used in this work contained 30% fat. The results pointed that fat content had no role of protection for *S. typhimurium* from thermal destruction, the observation agree with the findings of BAYNE (1966) and SMITH *et al.*, (1976).

As EL-AGROUDI *et al.*, (1963), registered *S. newport* in raw minced meat, experiments with *S. newport* were carried out in the same pattern of *S. typhimurium*, using two different concentrations Log 9.2 and Log 5.6. Similar findings were obtained Figures 3 and 4.

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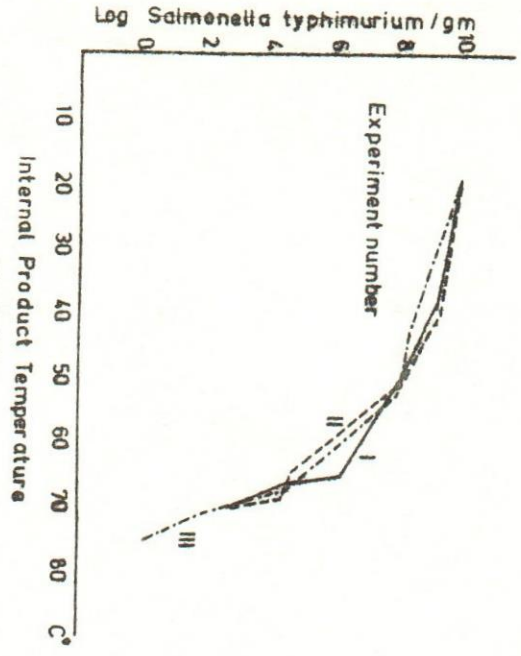
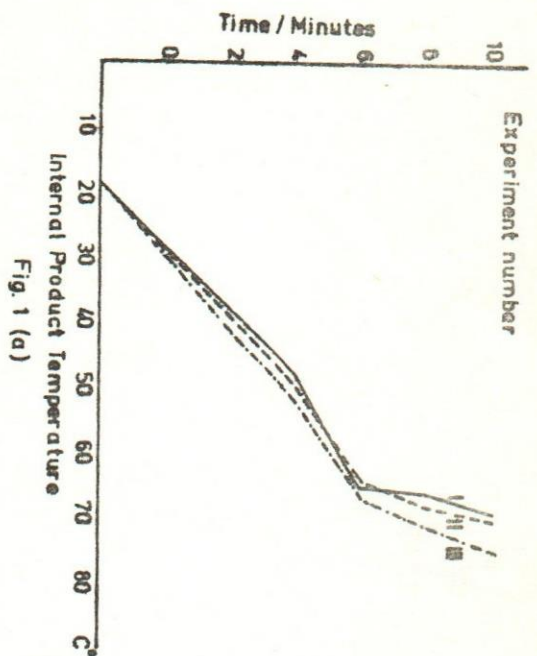
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THE HISTORY OF THE UNITED STATES

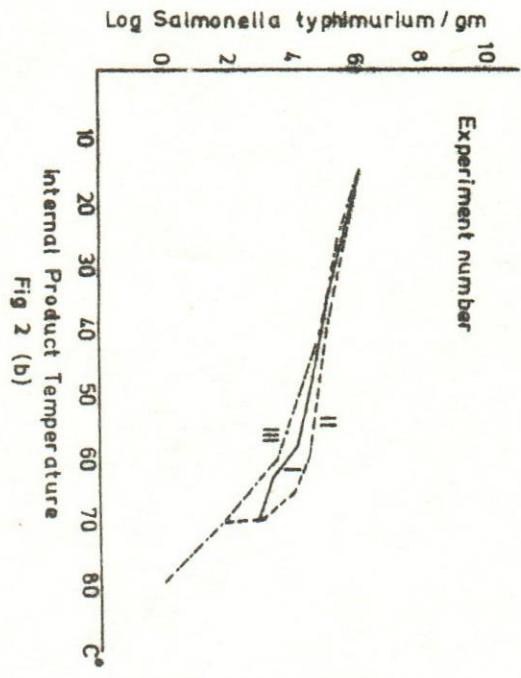
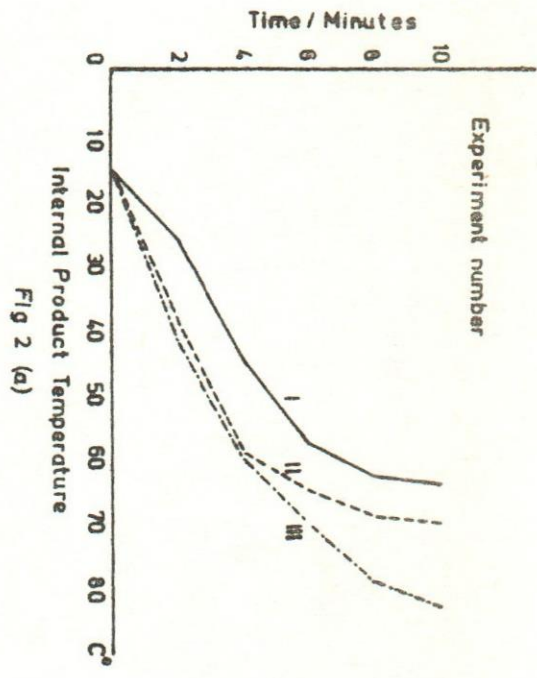
The history of the United States is a story of growth and change. It begins with the first settlers who came to the continent in search of a better life. They found a land of opportunity, but also a land of conflict. The struggle for independence was a long and hard one, but in the end, the people of the United States won their freedom. The new nation was born, and it grew and grew. It became a land of opportunity for all, a land where anyone could make their fortune. The United States became a world power, and its influence spread across the globe. Today, the United States is a land of freedom and opportunity, a land where anyone can make their fortune.



Influence of processing on the number of viable *S. typhimurium* in minced meat experimentally inoculated with starter count $10^{9.9}$.

a) Diagram illustrating the internal product temperature versus time for three different experiments.

b) Diagram illustrating log viable *S. typhimurium* per gram versus temperature for the three experiments.



Influence of processing on the number of viable *S. typhimurium* in minced meat experimentally inoculated with starter count $10^{6.1}$.

a) Diagram illustrating the internal product temperature versus time for three different experiments.

b) Diagram illustrating log viable *S. typhimurium* per gram versus temperature for the same three experiments.



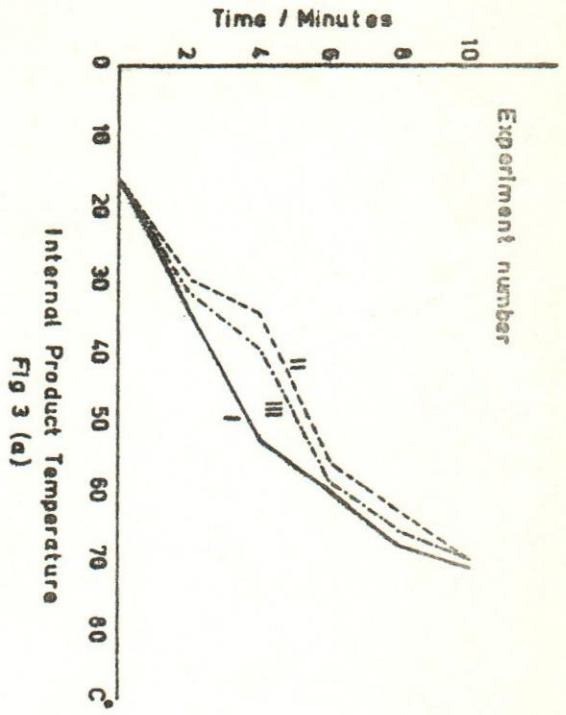


Fig 3 (a)

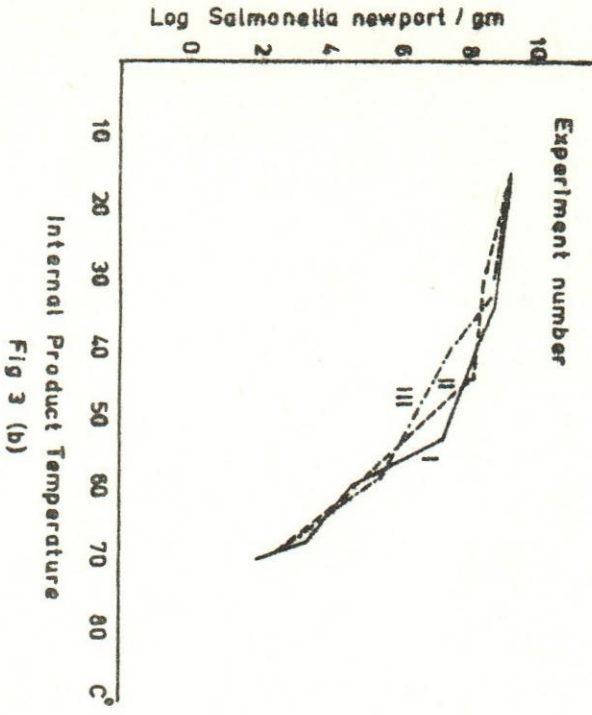


Fig 3 (b)

Influence of processing on the number of viable *S. newport* in minced meat experimentally inoculated with starter count $10^{9.2}$.

a) Diagram illustrating the internal product temperature versus time for three different experiments.

b) Diagram illustrating log viable *S. newport* per gram versus temperature for the same three experiments.

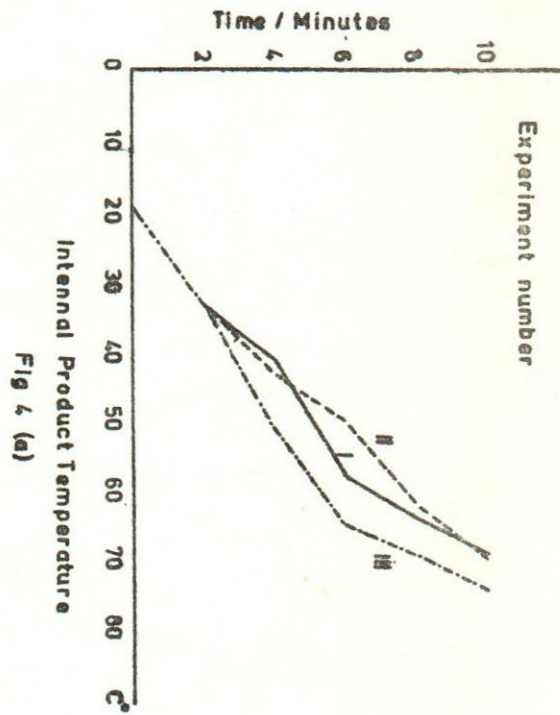


Fig 4 (a)

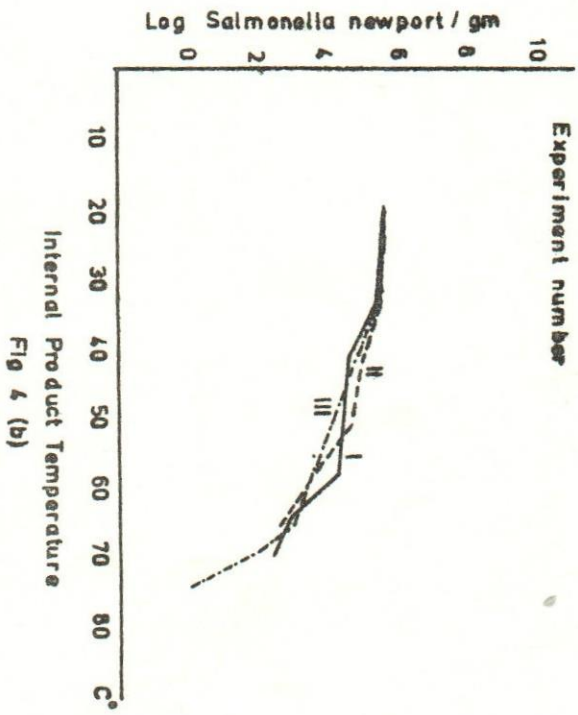


Fig 4 (b)

Influence of processing on the number of viable *S. newport* in minced meat experimentally inoculated with starter count $10^{5.6}$.

a) Diagram illustrating the internal product temperature versus time for three different experiments.

b) Diagram illustrating log viable *S. newport* per gram versus temperature for the same three experiments.

