BACTERIOLOGICAL EVALUTION OF GRILLED DEBONED CHICKEN

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Summary

In total, 100 samples divided into skin and muscle of ready-to-eat, grilled, deboned poultry meat (GDPM) were aseptically collected from various fast-food restaurants in Assiut City, Egypt. The microbiology of 40 samples of skin, 32 samples of breast meat and 28 samples of leg meat was determined. Tests undertaken included standard plate count (SPC), counts for *streptococcus faecalis*, *Enterobacteriaceae, Bacillus cereus*, coliform, *Escherichia coli* presumptive *Staphylococcus aureus* coagulase positive, *Clostridium perfringens* and tests for the presence of *Salmonellae*. SPC ranged from 4.0 $\log_{10}$ cfu/g in breast meat to 7.3 $\log_{10}$ cfu/g in skin. Skin samples consistently had the highest level of microbial contamination. The average counts for the total samples were 3.4, 2.3 and 2.3 $\log_{10}$ cfu/g for *Strept. faecalis*, *Enterobacteriaceae*, and *Bacillus cereus* respectively. The coliform count ranged from 3 to >1100 organisms/g in 95 samples, while the *E. coli* most probable number (MPN) count ranged from 3 to 100 organisms/g. *Salmonellae* was not found in any of GDPM samples analyzed. The results of this study indicated that food-borne pathogens i.e, *Staph. aureus* coagulase positive, *Clostridium perfringens* and *E. coli*, in GDPM constitute a potential public health hazard.

Introduction

Nowadays, fast food is becoming more and more popular. One of the most important types of fast, ready-to-eat meat in Egypt is grilled deboned poultry meat (GDPM). GDPM is often contaminated with different types of microorganisms. Singh and Yadava (1992) concluded that cooked products may be subjected to a great amount of handling during processing which increases the chance of recontamination with spoilage and pathogenic organisms. Even though strict hygienic conditions are maintained in the production, storage and distribution of ready-to-eat meat and meat products in developed countries, the U.S. Public Health Service has reported that two-thirds of all reported food poisoning results from meals served in restaurants (Ronsivalli and Vieira, 1992). Very little information is available in the literature on the microbiology of ready-to-eat GDPM in Egypt. In a previous study, El-Khateib et al. (1988), reported some of the food poisoning hazards of some poultry products. The presence of some food-poisoning bacteria after thermal treatment indicated insufficient cooking and neglected hygienic measures during handling. This stuty was designed to determine the relative level of bacterial contamination that exists in the ready-to-eat deboned poultry meat being consumed in a large scale of City of Assiut establishments.

Materials and Methods

Samples of ready-to-eat GDPM (40 samples of skin, 32 samples of breast meat and 28 samples of leg meat) were collected from four local restaurants in Assiut City, Egypt. Each sample weigh 200 g. The samples were taken to the laboratory in an ice chest and analyzed within 24 h.

Microbiological Analysis

A variety of microbiological analyses were performed (Bally and Scot, 1978): standard plate count (SPC), as well as counts of *Streptococcus faecalis*, *Enterobacteriaceae, Bacillus cereus*, coliform, *Escherichia coli*, and tests for the presence of the *Staphylococcus aureus* coagulase positive, *Clostridium perfringens* and *Salmonella (*Corry et al 1982). Eleven grams of thoroughly mixed samples were blended in 99 ml of 0.1% sterile peptone water. Serial dilutions were prepared from the original dilution (1:10) by transferring 1 ml to each of a series of sterile test tubes containing 9 ml of 0.1% sterile peptone water.

Results and Discussion

The total samples of ready-to-eat GDPM tested yielded a range of microbial contamination. The mean counts ($\log_{10}$ cfu/g) for aerobic plate count (APC), *Strept. faecalis*, *Enterobacteriaceae, and B. cereus*, for the skin were 6.6, 5.3, 2.6 and 3.0 respectively. While in case of breast and legs samples, the main counts were ; 5.8, 3.9, 2.0 and 2.0 and 4.6, 3.0, 2.0 and 2.0, respectively . All of the GDPM samples were found to be contaminated with bacteria above acceptable levels (Warburton et al., 1988).

The minimum *Enterobacteriaceae* count for the examined samples was 2.0 $\log_{10}$ cfu/g, while the maximum count was present in the skin samples (2.9 $\log_{10}$ cfu/g). The presence of *Enterobacteriaceae* may be attributed to insanitary handling conditions, contamination of the raw products with the excreta of the intestines, and inadequate heat treatment. *B. cereus* was isolated in all samples tested. The presence of *B. cereus* is reason for concern because of its role in food poisoning outbreaks (Davey, 1985). The presence of *B. cereus* in GDPM may be attributed to the fact that GDPM is frequently highly seasoned with spices which often contain large numbers of *B. cereus* (Roberts, 1982; Pafumi, 1986). *B. cereus* ranked as the most common cause of food poisoning in New South Wales during the period 1977 to 1984 (Davey, 1985). More than 10^5 cfu/g contamination by *B. cereus* is indicative of active growth and multiplication in food (Corry et al., 1982). It is apparent from the results of this study that while all the GDPM samples examined contained *Bacillus cereus*, the maximum level of contamination ($1X10^3$ cfu/g) was not sufficient to be a public health hazard. Spores can survive some cooking temperatures and warm storage of food allows spore germination and growth of the organisms to large enough numbers to produce toxin.

Out of 100 samples GDPM, coliform bacteria were detected in 95. The count ranged from 3 to >1100 microorganisms/g. *Escherichia coli* was enumerated in 68 samples. The count ranged from 3 to 100 microorganisms/g. The coliform level and in particular that of *E. coli*, reflects the degree of contamination during the cooking process. *E. coli* can be found in soil and water, on plants, in the intestinal tracts of animals, and in various foods, especially animal products and foods handled by people. Since the cells are heat sensitive, their presence in heat-pasteurized or cooked products indicates recontamination after heating.

The incidence of examined pathogens in ready-to-eat GDPM are *Staph. aureus* and *Clostridium perfringens* were recovered at rates of 42.5% and 32.5%from skin respectively. The same pathogens were recovered from breast meat at rates of 43.48% and 18.75 respectively. In leg meat, the incidence percentage of *Staph. aureus* was 14.29%, while that of the *Clostridium perfringens* was 17.86%. Ready-to-eat GDPM can be contaminated with *Staph. aureus* from many sources: cross-contamination from raw poultry products, contamination during processing,

packaging and from workers (Gibbs et al., 1978). *Clostridium perfringens* was present in 24% of the total samples. *Clostridium perfringens* gets into meats via contamination by containers, handlers or dust (Jay, 1992). Furthermore, the incidence of *Clostridium perfringens* in cooked meat, may be due to the use of untreated spices. Cooking kills competitive organisms but allows heat-resistant *clostridium* spores to survive. For this reason, untreated spices and contamination during handling after heat processing may contribute more to the presence of *Clostridium perfringens* in the final cooked products than the meat itself.

Salmonellae could not be detected in any of the examined samples. A comparison of the current results with the suggested guidelines for processed deboned poultry products put forth by Warburton et al. (1988, Table 1) suggests that the microbiological quality of GDPM was, in general, very poor.

The results of this preliminary investigation indicate that inadequate processing and poor handling of GDPM in the tropics pose a potential health hazard. From the data obtained it can be concluded that ready-to-eat GDPM harbour the same bacteria and the same pathogens as chilled poultry, and thus present the same problems of cross-contamination after they are thawed or exposed for sale. Therefore, it is suggested that great care be taken in service to prevent the aof microorganisms or filth to food after it has been cooked or otherwise prepared. It is also suggested that the quality certification agencies ensure that ready-to-eat GDPM is retailed in sterile containers and bags, and that studies be undertaken regarding the the sources, levels and types of contamination and to ascertain minimum tolerable counts under ideal practical processing and production conditions so that a grading scale can be formulated for improvement.

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Table 1. Suggested Guidelines for Processed Deboned Poultry Products (Source: Warburton et al., 1988)

Test/Condition	No.	+ve sample	Minimum Count	Maximum Count
APC (Heated prior to Serving)	5	3	10^4	10^5
APC (Cooked prior to Serving)	5	3	10^6	10^7
APC (Boiled prior to Serving)	5	3	10^5	10^6
Staphylococcus aureus	5	1	10^2	10^4
Escherichia coli	5	2	10	10^2

No *Salmonellae, Yersinae or Campylobacter*