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THE IMPACT OF PRESSURE COOKING ON *SALMONELLA SPP* ISOLATED FROM CHICKEN MEAT IN BAGHDAD

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ABSTRACT
Throughout the period December until November (2017), twenty five chicken meat samples were collected indiscriminately at weekly intervals from diverse markets and butcher retailers in Baghdad province during which they processed and analyzed by diverse food microbiological procedures to identify the *Aerobic plate counts* , *enterobacteriaceae and Salmonella Spp.* from chicken meat samples before and after pressure cooking. The Results Presented that the prevalence rate of *Aerobic plates count* (APC) and *enterbacteriaceae in chicken meat* samples was 100% with the mean value 7.454, 5.714 respectively. whereas *salmonella spp.* was noticed in 80% with mean value 3.280 also there was a significant difference between chicken meat samples before and after pressure cooking at $P<0.05$ in relevance to Aerobic plate counts APC, *enterobacteriaceae ENT* and *Salmonella Spp.* The reduction was from (7.454 to 4.085 for APC) and (5.714 to 3.059 for ENT) and (3.280 to 2.683) for *salmonella spp.*

KEYWORDS: chicken meat, *enterobacteriaceae, Salmonella Spp.,* pressure cooking.

INTRODUCTION

Infection triggered by *Salmonella* is titled salmonellosis. It is one amongst the foremost public and widely distributed food-borne diseases, organizing a serious public health burden and imposing significant costs in several countries (Luber, 2009). Human food-borne pathogen illness cases are reportable worldwide each year and annually there are thousands of deaths. Additional to prominent strains, new *Salmonella* strains are developing that are more resistant to common antimicrobial medication. Physicians and microbiologists, as well as food manufacturers and also the food industry, should be significantly alert to that and take their share in controlling communicable diseases. The numbers of relevant strains in food animals should be reduced and also the hazard of infection by resistant *Salmonella* at all phases within the food production chain should be dropped (WHO, 2005b). Unfortunately, *Salmonella* are ready to contaminate all stages of food production. The infective dose of salmonellosis is enormously variable. Ingesting food contaminated with about 10^5 to 10^6 cells per gram of food causes an illness (Fehlhaber *et al*., 1992). However, it depends upon the health status, age and immune system of the person. The YOPIS group (Young, Old, Pregnant, Immuno compromised Segments of the public) has the highest risk of gaining sick from food-borne diseases. Infants compose one constituent of the YOPIS group that is simply infected by *Salmonella* (Mahajan *et al*., 2003). Hygienic standard approaches are totally inserted in food chains including measures of animal husbandry, slaughtering and in processing plants, but *Salmonella* still are establish in finish products like poultry and meat. Poultry meat remains a very vital source of human infection with pathogenic microorganisms. It will simply be contaminated with microorganisms because it's actual appropriate for microorganism proliferation. Poultry Meat has high water activity, is high in nutrients and readily utilizable low molecular weight substances and is a source of carbon and energy by means that of glucose, lactic acid, amino acids, creatines, metal and soluble phosphorus (Jayasena *et al*., 2013; Hinton, 2000). One methodology to control the extent of those pathogens to the human population is to decontaminate the final product. Therefore, decontamination technologies are widespread useful within the operation of meat and poultry slaughtering and processing plants under principles of GMP (good manufacturing practice) and also the hazard analysis critical control point (HACCP) system. Ultimate decontamination shouldn't leave any deposits which will be destructive to the health of the consumer. Besides, the treatment shouldn't adversely have an influence on taste, color, nutrition properties and look of the carcasses or meat. Decontamination approaches moreover should be little cost, fitting to usage and not detrimental to workers and besides the environment (Hinton and Corry, 1999). Synergistic or additive effects are attained when combinations of two or more decontamination systems are employed in sequence Together, such an attitude is entitled as a multiple hurdles system. The more initial contamination, the bigger decontaminating effect of multiple hurdles technologies (Leistner, 1995). The studies confirmed effectiveness of the multiple hurdles systems by establishing substantial diminutions in bacterial counts and incidence of Salmonella on carcasses was reduced excellently (Bacon *et al*., 2000). The combination of a heating stage and pressure is centered to sterilize meat and meat products and certify greater meat safety, freshness and nutritionary quality, whereas prolonging shelf life. Pressure cooking is a multiple hurdles technology which usage heat with pressure process, it's a preservation technology that's free from chemical additives, and excludes infective and spoilage microorganisms (Garriga

et al., 2004; Davey and Smith, 1989). The proficiency of this process to eradicate microorganisms regardless of the geometry of the product and without the employment of preservatives or additives (Zhang and Mittal, 2008), generate this technology accepted as harmless and customer friendly (Rastogi *et al*., 2007). Therefore, this work aims to check the effect of pressure cooking on *Salmonella spp.* Isolated from chicken meat in Baghdad.

MATERIALS & METHODS

Collection and preparation of samples

Twenty five of frozen chicken meat samples were wrapped in sterile polyethylene baggage in a thermo cool container packed with ice and transported to the laboratory directly after collection and preserved frozen till analysis. Thawing of samples occurred throughout overnight incubation in refrigerator (Roberts *et al*., 2003). As soon as thawing, every samples were distributed into 2 groups, first group were directly used for microbiological analysis, The second group were placed in a glass beaker lined with aluminum foil and cooked in a domestic pressure cooker at 121ºC at 15 lb pressure for 10 min then, the samples were drawn hygienically for the analysis of microbiological quality of the product.

Aerobic plate count (APC) and Enterobacteriaceae counts (ENT)

Twenty five g of test sample (chicken meat) was weighed and homogenized during a stomacher machine for two minutes. A gram of the sample was weighed out and homogenized in 9mls buffered peptone water to present a dilution of 1:10. A six-fold serial dilution was then complete. 0.1 ml of dilutions for every sample was severally plated on plate count agar (PCA) for aerobic plate count determination and on MacConkey agar (MCA) for Enterobacteriaceae (enteric bacteria) counts. The PCA and MCA were each incubated overnight (18–24 hours) at 37°C (WHO., 2010; Hitching *et al*., 1995). Distinct colonies on PCA and MCA were counted employing a digital colony counting chamber and recorded in colony forming units per gram (cfu/g) of meat sampled.

Isolation and identification of salmonella

Twenty-five grams of every sample were put into a stomacher bag containing 225 mL buffered peptone water and homogenized employing a stomacher incubated at 37 °C for 24 to 48 h. One mL was transferred to 10 mL selenite cystine broth and incubated for 24 h at 37 °C. Plating carried on Brilliant Green (BG) agar and XLD agar and incubated at 37 °C for 24 h. The plates inspected for representative colonies of *salmonella* on BGA (colorless or pink or opaque-white colonies generally surrounded by pink or red zone) and XLD agar (red with or while not black center) were picked and streaked additional on BSA (bismuth sulfite agar) for purification. The pure cultures were streaked on Triple Sugar Iron (TSI) agar and incubated at 37ºC for 18 h. Those producing typical reaction on TSI (red slant and yellow butt with H2S production-blackening of agar) (Andrews and Hammack, 2001) colonies were examined by latex agglutination. Colonies giving a precipitation reaction were confirmed as *Salmonella Spp.* positive.

RESULTS & DISCUSSION

In the current survey, The results of the microbiological analysis (Total bacterial counts – TBC ,*Enterobacteriaceae* and *salmonella spp* count) from frozen chicken meat samples designated in Table 1:

TABLE 1: The mean log^{10} count of Aerobic plate counts, *enterobacteriaceae* and *Salmonella Spp.* from chicken meat samples in Baghdad

Bacterial Spp	No. of samples	Isolation %	Mean log_{10} count cfu\g^{-1} ±SE
Aerobic plate count	25	(25)100%	7.454±0.16
Enterobacteriaceae	25	(25)100%	5.714±0.11
Salmonella spp	25	(20)80%	3.280±0.82

SE: Standard Error

TABLE 2: The effect of pressure cooking on the mean log^{10} count of *Aerobic plate counts, enterobacteriaceae and Salmonella Spp.* from chicken meat samples in Baghdad

Meat Samples	Mean log_{10} count cfu\g^{-1}of chicken meat samples before cooking	Mean log_{10} count cfu\g^{-1}of chicken meat samples after cooking ±SE
Total Bacterial count	7.454±0.16 a	4.085±0.05 b
Enterobacteriaceae	5.714±0.11 a	3.059±0.01 b
Salmonella spp	3.280±0.82 a	2.683±0.88 b

SE: Standard Error; a,b :indicate there is significant difference for mean log_{10} count at level ($P \leq 0.05$)

The results of the microbiological analysis (Total bacterial counts-TBC, *Enterobacteriaceae* and *salmonella spp.* count) of frozen chicken meat samples before and after pressure cooking are described in Table 2:

The Results gained in Tables (2) exhibited that there was a big difference between chicken meat samples before and after pressure cooking at $P<0.05$ in relevance to *Aerobic plate counts, enterobacteriaceae and Salmonella Spp.* This study is accept as true with diverse other studies like (Koutchma and Marcotte, 2009) indicate that applying the pasteurization with pressure concerns the inactivation of vegetative micro-organisms in such pasteurization processes, the pressure ranges between 200 and 400 MPa and also the temperature doesn't exceed 45ºC, the logarithmic decrease of pathogens is between 5 and 6, altered pathogens are used as indications, for an example, *Salmonella* for eggs, *Listeria monocytogenes* for dairy and meat products, *Escherichia coli* for fruit and vegetable-based products. Moerman and others (2001) who related the heat with pressure induced drop of different microorganisms in fried chicken by an experimental design distinct over 0 to 400 MPa, 20 to 80°C and 1 to 60 min. Escriu and Mor-Mur, (2009) usage 400 MPa, and 20 °C for 2 min that reduced 4.35 to 3.26 log of *Salmonella*

Typhimurium in minced chicken (depending on the composition of meat). Yoste and others (2000) use 500 MPa and 50°C for 10min which reduced Salmonella enteritidis in Poultry sausages. Jofre and others (2009) exhibited that 2 of 2.7 inoculated of *Salmonella enterica* in Fermented sausages and use 400 MPa and 17 °C for 10 min that cause Inactivation of *Salmonella enterica* to <1 log CFU/g. Within the different study the application of a 600-MPa treatment (for 6min at 31°C), the reduction in *S. aureus* counts in meat products spiked at 3.5 log CFU/g was 2.7 log units in cut of beef (Yuste and others 2004). Among the bacterial species, the food poisoning bacteria like *Salmonella spp.* are among the primary sensitive bacteria treated with temperature and pressure (Jofré *et al.*, 2008).

The entire effectiveness of pressure cooking depends on influences like bacteriological kinds, number of treatment cycles, pH, pressure, time interval and temperature (Torres & Velazquez, 2005). The comparison between heat and pressure treatments and heat only procedures revealed that the adding of pressure conditions greatly enriched the destruction mechanics (Ramaswamy et al., 2010). Arise in the treatment temperature is the supreme often strategy used to improve the lethality of pressure treatments. Raised temperatures (45 to 60 °C) afford lower pressures and shorter process times for pathogen inactivation (Tassou and others 2008). The hot temperature with pressure sterilization processes stay competitive compared to the heat sterilization ones, chiefly attributable to the reduction in the duration process (Koutchma and Marcotte 2009). Usually Gram-negative bacteria, moulds and yeast are further sensitive to pressure cooking than Gram-positive bacteria and bacterial spores. (Hogan *et al.*, 2005; Earnshaw R**.,**1995). And cocci are more resistant than rod-shaped bacteria (Smelt, 1998).The temperature and pressure treatment encouragements the variety of inactivation of microbial cells. Some authors exhibited that the pressure resistance of microbial organisms is maximal at temperature 15-30^{o}C and reduce substantially at higher or lower temperature (Cheftel J.C**.,** 1995). Over the last years, the design and safety of pressure equipments available on the market have been largely developed, and this can certainly enable the distribution of this technology to a larger scale (Hernando Saiz et al. 2008).

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