

INCIDENCE OF PRESUMPTIVE SALMONELLA IN POULTRY MEAT PRODUCTS

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ABSTRACT

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A total of 50 poultry meat products samples were collected from shops and supermarkets in Aswan province; 10 samples chicken luncheon; 10 samples chicken burger; 10 samples smoked turkey; 10 samples livers & gizzard and 10 samples sheeshtawook. Samples were investigated for the presence of salmonella by using bacteriological and biochemical tests. It was observed that 10% (1/10) of livers & gizzard and 20% (2/10) of sheeshtawook; 0 % (0/10) of chicken luncheon; 0 % (0/10) of chicken burger; 0 % (0/10) of smoked turkey were positive for salmonella. Salmonella contamination was found in livers & gizzard and in sheeshtawook while chicken luncheon, chicken burger and smoked turkey were free from salmonella. Some poultry meat products especially products which consists of raw meat material such as livers & gizzards or products which not subjected to sufficient cooking considered an important source for salmonella infection. Poultry meat products manufactured in food factories apply good hygiene practices are free from salmonella contamination. Strategies to reduce salmonella levels on raw poultry should be undertaken to improve the safety of poultry products and reduce the incidence of human salmonellosis from poultry consumption.

Keywords: *Salmonella, poultry meat, chicken, products, contamination.*

INTRODUCTION

Salmonella is a gram negative rod, non-lactose fermenter, facultative anaerobic, non-spore forming, mesophilic heterotrophs, produce acid and gas from glucose, belonging to the family Enterobacteriaceae, are classified and identified into serotypes according to the Kauffmann-White scheme 7, which currently contains more than 2000 serotypes (Williams and Wilkins, 1984).

Salmonella is one of the most commonly reported causes of food-borne disease in the Worldwide and show the highest disease burden on the population scale among bacterial food-borne pathogens (Franz *et al.*, 2012; Hanning *et al.*, 2009). Ninety-seven percent of food samples were contaminated with at least one enteric pathogen, salmonella is one of the most commonly isolated pathogen about 84%. Fifty-one percent of children infected with salmonella, infected with the same serotypes isolated from meat samples, suggesting this pathogen is widespread in food and humans (Bodhidatta *et al.*, 2013). In 2007 Austria reported a total of 438 food borne outbreaks, salmonella caused 70% of the bacterial outbreaks and the most implicated food was the poultry meat products (Much *et al.*, 2009). Strong associations were found between contamination of poultry meat

and poultry meat products with salmonella and some factors such as production system, number of birds per flock, feeding system, slaughterhouse, storage condition, retail store type, poultry company, and socioeconomic conditions. Chickens from a non-integrated poultry company were associated with a significantly greater risk of salmonella contamination than chickens from an integrated company (Donado-Godoy *et al.*, 2012).

Strains of Salmonella isolated from poultry products are strongly associated with multi-locus sequence type ST28 and showed antimicrobial multi-resistance profiles, so that poses a health risk to consumers (Toboldt *et al.*, 2012). Pulsed-field gel electrophoresis (PFGE) results confirmed occurrence of similar Salmonella genotypes in both poultry meat products and humans, also, antimicrobial drug resistance profiles suggesting possible transmission of resistance from meat to humans (Oloya *et al.*, 2009). In the last two decades, *Salmonella enterica* serotype Enteritidis has become one of the main agents causing food borne diseases worldwide. This agent is transmitted mainly by contaminated meat and poultry products (88%), suggesting strong relationships between cases of Salmonella related to human illness and Salmonella positive in meat and poultry products (Rios *et al.*, 2009; Chen *et al.*, 2008; Pang *et al.*, 2007).

The same multi-drug resistant *Salmonella infantis* clone was spread from the examined broiler farms contaminating the slaughter and the retail meat and appeared in the human illnesses of the examined region that was earlier detected as the dominant clone characteristic of the broiler and human population of the whole country (Nogrady *et al.*, 2008). Preventive hygienic measures and strategies were suggested to minimize the incidence of Salmonella contamination of broiler chicken and chicken products such as acidification of feed and drinking water with organic acids, immune strategies based on passive and active immunity, modification of diet by changing ingredients and compositions, food additives as antibiotics, prebiotics, probiotics and symbiotic, cooking methods and good hygienic practices during preparation and manufacture (Vandeplas *et al.*, 2010). Treatment of poultry meat products with 1.0% antimicrobials reduced Salmonella to non-detectable levels in stored frozen products (Moschonas *et al.*, 2012).

MATERIALS and METHODS

Collection of samples: 50 poultry meat products samples were collected from retailers and markets in Aswan province. 10 samples were collected from each product; chicken luncheon, chicken burger, smoked turkey, livers & gizzards and sheeshtawook. Samples were collected in sterile polyethylene bags, put in ice tank under low temperature and transported to the laboratory for bacteriological examination.

Preparation of samples: Twenty-five grams meat were taken from each poultry meat product sample in sterile stomacher bag, mixed with 225 ml buffered peptone water (BPW) (Co, Oxoid Limited,

Hampshire, England) and homogenized by using Stomacher® 400 Circulator (Co, Seward Ltd., UK).

Isolation and Identification: The samples mixtures incubated at 37 ± 2 °C for 18± 0.2 hours, 0.1 ml mixture was transferred to 10 ml Rappaport-Vassiliadis (RV) medium, vortexed and incubated for 24 ± 2 h at 42 ± 0.2°C (circulating, thermostatically-controlled, water bath). 3 mm loopful (10 µl) of each incubated tube was streaked on Xylose Lysine Desoxycholate (XLD) agar and incubated for 24 ± 2 h at 35°C. Typical colonies of salmonella were pink colonies with or without black centers. Many cultures of salmonella may produce colonies with large, glossy black centers or may appear as almost completely black colonies. Salmonella isolates were confirmed by biochemical tests as Triple Sugar Iron agar (TSI), Lysine decarboxylase (LIA), Urease, Indole, Methyl red, Voges-Proskauer and Simmons citrate (AOAC, 2000; Ewing, 1986; June *et al.*, 1995; Hammack *et al.*, 1999; June *et al.*, 1999; Hammack *et al.*, 2001).

RESULTS

Results of this study showed that incidence of presumptive salmonella in poultry meat products was 6%. It was observed that 10% (1/10) of livers & gizzard and 20% (2/10) of sheeshtawook; 0% (0/10) of chicken luncheon; 0% (0/10) of chicken burger; 0% (0/10) of smoked turkey were positive for presumptive salmonella. Salmonella contamination was found in livers & gizzard and in sheeshtawook while chicken luncheon, chicken burger and smoked turkey were free from salmonella (Table 1).

Table 1: Incidence of Salmonella in poultry meat products.

Meat Type	No. of Samples	Salmonella			
		Positive		Negative	
		No.	%	No.	%
Chicken luncheon	10	0	0	10	100
Chicken burger	10	0	0	10	100
Smoked turkey	10	0	0	10	100
Livers & gizzards	10	1	10	9	90
Sheeshtawook	10	2	20	8	80
Total	50	3	6	47	94

DISCUSSION

The overall incidence of salmonella in poultry meat products was 6%. Incidence rate of salmonella differs variably in poultry meat products; chicken luncheon, chicken burgers and smoked turkey samples were free from salmonella while 10% of livers & gizzards and 20% of sheeshtawook samples were positive for Salmonella. The results of overall incidence of salmonella in poultry products agreed with some other studies such as Madden *et al.*, 5.1% (Madden *et al.*, 2011), White *et al.*, 4.3% (White *et al.*, 2007), Oscar, 3% (Oscar, 2013) and lower than other results such as Ta *et al.*, 45.9% (Ta *et al.*, 2012), Alali *et al.*, 31.5% (Alali *et al.*, 2012), Fearnley *et al.*, 38.8% (Fearnley *et al.*, 2011), Dione *et al.*, 40.4% (Dione *et al.*, 2009), Vindigni *et al.*, 61% (Vindigni *et al.*, 2007). Our results of salmonella contamination in livers & gizzards and in sheeshtawook were 10 and 20%, respectively, agreed with similar results such as Busani *et al.*, 9.9% (Busani *et al.*, 2005), Raufu *et al.*, 15% (Raufu *et al.*, 2009) and Mikanatha *et al.*, 22% (Mikanatha *et al.*, 2010).

Results showed higher incidence rate of salmonella in livers & gizzards and in sheeshtawook and freedom of chicken luncheon, chicken burgers and smoked turkey, these findings can be attributed to cooking and hygienic measures adopted during production and preparation of these products. Raw or undercooked poultry meat products such as livers & gizzards and raw chicken meat, insufficiently cooked sheeshtawook, nuggets, strips and microwave-cooked products considered as infection vehicles for salmonella and these products may pose an infection risk if the products is improperly cooked (Domingues and Schaffner, 2009; Smith *et al.*, 2008). Freedom of Salmonella in chicken luncheon, chicken burger and smoked turkey could be partly due to heat treatment during manufacture and partly due to the presence of chemical preservatives (Waters *et al.*, 2011; Bennet *et al.*, 1986).

Growth and inactivation of salmonella in poultry meat products are highly influenced by temperature after controlling for other factors (Smadi *et al.*, 2012). Outbreaks of salmonellosis associated with raw, frozen and undercooked chicken products and the infection were 11 times higher in individuals who had consumed frozen processed chicken products (MacDougall *et al.*, 2004). Fresh poultry meat especially edible organs are the dominant sources of the detected salmonella than other samples (Trajkovic-Pavlovic *et al.*, 2007). A significant difference in salmonella occurrence between meat type and sampling month, also, salmonella from raw turkey exhibited higher antimicrobial resistance (53%) compared to those from ready-to-eat products (Khaita *et al.*, 2007).

Overall 80.9% of broiler processing establishments were positive for salmonella and fail to meet the salmonella performance standard (Elben *et al.*, 2006). Application of hygienic approaches and effectiveness of potential interventions during production, slaughtering, manufacturing, preparation and processing of poultry meat products can significantly reducing the number of salmonella positive samples in poultry meat products (Van Der Fels-Klerx *et al.*, 2008).

CONCLUSION

Some poultry meat products especially products which consists of raw meat material such as livers & gizzards or products which not subjected to sufficient cooking are considered an important source for salmonella infection. Poultry meat products manufactured in food factories apply good hygiene practices are free from salmonella contamination. Strategies to reduce salmonella levels on raw poultry should be undertaken to improve the safety of poultry products and reduce the incidence of human salmonellosis from poultry consumption.

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مدى حدوث ميكروب السالمونيلا فى منتجات لحوم الدواجن

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تم جمع 50 عينة من منتجات لحوم الدواجن من المحلات والسوبر فى محافظة أسوان ماركت منها 10 عينات لنشون الفراخ و 10 عينات برجر الفراخ و 10 عينات الرومى المدخن و 10 عينات الكبد والقوانص و 10 عينات الشيش طاووك وتم فحص هذه العينات بكتريولوجيا و كيميائيا لوجود السالمونيلا. أسفرت النتائج عن وجود ميكروب السالمونيلا فى كل من الشيش طاووك بنسبة 20% و فى الكبد والقوانص بنسبة 10% بينما خلّت عينات لنشون الفراخ وبرجر الفراخ و الرومى المدخن من هذا الميكروب. لوحظ من النتائج ارتفاع معدل التلوث بالسالمونيلا فى منتجات لحوم الدواجن النيئة والغير مطهية جيدا والتي لم تتعرض لمعاملات حرارية مثل الكبد والقوانص والشيش طاووك كما لوحظ أن منتجات لحوم الدواجن التي تم معاملتها حراريا أو التي تحتوى على مواد حافظة أو تم تصنيعها فى مصانع أغذية تطبق المعايير الصحية الجيدة خالية من السالمونيلا. يجب وضع الاستراتيجيات المناسبة لتقليل معدل انتشار السالمونيلا فى منتجات لحوم الدواجن النيئة ولتحسين سلامتها وتقليل انتقال العدوى الى الإنسان من خلال استهلاكه لمنتجات لحوم الدواجن.