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An Investigation on Contamination of Poultry by *Salmonella* Species in Zahedan (South-East Iran) During 2004*

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Abstract: In current research project, as the consumption of poultry products in Zahedan (south-east Iran) is exceeding, we intended to examine this important issue by investigating 250 chicken samples. The samples included frozen, freshly slaughtered, raw (uncooked), cooked and canned chicken. Besides, different pieces of chickens were checked up in this study. All samples were cultured in enriched, selective media and after 24 h of incubation at 37°C suspected colonies were recognized by biochemical tests and finally by application of specific anti-sera the isolated species were serotyped as confirmation test. Overall, 28 *Salmonella* strains were isolated (11.2%) that majority belonged to scum swabs of fresh chickens (15 cases) and the least belonged to frozen chickens (3 cases) and no strain was isolated from canned chicken. The serotypes isolated in descending order were *S. enteritidis* (12 strains), *S. paratyphi* (9 strains), *S. typhimurium* (4 strains) and the remaining *Salmonellae* (3 strain). In accordance with isolation of different salmonella species from poultry products excluding canned chicken it seems that examination of other poultry products including: eggs, sausages, salami, sauces and other seasoning stuffs looks mandatory. The latter does help in promotion of hygienic situation of the region besides investigation of other food poisoning pathogens in general and *campylobacter* in particular do look essential.

Key words: *Salmonella*, chicken, poultry, contamination

Introduction

Salmonellae are a diverse group of bacteria which are gram negative bacilli and one of the major causative agents of food poisoning (Morales *et al.*, 2005). The latter correlates mostly by consumption of animals' food stuffs especially hens products and foremost poultry products (Baumler *et al.*, 2000) therefore, producers of such items have to make sure about the safety of their products either in wholesale or unit sell out.

Different serotypes of *Salmonellae* have certain associations with hens and fowls products as meat and eggs (Elson *et al.*, 2005) however; the rate of isolation of this organism differs throughout the world (Meldrum *et al.*, 2004; Chung *et al.*, 2003; Guard-Petter, 2001).

In city of Zahedan, there are several chicken producers that send their products to the market as well as similar foodstuffs are imported from other cities, these chickens are sold in different forms including: live, freshly slaughtered, frozen and canned. Hence, by considering above stated issue plus lower price of chicken in comparison with lamb, beef and larger consumption of chicken and its products by different groups of people, we tried to collect different samples of consumable chicken from different parts of the city and look for *Salmonella* species within them.

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Materials and Methods

In the current study, due to dispersion of shops involved in dealing of chickens and its various products, a total of 250 samples were collected randomly and were subjected to careful examination in Ali-Bin-Abitaleb specialized hospital of Zahedan. As different pieces of chickens including; skin, meat and even content of their digestive system were thoroughly inspected. The prepared swabs from different sections were kept in lactose broth tubes at 37°C for 24 h and later few drops from each tube was transferred to tubes containing tetrathionate and selenite cysteine. After 24 h incubation at 37°C in tetrathionate and 43°C in selenite cysteine tubes, the specimens were sub-cultured in SS, XLD and bismuth sulphate selective agar (Jorgensen *et al.*, 2002). These plates were incubated at 37°C for 24 h and suspected colonies were subjected to biochemical tests as: TSI agar, urease agar and lysine decarboxylase for confirmation (Ohtsuka *et al.*, 2005). In the final step, isolated strains were serotyped by specific anti-sera.

Results and Discussion

Out of 250 collected and examined, 75 samples belonged to fresh, 75 from frozen, 50 cooked and 50 canned chickens, respectively. Totally, 28 strains of *Salmonellae* were isolated (11.2% of whole samples). The largest number of isolation was from fresh chicken (15 cases) and the least belonged to cooked (3 cases) though no strain was seen in canned chickens as shown in Table 1.

Of 28 isolated *Salmonellae* serotypes 28 belonged to *S. enteritidis* (42.8%) whereas 9 strains to *S. paratyphi* (32.1%) and 4 to *S. typhimurium* (14.2) and 3 strains fit in other *Salmonellae* (1.7%), respectively as revealed in Table 2.

The frequency of *Salmonella* species isolation has been documented variously in different studies. In present study 11.2% of the total samples proved positive for *Salmonellae*; although according to two different studies in England 8 and 25% of total samples were found positive for *Salmonellae* (Meldrum *et al.*, 2004; Jorgensen *et al.*, 2002). In similar studies in Canary Island and New Zealand these figures were 16.5 and 16%, respectively (Hernandez *et al.*, 2005; Javadi *et al.*, 2005) and in Korea only 2.2% of samples were found positive for *Salmonellae* (Chung *et al.*, 2003). It is evident that percentage of recovery varies from country to country and this applies even to different regions in a particular country, for instance the latter is quite obvious in case of Iran. In a study in Kerman (south-east of Iran) the percentage of isolation has been reported 5.9% (Ghanbaripour and Pourbakhsh, 2001) while in three consequent studies carried out in Tabriz (north-east of Iran) the figures were 6.3, 6.6 and 16.5% correspondingly (Javadi *et al.*, 2005). Different reasons for this discrepancy have been

Table 1: Frequency of culture according to type of samples

Samples	Culture results		
	Negative	Positive	Total
Fresh chickens	60	15	75
Frozen chickens	65	10	75
Cooked chickens	47	3	50
Canned chickens	50	0	50

Table 2: Frequency of positive culture according to isolated strains of *Salmonellae*

Serotype	Figure	Percentage
<i>S. enteritidis</i>	12	42.8
<i>S. paratyphi</i>	9	32.1
<i>S. typhimurium</i>	4	14.2
Other	3	10.7
Total	28	100.0

stated; one could be variability in husbandry and growing conditions of chickens (Murase *et al.*, 2001). Other workers believe that factors like herd's sensitivity, stress, nutrition and transportation contribute in onset of salmonellosis amongst them (Javadi *et al.*, 2005; Humphrey, 2004). In present study 15 out of 28 of *Salmonellae* isolation were belonged to scum swabs and presence of *Salmonella* in chickens' cloacae specially in case of *S. enteritidis* strains would have been attributed to unusual biology of this bacteria that induces their target to reproductive tracts and naturally production of contaminated eggs (Humphrey, 2004; Guard-Petter, 2001; Baumler *et al.*, 2000; Schutze *et al.*, 1996). Nevertheless, contamination of eggs by different serotypes of *Salmonellae* could be due to presence of these bacteria in reproductive tracts and particularly in cloacae (Movassagh Ghazani, 2006; Elson *et al.*, 2005; Ohtsuka *et al.*, 2005; Arnedo *et al.*, 1998). Hence, it can be concluded that contamination of the other segments of chickens are in consequence of adulteration with content of digestive system, this is why in abattoirs or shops that slaughter chickens, pouring out the viscera can enhance significantly the spread of *Salmonellae* within carcasses (Javadi *et al.*, 2005). In this study too, the largest recovery of *Salmonella*, after scum, came from chickens' skin specially their legs the latter corresponds with findings of other researchers (Hernandez *et al.*, 2005; Jorgensen *et al.*, 2002). One of the reasons for contamination of skins with *Salmonellae* according to Javadi *et al.* (2005) is immersion of chickens in a tank of hot water in order to facilitate the removal of feathers. This action increases the microbial load of water and subsequently attachment of bacteria to skin pores and their contamination (Javadi *et al.*, 2005).

In present study the *S. enteritidis* serotype was mostly isolated from samples in comparison with the rest of serotypes (i.e., 42.8% of total isolation). Although, recovery of *Salmonellae* serotypes in different studies vary substantially (Hernandez *et al.*, 2005; Chung *et al.*, 2003; Jorgensen *et al.*, 2002; Aenedo *et al.*, 1998) but in majority of them isolation of *S. enteritidis* serotype stands first (Hernandez *et al.*, 2005; Chung *et al.*, 2003). Similarly, the largest serotype extracted from eggs too, was *S. enteritidis* in different studies (Elson *et al.*, 2005; Morales *et al.*, 2005; Arnedo *et al.*, 1998).

Conclusions

Nevertheless, in accordance with isolation of different serotypes of *Salmonellae* from chickens, it seems that investigation on other foodstuffs prepared from chicken e.g., sausage and salami or those that contain eggs as an ingredient like sauces, seasoning stuffs, salads and so on... search for *Salmonella* is obligatory. In the other hand, as the bacteria has been extracted even from cooked meat of hens and fowls, more investigation is needed on origin of such contamination since, most of the times these edible items are consumed without thawing. Furthermore, exploration for other bacteria involved in contamination of chickens and eggs as compylobacters and possible infectivity of humans in this region looks terribly essential.

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