An Investigation on Contamination of Poultries 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 collected 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 *Salmonella* (3 stain). 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' foodstuffs especially hens products and foremost poultry products (Baumber 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-Abilehab 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 tetrahydrone and selenite cysteine. After 24 h incubation at 37°C in tetrahydrone 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% (Ghanbarzadeh and Pourbakhshe, 2001) while in three subsequent 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>
<thead>
<tr>
<th>Samples</th>
<th>Culture results</th>
<th>Total</th>
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<tr>
<td>Fresh chickens</td>
<td>60</td>
<td>15</td>
</tr>
<tr>
<td>Frozen chickens</td>
<td>65</td>
<td>10</td>
</tr>
<tr>
<td>Cooked chickens</td>
<td>47</td>
<td>3</td>
</tr>
<tr>
<td>Canned chickens</td>
<td>50</td>
<td>0</td>
</tr>
</tbody>
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Table 2: Frequency of positive culture according to isolated strains of Salmonellae

<table>
<thead>
<tr>
<th>Serotype</th>
<th>Figure</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>S. enteritidis</td>
<td>12</td>
<td>42.8</td>
</tr>
<tr>
<td>S. paratyphi</td>
<td>9</td>
<td>32.1</td>
</tr>
<tr>
<td>S. typhimurium</td>
<td>4</td>
<td>14.2</td>
</tr>
<tr>
<td>Other</td>
<td>3</td>
<td>10.7</td>
</tr>
<tr>
<td>Total</td>
<td>28</td>
<td>100.0</td>
</tr>
</tbody>
</table>
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 swab 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; Schutte 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 swab, 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; Arnedo 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 hares 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 campylobacters and possible infectivity of humans in this region looks terribly essential.

References


