A survey of the Salmonella infection in backyard chickens in Iran
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Salmonellosis is one of the most prevalent diseases in birds, causing high losses in poultry industry, and food poisoning in human. Between January 2003 and June 2004, 422 chickens from 35 backyard flocks in the urban and rural areas of Ahvaz (a city in the southwestern Iran) were sampled by cloacal swab as per OIE standards (1992). The swabs, from each flock, were pooled in groups of up to five. Each sample was placed in 9 ml of tetrathionate broth, and kept at 42°C for 24 hr. Then, one loop was streaked on BG & XLD agars, and incubated at 37°C for 24 hr. After purified on blood agar, the suspected colonies were confirmed by routine biochemical & serological tests. Out of 85 samples, five (5.8%) were positive for Salmonella. Of these, four isolates were identified as S. typhimurium, and one isolate as S. enteritidis. The isolates belonged to 3 flocks (8.5%). S. typhimurium was isolated from two flocks (5.7%), and S. enteritidis from one flock (2.8%). Considering that the cloacal swabs were not assessed individually, and that the shedding of Salmonella in the feces of infected birds is often intermittent, the actual infection rate is likely to be more than our result.

Key words: Salmonella; Backyard; Chicken; Iran

Introduction
Salmonellosis is one of the most prevalent diseases in birds caused by a vast range of salmonella serotypes. The non – motile serotypes (S. pullorum & S. gallinarum) are adapted mostly for chickens and turkeys, being less prevalent in the world, (Shivaprasad, 2003), whereas the motile serotypes often referred to as paratyphoid (PT) salmonellae occur throughout the world, and can infect a very wide variety of hosts including wild and domestic animals, and humans. PT infections have long been known to cause great losses in poultry. In addition, they play a very important role in food – borne salmonellosis in humans (Gast, 1997). For example, more than one – third of food – borne salmonellosis outbreaks in humans in USA between 1983 and 1987 was associated with poultry meat or eggs (Tauxe, 1991).

Backyard chickens can also be infected through contact with wild animals, domestic mammals and commercial poultry that are carriers of salmonellae, and consequently may play a role in the transmission of the organism to other animals and humans. In Iran, the rearing of backyard chickens is very common, providing a part of nutritional requirements among villagers and even citizens. However, little is known of the prevalent salmonellae in the rural chicken flocks. So, this study was undertaken to determine the salmonella infection status in the native chickens of Iran.

Materials and methods
Between January 2003 and June 2004, 422 apparently healthy chickens from 35 backyard flocks in the urban and rural areas of Ahvaz (a city in the southwestern Iran) were sampled by cloacal swab as per OIE standards (1992) (Table 1). The cloacal swabs, from each flock, were pooled in groups of up to five, so that a total of 85 pooled samples were collected. Each sample was placed in 9 ml of tetrathionate broth (Merck, Germany), and kept at 42°C for 24 hr. Then, one loop was streaked on both BG & XLD agars, and incubated at 37°C for 24 hr. To inhibit the growth of Proteus species, novobiocin (Hi – Media, India) was added to the plating media (Hi – Media, India), and to TT broth at a rate of 20 µg/ml and 40 µg/ml respectively. After purified on blood agar, the colonies characteristic of salmonella were confirmed by routine biochemical and serological tests as recommended by Douglas Waltman et al. (1998).
Table 1 The number of birds in a flock sampled by cloacal swab

<table>
<thead>
<tr>
<th>No. of birds in a flock</th>
<th>No. of birds sampled</th>
<th>No. of birds in a flock</th>
<th>No. of birds sampled</th>
</tr>
</thead>
<tbody>
<tr>
<td>25-29</td>
<td>20</td>
<td>60-89</td>
<td>40</td>
</tr>
<tr>
<td>30-39</td>
<td>25</td>
<td>90-199</td>
<td>50</td>
</tr>
<tr>
<td>40-49</td>
<td>30</td>
<td>200-499</td>
<td>55</td>
</tr>
<tr>
<td>50-59</td>
<td>35</td>
<td>&gt;500</td>
<td>60</td>
</tr>
</tbody>
</table>

Results and discussion

The results showed that five of 85 samples (5.8%) were positive for *Salmonella*. Of these, four isolates were identified as *Salmonella typhimurium*, and one isolate as *S. enteritidis*. The isolates belonged to 3 flocks (8.5%). *S. typhimurium* was isolated from two flocks (5.7%), and *Salmonella enteritidis* from one flock (2.8%).

Salmonellae usually infect their hosts via gastrointestinal tract. In the absence of other microflora, the organisms are apparently able to adhere, multiply, and colonize at any point along the GI tract of animals, humans and the environment (Poppe, 2000). Cloacal swabs have been used to provide evidence of persistent intestinal colonization by salmonellae in individual birds (Gast and Beard, 1990). Yagoub and Mohammad (1987) reported that 17 of 288 cloacal swabs taken from broiler chicks in Sudan were positive for motile salmonellae. The isolation of *S. typhimurium* was reported from the cloacal swabs of Italian pigeons (Cena et al., 1989), of a turkey in a children's zoo (Yoshihiko et al., 1998), and from the one rectal swab of 248 healthy calves (Inal et al., 1999). Goncagul and Carli (1999) could isolate *Salmonella enteritidis*, *S. typhimurium* and *S. gallinarum* from the cloacal swabs taken from the broiler, broiler breeder and commercial layer flocks in Turkey. Cloacal swab has also been used for the isolation of *S. enteritidis* from the parenterally inoculated broiler chicks (Turnbull and Snyenbos, 1974), parrots (Orosz et al., 1992) and layer flocks (Blaszczak and Binek, 1999). The literature shows that there is little information about the salmonella infection status in backyard chickens. Bouzoubaa et al. (1992) assessed 500 cloacal swabs, as 100 pooled samples, taken from village chickens in 50 different farms in Morocco, and stated that three cultures were isolated: two were *S. pullorum*, and one was *S. gallinarum*.

Although *S. typhimurium* may still be reported as the most prevalent serotype in some countries, *S. enteritidis*, during the last 10-15 years, has replaced *S. typhimurium* as the commonest serotype in poultry in many countries worldwide (Poppe, 2000). In our study, four of 5 isolates were *S. typhimurium*, indicating that it is the predominant serotype in the native chickens. This is in agreement with the authors' earlier study, resulting in the isolation of *S. typhimurium* (4 isolates) and *S. enteritidis* (one isolate) from 300 backyard hen's eggs sampled (unpublished data).

Considering that the cloacal swabs were not assessed individually, and that the shedding of *Salmonella* in the feces of infected birds is often intermittent (Fanelli et al., 1971 and Gast, 1997), the actual infection rate is likely to be more than our result.

The overall isolation rate of 5.8% (five isolates from 85 samples) indicates that there is at least a moderate prevalence of infection in the backyard chickens, posing a risk to industrial chicken farms, and public health. Therefore, any prophylactic program aimed at controlling salmonella infections must take into account the backyard chickens.

References


