Salmonella in Reptiles in Zoological Gardens

By

M. Refai and R. Rohde

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Salmonellosis in birds and animals in Egypt is on the increase in both numbers and serotypes. Up to the present, cold-blooded animals have not been investigated for Salmonella to any appreciable extent. This is of special interest since many of these animals were imported from different parts in Africa where many types of Salmonella are prevalent.

The present paper reports the recovery of 10 Salmonella and 4 Arizona serotypes from different cold-blooded animals in the Zoological Garden, Gizeh.

Materials and methods

Faeces were collected from the boxes of 25 reptiles. One gram faeces was first enriched in Selenite F and tetraphionate fluid media and incubated for 24 hours at 37°C. Subcultures were sown on selective solid media (McConkey and SS agar) and the plates incubated for a further 24—48 hours. Colonies simulating salmonellae were picked off and purified. Those showing the characteristic typical behaviour of the genus were identified serologically.

Results

From the 25 samples examined only 13 yielded Salmonella or/and Arizona. In 3 samples double infection with Salmonella and Arizona was found and in another 2 samples double infection with 2 types of Salmonella. In one sample 2 types of Salmonella and one Arizona were isolated.

There were 10 Salmonella serotypes of which S. Ilanudno and S. Chailey were isolated more than one time. Arizona were met with in 7 samples.

The results are summarized in the following tables:

<table>
<thead>
<tr>
<th>Reptile</th>
<th>Microorganism</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Iberus giganteus</td>
<td>S. Ilanudno, Ar. 30 : 27 : 28</td>
</tr>
<tr>
<td>2. Tarentola ornata</td>
<td>S. Ilanudno, Ar. 30 : 27 : 28</td>
</tr>
<tr>
<td>3. Natrix tessellata</td>
<td>S. Typhi-murium, S. Chailey</td>
</tr>
<tr>
<td>4. Bitsis arietans</td>
<td>S. Ilanudno, S. Erme</td>
</tr>
</tbody>
</table>
**Table 2**

Salmonella and Arizona isolated from faeces of reptile

<table>
<thead>
<tr>
<th>Serotype</th>
<th>Formula</th>
<th>Reptile</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>S. Ilandrodo</em></td>
<td>281, 282 : g, m, s, t : 1,5</td>
<td>1. Retudo gigantea</td>
</tr>
<tr>
<td><em>S. typhi-murium</em></td>
<td>4, 5, 12 : l : 1,2</td>
<td>2. Retudo sublata</td>
</tr>
<tr>
<td><em>S. nager</em></td>
<td>43 : x : 1,5</td>
<td>3. Bria arizonae</td>
</tr>
<tr>
<td><em>S. ratu</em></td>
<td>30 : j : 1,6</td>
<td><em>Matrix tessellata</em></td>
</tr>
<tr>
<td><em>S. nager</em></td>
<td>41 : z15 : 1,2</td>
<td>1. Matrix tessellata</td>
</tr>
<tr>
<td><em>S. ratu</em></td>
<td>1, 9, 12 : e, h : 1,5</td>
<td>2. Naja nigricollis</td>
</tr>
<tr>
<td><em>S. ratu</em></td>
<td>18(1), 20 : g, h, x</td>
<td><em>Naja nigricollis</em></td>
</tr>
<tr>
<td><em>S. muenster</em></td>
<td>64 : r : 2</td>
<td><em>Crotophos ruber ruber</em></td>
</tr>
<tr>
<td><em>S. muenster</em></td>
<td>65 : z15 : e, n, x, z15</td>
<td><em>Melipona monteplusiana</em></td>
</tr>
<tr>
<td><em>S. muenster</em></td>
<td>3, 10 : e, h : 1,5</td>
<td><em>Gekko gekko</em></td>
</tr>
<tr>
<td><em>S. muenster</em></td>
<td>60 : i11 : z15</td>
<td><em>Bella abrae</em></td>
</tr>
<tr>
<td><em>S. muenster</em></td>
<td>61 : l, y : z15</td>
<td><em>Cerastes cornutus</em></td>
</tr>
<tr>
<td><em>S. muenster</em></td>
<td>64 : r : 2</td>
<td><em>Cerastes cornutus</em></td>
</tr>
</tbody>
</table>

* Belong to the sub-genus II.

**Arizona species are written with the Salmonella formula since they are classified by** Kauffmann as Salmonella sub-genus III.

**Discussion**

All the Salmonella and Arizona serotypes in the table were isolated for the first time in Egypt from reptiles, as this is the first study in this field. With the exception of *S. typhi-murium*, *S. saint-paul* and *S. eastbourne* the other microorganisms isolated have not hitherto been isolated in Egypt.

*S. typhi-murium* has been involved several times in outbreaks of ice cream poisoning (AZMY, 1944) and meat and fish poisoning (SANDIFORD, 1936; GOHAR et al., 1938; SANDIFORD et al., 1943; Moustafa et al., 1948, and HARGAN, 1966). The same serotype was recovered from different animals pigs (FARRAG EL AFF, 1954), cattle and pigs (FLOYD, 1956), sheep (Lotfi and Kamel, 1964) and buffalo (ZIEH ABUDEE et al., 1966).

These findings indicate that this serotype is prevalent in Egypt.

It is interesting to note that McNEIL and HINSWORTH, 1944, investigating the epidemiology of *S. typhi-murium* infection in turkey pouls, were able to isolate the same serotype from a gropper snake and a garter snake caught on the infected turkey ranches.

*S. saint-paul* is one of the uncommon Salmonella, but like others in the subgenus I, it is potentially pathogenic for men and animals. In Egypt this type of Salmonella was recorded from slaughtered camels and cattle in Cairo abattoir (FLOYD, 1956; HAMADA et al., 1963 and Kamel and Lotfi, 1964).

*S. eastbourne* isolated from the great house Geko is a rare type which was originally found in one case of enteric fever by Leslie and Shera, 1931. In the Sudan, KAHN, 1962, recorded the same type in ann. In Egypt, Sadek isolated it from fresh beef sausages. EL AGROUDI, 1963, recovered it in game birds and LOTFI and KAMEL, 1964, described it in sheep. Therefore, from the public health aspect, the presence of this serotype in the Geko is hazardous,
especially as Geckos are common in this country. This creature hides at day
time and wanders at night in many houses seeking for food; unprotected
foods are liable to contamination by its faeces. The *Gecko geko* eats insects,
like flies, mosquitoes, ants and cockroaches etc. which might be responsible for
its infection.

Salmonellosis in snakes has been the subjects of many investigators.
Zwart, 1962, studied salmonella infection in wild and domestic animals in
Ghana and found that infection in lizards was the highest (37.5 %) followed
by snakes (29.6 %). Delage et al., 1963, investigated salmonella in animals in
Morocco and came to the conclusion that the highest incidence was in
tortoises (70.2 %), then snakes (48 %). Later, Milanov et al., 1966, found
that the proportion of carriers was greatest among tortoises, then snakes and
lizards.

It is evident that reptiles whose life history has remained practically un-
affected by modern developments in agriculture have recently attracted the
attention of epidemiologists who considered them common sources of salmo-
rella without clinical symptoms.

The distribution of salmonella in reptiles is puzzling. Many of the recor-
ded isolations from snakes are from dead or sick animals or from zoo-
logical gardens where there is often a risk of infection from some other captives.
Since all snakes are carnivorous and are liable to infection from their victims
this might explain the simultaneous infection of groper snakes and turkey
poults recorded in Arizona (Hinshaw and McNeil, 1945/46).

It appears that reptiles are frequently symptomless carriers and are,
therefore, a hazard to the control of infection among human and domestic
animals. Therefore, the public health significance of this reservoir of salmo-
rella must be considered due to the possible faecal contamination of objects
and foods as well as the spread of faecal dust.

Summary

25 faeces samples of reptiles yielded 10 Salmonella and 4 Arizona sero-
types. These were: S.llandudno, S. typhi-murium, S. chailey, S. kingabwa,
double infection with Salmonella and Arizona was noticed. In another 2
samples 2 types of Salmonella and in one sample 2 types of Salmonella and
one Arizona were isolated. The public health importance of salmonella in-
festation in reptiles is discussed.

Zusammenfassung

Aus 25 Kotproben von Reptilien wurden 10 Salmonellen-Arten und 4
verschiedene Arizona-Serotypen isoliert. Es handelt sich um: S.llandudno,
S. typhi-murium, S. chailey, S. kingabwa, S. aqua, S. negev, S. eastbourne,
mit Salmonellen- und Arizonaabakterien festgestellt. In zwei anderen Proben
wurden zwei verschiedene Salmonellen-Typen und in einer Probe zwei Salmo-
ellen-Typen und einmal Arizona nachgewiesen. Die hygienische Bedeutung
des Vorkommens von Salmonellen bei Reptilien wird diskutiert.
Résumé

Les salmonelles chez les reptiles des jardins zoologiques


Resumen

Salmonelas en los reptiles de parques zoológicos


References


Authors address: Dr. Mohamed Refai, Faculty of Veterinary Medicine, Cairo-University, El-Gizeh Egypt., and Dr. R. Rohde, Hygiene-Institut der Universität Hamburg, Gerd-Fodd-Wall 15—17.