INTRODUCTORY STUDIES ON *SALMONELLAE* IN CAMELS AND OSTRICHES

By

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ABSTRACT

In the present study , 200 camel and 100 ostrich samples were examined bacteriologically and serologically for isolation of *Salmonellae*. 17 *Salmonella* serotypes were isolated from 200 camel samples with an incidence of 8.5%. The highest incidences were revealed from the young age camels. By serotyping , 7 *Salmonella* serotypes were *S.* enteritidis (41.7%) , 4 *S.* dublin (23.5%) and 3 *S.* typhimurium (17.64%) , in addition to 3 untypable serotypes (17.64%) . In case of ostriches 10 *Salmonella* serotypes were isolated and typed as *S.* typhimurium (3%), *S.* enteritidis (2%) , *S.* gallinarum (1%)and *S.* pullorum (1%) in addition to 3 untypable *Salmonellae*.

INTRODUCTION

Salmonellosis as a zoonotic disease is prevalent allover the world. Over 2000 *Salmonella* serotypes are known today and quite a few are isolated, characterized and added to the list every year. These organisms are strict pathogens and a human or animal body is the only recognized habitat (**Saxena *et al.*, 1980**).

Camels are considered one of the most important groups of livestock in Egypt, one of the cheapest sources of animal protein and consumed by different classes of people. Numerous authors believe that the dromedary (camel) is an important reservoir for *Salmonellae*, which have been reported in different parts of the world, so could therefore represent health hazard for man (**Wernery, 1992 and Wernery and Kaaden, 2002**).

The recent interest in ostrich farming has led to an increasing demand for information about this bird, how to manage it in a commercial environment and how to prevent or to minimize its infectious diseases especially salmonellosis which is considered an important gram-negative bacteria in ostrich diseases (**Huchzemeyer, 1997 and Verwoerd *et al.*, 2000**).

Little research has focused on enumerating the intestinal load of zoonotic pathogens such as *Salmonellae* in camels and ostriches. The overall objective was planned to investigate the occurrence of *Salmonellae* in both species.

MATERIAL AND METHODS

Samples:

1- Camel samples:

A total of 200 camels, 85 slaughtered camels and 115 alive camels from El-Basateen abattoir were selected to fulfill this study. They were including 182 apparently healthy camels and 18 had health problems including diarrhea, emaciation, external parasite like ticks and enlargement in cervical lymph nodes. The collected samples were classified according to age, sex and health condition.

2. Ostrich samples:

A total of 100 cloacal swabs were collected from alive apparently healthy ostriches aged from 1 day to one year. The samples were selected from private farm in Ismailia Road.

Identification of the isolates:

A loopful from homogenized suspension of fecal samples collected from camels and ostriches were inoculated onto selenite-F broth medium and incubated aerobically at 37°C for 16 hours, then streaked onto the surface of MacConkey's agar, Hektoen enteric agar and *Salmonella* -Shigella agar media.

The plates were incubated at 37°C for 24-48 hours. Suspected growing colonies were characterized according to **Cruickshank *et al.*, (1975)** and **Quinn *et al.*, (2002)** and transferred onto triple sugar iron and Christensen's urea agar slopes.

RESULTS AND DISCUSSION

In the present investigation, a total of 300 samples (200 camel and 100 ostrich samples) were studied for salmonellosis. All isolates were gram negative, non-spore forming, straight rods and highly motile except *S.* gallinarum and *S.* pullorum. Motility facilitates initial contact with cells and increase virulence characters for *Salmonellae* **(Carsiotis *et al.*, 1984)**.

The present results shown in Table (1), revealed that out of 200 camel samples, 17 *Salmonella* species were isolated with an overall incidence 8.5%, which is considered significantly high. These findings appear to agree nearly with those obtained by **Mohamed *et al.*, (1998)** who isolated 4 serotypes of salmonellae from camels with an incidence of (9.5%). A lower incidence of

Salmonella in camels was recorded by **Selim *et al.*, (1990)** 3% and **Wernery (1992)** 4.3% . As well as, a comparatively higher incidence of salmonellae in camels was reported by **Nation *et al.*, (1996)** 33.3%.

This significant difference could be attributed to the increase in the incidence of salmonellosis among food animals, the difference in number of examined samples and presence of a chance to contamination and to the improvement of methods used for isolation. As well as to the health condition of animals either they were apparently healthy or diseased, the season during which these studies were done and finally the different epidemiological characters.

It is clear that the incidence of *Salmonella* in the apparently healthy camels was (6.04%) and appeared to be lower than that obtained in diseased camels (33.3%).

Salmonellae were also isolated from 8 healthy dromedary calves and from one diseased calf from the UAE (**Nation *et al.*, 1996**) as well as from (9.5%) diarrheic camel claves from Sudan (**Mohamed *et al.*, 1998**).

In Egypt, **Selim *et al.*, (1990)** found *Salmonellae* among the feces of healthy camels. As shown in Table (1), *S. enteritidis* (2.75%), *S. dublin* (1.65%), *S. typhimurium* (0.55%) and untypable *Salmonellae* (1.09%) could be isolated from the apparently healthy camels (6.04%).

Among diseased camels *S. enteritidis* and *S. typhimurium* (11.11% each) as well as *S.dublin* and untypable salmonellae (5.56% each) were isolated with an overall incidence of 33.33%.

Selim *et al.*, (1990) isolated *Salmonellae* (17%) from dromedaries with enteritis. Also **Alambedjir *et al.*, (1992)** detected *Salmonellae* from diarrheic camels.

From the results achieved in the same Table it was evident that the incidence of *Salmonella* isolates in males (10%) was higher than in females (7%). These findings could be explained depending on the fact that there is a great importance of the female to the owner for the production of labour and milk, receiving a lot of care in dealing with its treatment. Such management leads to higher levels of immunity providing she-camels a good defense against the disease.

The incidence of *Salmonellae* among slaughtered and alive camel samples were 11.76% and 6.08% respectively. Furthermore the incidence of salmonellae in young ages of camels (12.6%) was higher than in older ages (3.37%).

These results appear to be confirmed by **Rollefson *et al.*, (2001)** who reported salmonellosis as a serious bacterial disease in camels especially in younger ages and salmonellosis may be developed to septicemia.

Recently, **Wernery and Kaaden (2002)** concluded that acute enteritis

due to *Salmonella* infection is the common form in camel calves and in adult camelids when predisposing factors like clostridiosis, coccidiosis or candidiasis exist, meanwhile chronic enteritis is a common form in adult camelids. They added that Salmonella septicemia is a usual syndrome in newborns with outbreaks occurring for up to 6 months. This illness is acute with fever and depression. Death occurs within 48 hours.

From the same Table, it is clear that *S. enteritidis* was the most prevalent serovar followed by *S. dublin* then *S. typhimurium*. These results reflected the increased importance of *Salmonella enteritidis* as human and animal pathogen that tended to over shadow the other *Salmonella* serovar (**Wray and Wray, 2000**) and what was stated by **Wernery and Kaaden (2002)** who believes that *S. typhimurium*, *S. enteritidis*, *S. kentucky* and *S. saint-paul* are the most important serovars in camels and the disease manifests itself in hemorrhagic diarrhea with dehydration and death.

The ratite industry in Egypt has been newly created with only a few ostrich breeders, and it has expanded to thousands of small enterprises.

As shown in Table (2) it was observed that the incidence of *Salmonellae* in ostriches was 10%. These results approach to those reported by **More (1996); Cadman *et al.*, (1994)** and **Welsh *et al.*, (1997)** who recorded rates of *Salmonellae* incidence of 11%, 8%, 12.5% respectively. **Ley *et al.*, (2001)** had a low prevalence rate of *Salmonella* among ostriches.

Among sick birds **Kamel *et al.*, (2000)** recorded that of 300 ostriches examined (200 diseased and 100 dead chicks) 148/300 (49.3%) were found positive for the presence of *Salmonellae*, and *S. typhimurium* and *S. enteritidis* were identified. Isolation of sick birds at the first signs of diarrhea is the most important preventive measure.

Here it is considered the first time to isolate *Salmonella* from apparently healthy ostriches in Egypt and can consider it as an important carrier. It is clear from Table (2) that the highest incidence of *Salmonella* isolates present mainly in ostriches aged 2-3 weeks (13.04%) followed by one day old and one month old (12.5% each). It may be attributed to the failure of establishment of normal gut flora, which do not present in newly born ostrich chicks. Some ostrich farms tried to solve this problem by administration of fresh feces from apparently healthy adult birds or other animals. This empirical method may has some advantages but it has many serious disadvantages as this is the practical use of fresh feces through which the young chicks will receive the right amount of beneficial bacteria and fungi required to protect the intestinal tract, but it may also increase the transmission of pathogenic bacteria such as *Salmonella* to the young birds (**Deeming, 1999**).

Serotyping of the 10 obtained isolates of salmonellae as it is clear in Table (24), revealed that 3 isolates were *S. typhimurium* (3%), 2 were *S. enteritidis* (2%), one isolate was *S. pullorum* (1%) and one isolate was *S. gallinarum* (1%) in addition to 3 untypable isolates (3%). In this concern. **Ley *et al.*, (2000)** recorded that *S. pullorum*, *S. gallinarum* and *S. typhimurium* are avian pathogens that may be of concern to commercial ratite producers.

It is clear from the same Table that it is the first time for isolation of *S. gallinarum* and *S. pullorum* from ostrich in Egypt and that gives a conclusion about the possibility of occurrence of *Salmonella* vertical transmission via fecal contamination of eggs in ostriches. Also, like chicken where these two strains were isolated from one day old and 2 week old and not from older birds.

On the other hand, *Salmonellae* could not be detected among ostriches older than 3 months as shown in Tables (23 & 24). Disease resistance is due to a combination of genetically determined insensitivity towards certain pathogenic microorganisms, the age immunological status, stamina and condition of the bird **(Mayer, 1991)**.

The present study concluded that camels and ostriches constitute a non-neglectable host act as source for *Salmonella* infections for either animals or man.

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Table (1): collective table for prevalence of salmonellae in camels.

Different data about camels		Total no. of samples	Positive no.	% of positive number	Different isolated serotypes							
					Salmonella Dublin		*Salmonella* Enteritidis		*Salmonella* Typhimurium		Untypable	
					No.*	%**	No.	%	No.	%	No.	%
Age	Up to 1 year	111	14	12.61	4	3.60	5	4.50	3	2.70	2	1.80
	Over 1 year	89	3	3.37	-	-	2	2.25	-	-	1	1.12
Sex	Male	100	10	10.0	4	4	4	4	1	1	1	1
	Female	100	7	7.0	-	-	3	3	2	2	2	2
General health condition	Apparently healthy	182	11	6.04	3	1.65	5	2.75	1	0.55	2	1.09
	Diseased	18	6	33.33	1	5.56	2	11.11	2	11.11	1	5.56
Statement	Slaughtered	85	10	11.76	3	3.53	5	5.89	1	1.18	1	1.18
	Alive	115	7	6.08	1	0.87	2	1.74	2	1.74	2	1.74

* No. Positive number

** % was calculated according to total number of samples.

Table (2): The incidence of *Salmonella* serotypes regarding to different ages of ostriches.

Serotypes	Different ages of ostriches											
	1 day (24)		2-3 weeks (23)		1 month (24)		2 months (14)		3 months to 1 year (15)		Total No. (100)	
	No.*	%**	No.	%	No.	%	No.	%	No.	%	No.	%
Salmonella Enteritidis	0	-	2	8.7	0	-	0	-	0	-	2	2
Salmonella Gallinarum	0	-	1	4.3	0	-	0	-	0	-	1	1
Salmonella Pullorum	1	4.2	0	-	0	-	0	-	0	-	1	1
Salmonella Typhimurium	2	8.3	0	-	1	4.2	0	-	0	-	3	3
Untypable	0	-	0	-	2	8.3	1	7.1	0	-	3	3
Total	3	12.5	3	13.04	3	12.5	1	7.1	0	-	10	10

* No. Positive number

** % was calculated according to total number of examined samples of each age.

الملخص العربي

دراسات تقديمية عن السالمونيلا في الجمال والنعام

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في هذه الدراسة تم فحص عدد (200) جمل ، وعدد (100) نعامة بكتريولوجيا لعزل وتصنيف ميكروبات السالمونيلا. وكذلك تم اجراء الفحص السيرولوجي لتصنيف العترات المعزولة سيرولوجيا. ولقد تم عزل عدد (17) سبعة عشر عترة من السالمونيلا من الجمال بنسبة عزل 8.5 % وكانت أعلي نسبة للعزل من الجمال صغيرة السن. وأثبتت الأختبارات السيرولوجية أن (7) سبعة عترات كانت من السالمونيلا (انتريتيدس بنسبة 41.7 % ، و4 عترات سالمونيلا دبلن بنسبة 23.5 % وثلاث عترات سالمونيلا تيفي ميوريم بنسبة 17.64 %). وبالنسبة لعينات النعام تم عزل عدد عشرة عترات وتم تصنيفها كالتالي 3 عترات سالمونيلا تيفي ميوريم (3 %) وسالمونيلا انتريتيدس (2 %) وسالمونيلا جلينيرم (1 %) وسالمونيلا بللورم (1 %) بالأضافة الي ثلاث عترات لم يتم التمكن من تصنيفهم.