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## SALMONELLAE ISOLATED FROM CAPTIVE ANIMALS IN IBADAN, WESTERN STATE OF NIGERIA

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**Abstract:** Six serotypes of salmonellae, *Salmonella offa*, *S. glostrup*, *S. wimborne*, *S. dublin*, *S. saint-paul* and *S. webridge* were isolated from captive wild animals in Ibadan, Western State of Nigeria. *S. wimborne* and *S. glostrup* are reported for the first time in Nigeria. All strains were sensitive to nitrofurantoin (200 mcg) and chloramphenicol (10 mcg) but there was marked resistance to sulphafurazole (100 mcg) and penicillin (1.5 units).

### INTRODUCTION

*Salmonella* infections have been reported in captive wild animals by several workers, including Debbie,<sup>6</sup> Locke *et al.*<sup>12,13</sup> Jackson,<sup>10</sup> Jackson,<sup>11</sup> Otis and Behler,<sup>14</sup> Cornelius<sup>7</sup> and Taylor.<sup>16</sup> Although a few diseases have been reported from captive wild animals in Nigeria<sup>7,8,9</sup> there are no published reports on salmonellae. Ojo (personal communication) isolated *S. aba* and *S. takoradi* from a lizard and dead baby elephants, respectively, at the University of Ibadan Zoo. Also, Olufemi and Etukudo (personal communication) isolated *C. typhimurium* from a healthy monkey and gorilla at the Zoo.

Records obtained from the State Veterinary Investigation Laboratory, Ibadan, of cases of unexplained diarrhoea among captive animals at Agodi Gardens prompted a bacteriology survey. Also, animals at the University of Ibadan Zoological Gardens were included in the survey. This article reports the isolation of six salmonella serotypes from these sources.

### MATERIALS AND METHODS

Fecal samples were collected from 20 animals at Agodi Gardens and from 21 apparently normal animals at the University Zoological Gardens. One gram of each fecal sample was inoculated into 10

ml of selenite broth and incubated for 24-48 hrs, followed by subculturing onto desoxycholate citrate agar (DCA). After further incubation for 24 hrs, *Salmonella*-like colonies were subcultured onto MacConkey agar medium. Non-lactose fermenting colonies were isolated and subcultured onto nutrient agar slants. All isolates were tested by the slide agglutination method using *Salmonella* polyvalent 'O' and 'H' antisera Welcome Batch K 0838 and K 0432, respectively. Those positive were later sent to Dr. B. Rowe, Director, *Salmonella/Shigella* Reference Laboratory, Colindale, U.K. for complete identification.

Disc antibiotic sensitivity tests to eight chemotherapeutic agents were performed on 24 hr blood agar culture of each *Salmonella* isolate. An organism was considered sensitive when there was a clear zone of inhibition around the antibiotic discs.

### RESULTS

Salmonellae (subgenus I) were isolated from 6 of 20 animals at Agodi Gardens and 2 of 21 animals at the University of Ibadan Zoo (Table 1). All strains were sensitive to nitrofurantoin (200 mcg) and chloramphenicol (10 mcg) but there was marked resistance to sulphafurazole (100 mcg) and penicillin (1.5 units) (Table 2).

TABLE 1. *Salmonella* species and animals from which they were isolated.

AGODI GARDENS		
Putty-nosed monkey	<i>Cercopithecus nictitans</i>	<i>S. weybridge</i> 3, 10:d:Z6
Green monkey	<i>Cercopithecus aethiops</i>	<i>S. weybridge</i> 3, 10:d:Z6
Patas monkey	<i>Erythrocebus patas</i>	<i>S. offa</i> 41:Z38:-
Baboon	<i>Papio anubis</i>	<i>S. saint-paul</i> 4, 12:e,h:1, 2
Marsh Mongoose	<i>Atilax paludinosus</i>	<i>S. saint-paul</i> 4, 12:e,h:1, 2
Civet cat	<i>Viverra civetta</i>	<i>S. glostrup</i> 6, 8:Z10:e,n,Z15
White Rat	<i>Rattus norvegicus</i>	None
Crowned crane	<i>Balearica pavonina</i>	None
Peacock	<i>Pavo cristatus</i>	None
Lion	<i>Panthera leo</i>	None
Duiker	<i>Cephalophus rufilatus</i>	None
Hyaena	<i>Crocuta crocuta</i>	None
White-faced duck	<i>Dendrocygna viduata</i>	None
Savannah Duck	<i>Anseriformes</i> sp.	None
Owl	<i>Athene brama</i>	None
Jackal	<i>Canis mesomelas</i>	None
Grey Heron	<i>Ardea cinerea</i>	None
Tortoise	<i>Kinixys homeana</i>	None
Crested Porcupine	<i>Hystrix cristata</i>	None
W. Africa ground squirrel	<i>Xerus erythropus</i>	None
UNIVERSITY OF IBADAN ZOO		
Hyaena	<i>Crocuta crocuta</i>	<i>S. wimborne</i> 3, 10:k:1,2 and <i>S. dublin</i> 1,9,12:g,p:-
Aviary	<i>Sagittarius serpentarius</i>	<i>S. wimborne</i> 3, 10:K:1,2
Baboon (3)	<i>Papio anubis</i>	None
Lion (2)	<i>Panthera leo</i>	None
Mangobey	<i>Cercocebus torquatus</i>	None
Putty-nosed monkey	<i>Cercopithecus nictitans</i>	None
Patas monkey (2)	<i>Erythrocebus patas</i>	None
Red-bellied monkey	<i>Cercopithecus erythrogaster</i>	None
Rock Hyrax	<i>Procavia capensis</i>	None
Duiker (2)	<i>Cephalophus rufilatus</i>	None
	<i>Cephalophus maxwelli</i>	None
Statunga	<i>Tragelaphus spekei</i>	None
Elephant	<i>Loxodonta africana</i>	None
Chimpanzee	<i>Pan troglodytes</i>	None
Gorilla	<i>Gorilla gorilla</i>	None
Hyaena	<i>Crocuta crocuta</i>	None
Tortoise	<i>Kinixys beliana</i>	None

TABLE 2. Disc Antibody Sensitivity Test.

	<i>S. weybridge</i>	<i>S. offa</i>	<i>S. saint-paul</i>	<i>S. glostrup</i>	<i>S. winborne</i>	<i>S. dublin</i>
Polymyxin B (100 mcg)	Sensitive	Resistant	Sensitive	Sensitive	Sensitive	Sensitive
Terramycin (10 mcg)	Sensitive	Sensitive	Resistant	Resistant	Resistant	Resistant
Erythromycin (10 mcg)	Sensitive	Sensitive	Resistant	Resistant	Resistant	Resistant
Chloramphenicol (10 mcg)	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive
Streptomycin (10 mcg)	Sensitive	Sensitive	Resistant	Resistant	Resistant	Sensitive
Penicillin (1.5 units)	Resistant	Resistant	Resistant	Resistant	Resistant	Resistant
Nitrofurantoin (200 mcg)	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive
Sulphafurazole (100 mcg)	Resistant	Resistant	Resistant	Resistant	Resistant	Resistant

#### DISCUSSION

The fact that some of the serotypes isolated during this investigation have been reported in Nigeria indicate the complex epidemiology of salmonellosis. *S. saint-paul* was isolated from human feces, market meat, dead birds and pigs (Olufemi and Etukudo, personal communication). So far only two strains of *S. weybridge* have been isolated from human feces. *S. dublin* has been isolated from humans, cattle, dog, and market meat.<sup>1,3,15</sup> *S. offa* was first isolated from

human feces in 1957<sup>2</sup> but has not been reported again.

According to Taylor,<sup>10</sup> factors such as adverse conditions, feeding habits, environment, natural behaviour and gut flora influence *Salmonella* infections in wildlife. While it could be assumed that *S. saint-paul*, *S. offa*, *S. weybridge* and *S. dublin* were acquired from contact with human beings and animals (it is common practice to feed the captive carnivores market meat), the source of *S. winborne* and *S. glostrup* remains uncertain.

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