

ENTERIC INFECTIONS OCCURRING DURING AN EIGHT YEAR
PERIOD AT THE CHICAGO ZOOLOGICAL PARK
BROOKFIELD, ILLINOIS

by

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The bacteriological examinations of abnormal stools, irrespective of the apparent seriousness of the illness, is particularly important in a zoological park where it is difficult to apply measures to keep out possibly infected wild, non-resident animals and mechanical carriers, such as flies, cockroaches, etc. One obvious instance of the initiation of an epidemic by non-resident animals was the occurrence of infection with *Salmonella newport* among the animals in the pachyderm house. The first case in an elephant occurred about a month after *S. newport* had been isolated from the blood of a skunk found dead in the park. Prompt diagnosis of the first case and examination of the stools of other animals in the same building led to the discovery of further infections before symptoms occurred in the other animals. Suitable antibiotic therapy was instituted, but the first animal, an adult female elephant, was lost. All the pathogenic enteric bacteria isolated were identified as *S. newport*.¹⁾

A fatal infection of a young forest horse with *Salmonella typhimurium* occurred following a long period of rainy weather leading to standing water in the enclosure. Contamination of the water by wild rats is believed to have been the most likely source of infection in this instance. No secondary cases occurred.

The mice used for feeding of reptiles are practically free from enteric infection, but the occurrence of infection with an Arizona paracolon, leading to death of a reticulated python, may well have come from a chicken that it ate, since death occurred after an interval compatible with the usual length of the incubation period. A later case in a reticulated python of infection with Arizona paracolon was successfully treated with chloromycetin.

The primates and other monkeys are subject to infection not only from the introduction of new animals but perhaps also from human sources. In 1957, an unexplained outbreak of Shigella dysentery (*Shigella flexneri* Group B) occurred in the primate house in a gorilla, nine days later in a chimpanzee,

and in a gibbon more than three months later. In this instance, the chimpanzee and the gibbon died.

A complete list of the enteric infections occurring in the park from 1954 through 1962 is given in Table 1. The young rhinoceros "Rosie" survived two infections with different species of *Salmonella*, as did also the anteater.

The technique followed in the laboratory examination for enteric bacteria was that of Edwards and Ewing.²⁾ Plates of *Salmonella-Shigella* (SS) medium and eosin-methylene blue (EMB) medium were heavily inoculated with as much of the stool as could be held on a swab, and another heavy inoculation was made into selenite broth for plating the next day. The first plates were usually all that were needed in samples from sick animals. Kligler slants were inoculated from suspicious colonies the next morning, and it was often possible to make urea tests in the late afternoon. All these media were made from dehydrated Difco preparations. If the animal was obviously seriously ill, agglutination tests were also made at this time with the growth on the Kligler slants, using polyvalent *Salmonella* O antiserum and, if these were positive, with group antisera, and positive tests were reported. Before submitting the cultures for identification, they were tested on Moeller's potassium cyanide medium and other biochemical reactions examined.

At the beginning of the laboratory investigations, antisera for pathogenic strains of *E. coli* were not commercially available. In view of the fact that blood cultures from animals coming to necropsy sometimes yielded pure cultures of *E. coli* (Table 2), it would be of interest to test such cultures with the antisera which are now available, especially since some of the animals from which they came were very young.

Paracolons other than the Arizona type, *Proteus*, and even lactobacilli were occasionally recovered in pure culture from blood taken at necropsy.

¹⁾ Identification to species were all made by the Enteric Unit of the Communicable Disease Center, Atlanta, Georgia.

²⁾ EDWARDS, P. R. and EWING, W. H., Identification of Enterobacteriaceae, Burgess Publ. Co., Minneapolis. 1955.

TABLE 1. ENTERIC PATHOGENS ISOLATED

Species	Animal	Scientific Name	Tissue Cultured	Remarks
Arizona paracolon	Reticulated python	<i>Python reticulatus</i>	Pleural exudate	Necropsy
Arizona paracolon	Reticulated python	<i>Python reticulatus</i>	Stool	Living
Salmonella chester	Malabar squirrel	<i>Ratufa indica</i>	Blood	Necropsy
Salmonella typhimurium	Mynah bird	<i>Gracula r. religiosa</i>	Blood	Necropsy
Salmonella typhimurium	Forest horse yearling	<i>Equus caballus</i>	Stool	Living
Salmonella typhimurium	Anteater	<i>Myrmecophaga tridactyla</i>	Blood	Necropsy
Salmonella typhimurium	Rabbit	<i>Oryctolagus cuniculus</i>	Stool	Living
Salmonella typhimurium	Guinea pig	<i>Cavia porcellus</i>	Blood	Necropsy
Salmonella typhimurium	Quetzal	<i>Pharomachrus mocinno costaricensis</i>	Blood	Necropsy
Salmonella muenchen	Rhinoceros (young)	<i>Rhinoceros bicornis</i>	Stool	Living
Salmonella newport	Non-resident skunk	<i>Mephitis mephitis</i>	Stool	Necropsy
Salmonella newport	Elephant (adult)	<i>Loxodonta africana</i>	Stool	Living (Died later)
Salmonella newport	Elephant (young)	<i>Loxodonta africana</i>	Stool	Living
Salmonella newport	Rhinoceros (young)	<i>Rhinoceros bicornis</i>	Stool	Living
Salmonella newport	Kangaroo (baby)	<i>Macropus melanops</i>	Stool	Living
Salmonella newport	Dall sheep	<i>Ovis d. dalli</i>	Rectal swab	Living
Salmonella senftenberg	Opossum	<i>Didelphis marsupialis</i>	Blood	Necropsy
Salmonella senftenberg	Anteater	<i>Myrmecophaga tridactyla</i>	Stool	Living
Salmonella urbana	Gorilla	<i>Gorilla gorilla</i>	Abscess (abdominal cavity)	Living (Died later)
Shigella Group B	Gorilla	<i>Gorilla gorilla</i>	Stool	Living
Shigella Group B	Lar gibbon	<i>Hylobates lar</i>	Rectal swab	Living (Died later)
Shigella Group B	Chimpanzee	<i>Pan satyrus</i>	Stool	Living (Died later)

TABLE 2. BLOOD CULTURES IN WHICH ONLY ESCHERICHIA COLI GREW

Common Name	Scientific Name	Remarks
Red kangaroo	<i>Macropus rufus</i>	Necropsy
Aoudad	<i>Ammotragus lervia</i>	Necropsy
Cotton-topped marmoset	<i>Oedipomidas oedipus</i>	Necropsy
L'Hoest's monkey	<i>Cercopithecus l'hoesti</i>	Necropsy
Wildebeest (young)	<i>Connochaetes gnou</i>	Necropsy
Lar gibbon	<i>Hylobates lar</i>	Necropsy