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## SALMONELLOSIS IN A CAPTIVE HERON COLONY

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**Abstract:** Salmonellosis caused by *Salmonella typhimurium* was one of several factors responsible for losses among young herons being held at the Patuxent Wildlife Research Center. The infection was demonstrated in five black-crowned night herons (*Nycticorax nycticorax*), three common egrets (*Casmerodius albus*), two little blue herons (*Florida caerulea*), one cattle egret (*Bubulcus ibis*), one snowy egret (*Leucophoyx thula*) and one Louisiana heron (*Hydranassa tricolor*). The disease was characterized by emaciation, focal liver necrosis, and frequently by a caseo-necrotic enteritis.

The Patuxent Wildlife Research Center has undertaken the establishment of a captive breeding colony of herons for use in experimental studies to determine the effect of various environmental pollutants upon these birds. Young herons were captured in the wild or obtained from previously existing captive flocks at the Bronx Zoo and placed in holding pens at the Patuxent Center.

Within 2 weeks after capture and movement to the Patuxent Center, occasional deaths began to occur and salmonellosis was found to be one of the causes.

### MATERIALS AND METHODS

Autopsies were performed on the dead birds and materials from organs or lesions were inoculated onto 5% sheep blood agar and incubated overnight at 37.5 C. Isolates were then streaked onto MacConkey's agar, eosin-methylene blue plates, Salmonella-Shigella plates, and brilliant green agar. Isolates were subsequently identified as *Salmonella typhimurium* by standard bacteriological techniques including the Spicer-Edwards serological techniques. Lesions were fixed in 10% formalin for histological study and sections were stained with either hematoxylin and eosin, Giemsa, Gram, or the Ziehl-Neelsen acid-fast stains.

### FINDINGS

The results of the necropsies and the occurrence of *Salmonella* are summarized in Table I.

### NECROPSY FINDINGS

Nine of the 13 herons found to be infected with *Salmonella typhimurium* were emaciated; there was little or no fat, the pectoral muscles were atrophied and the sternal keel was prominent. Of the remaining four herons, one young black-crowned night heron received from the Bronx Zoo was killed by the pecking of its cagemates. Autopsy revealed internal lesions of steatitis and aspergillosis. *Salmonella typhimurium* was isolated from the heron's liver, but not from its heart blood. A common egret which was in good flesh and had moderately good fat deposits died from an acute hemorrhagic pneumonia and *S. typhimurium* was isolated from lungs and liver.

The livers of the infected herons were frequently enlarged from two to four times normal, often with a slightly greenish cast, and were studded with innumerable areas of focal necrosis, ranging in size from pinpoint to 2-3 mm in diameter. These foci were usually slightly sunken, yellowish to tan, and usually had ill-defined borders. Microscopically

TABLE I. Salmonellosis in Captive Herons

Species	Held	Died	Autopsied	Salmonella
*LBH	5	5	3	2
CaE	5	3	1	1
CoE	5	4	4	3
SE	4	3	3	1
LaH	5	5	4	1
BCNH	62	21	21	5

\*LBH = little blue heron; CaE = cattle egret; CoE = common egret; SE = snowy egret; LaH = Louisiana heron; BCNH = black-crowned night heron.

these foci were composed of necrotic hepatic cells, acellular debris and scattered clumps of gram-negative bacteria. Liver cords were focally ruptured and there was some infiltration by lymphocytes and macrophages.

In two herons, a black-crowned night heron and one little blue heron, there were well-defined granulomata, up to 4 mm in size. Histologically these granulomata closely resembled small tubercles with well-defined borders of epithelioid cells and a central caseo-necrotic mass. Gram-positive, non-acid-fast bacilli were present in the necrotic centers. No acid-fast bacteria were found. The lesion closely resembled the hepatic granulomata frequently reported from domestic turkeys, but attempts to isolate *Corynebacterium*, *Propionibacterium* or *Catenabacterium* were unsuccessful.<sup>1</sup>

No grossly visible liver lesions were present in two infected black-crowned night herons, one common egret or the one cattle egret. However, the spleen of

the latter was enlarged and studded with necrotic foci.

A necrotic enteritis was grossly evident in three black-crowned night herons, one common egret, and both little blue herons. Microscopic necrotic enteritis was also found in another infected common egret, and in the Louisiana heron. The enteritis was characteristically caseo-necrotic with the lumen frequently distended two to three times the normal diameter by a necrotic plug. In the less severely involved cases, there were focal caseo-necrotic changes within the intestinal crypts which were filled with masses of bacteria and necrotic debris. Often there was a localized pseudomembrane composed of necrotic tissue, bacteria, and acellular debris overlying such sites.

#### BACTERIOLOGY

The results of the bacteriological examinations for *Salmonella* are summarized in Table II. *S. typhimurium* was

TABLE II. Isolation of Salmonella by Organ/Tissue

Species (Number)	Liver	Heart Blood	Intestine
BCNH (5)	5/5 <sup>a</sup>	2/3	0/1
CoE (3)	3/3	2/2	1/1
LBH (2)	2/2	1/1	2/2
SE (1)	1/1	1/1	ND <sup>b</sup>
CaE (1)	1/1	1/1	ND
LaH (1)	1/1	ND	(cloaca) 1/1

<sup>a</sup> Number positive/number examined

<sup>b</sup> ND = Not done

also isolated from the kidneys and spleen of one common egret and the lungs of a second common egret.

Six months after the last *Salmonella* infection was demonstrated, 20 surviving herons were bled and cloacal swabbings taken. None of the cloacal swabbings were positive for *Salmonella* sp., and no *Salmonella* antibodies were detected by use of the tube agglutination test for *S. pullorum* and *S. typhimurium*.

#### DISCUSSION

Although *Salmonella* infections have been known to be serious problems in domestic poultry for many years, the disease is only recently becoming recognized as a serious disease of wild birds. In a recent review, Steele and Galton<sup>2</sup> gave only one reference to the occurrence of *S. typhimurium* in a heron. Our data suggest that the infection in herons may be much more common than has been realized.

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