# A Review of Canine Salmonellosis

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Salmonellosis in animals and birds has been the subject of many studies. Earlier work was concerned with the etiological role of salmonellas in those infections which were believed to involve animals or birds and in identifying the source of human infections. The role of fowl, swine, cattle, rodents, and horses as a source of outbreaks of salmonellosis in man was established clearly. But only recently has any concerted attention been given to our domestic pets, the animals living in closest association with man.

Although many animal species have been associated with outbreaks of salmonellosis, and there have been numerous reports of the isolation of *Salmonella* from dogs, in particular, this animal has received little attention as a possible source of *Salmonella* infection in man. This observation has been made by Wolff (1) also in a discussion of the public health significance of animal *Salmonella* infections. There have been very few reports incriminating the dog as the source of human outbreaks. Probably the earliest report is that of Casperson (2) who investigated six cases of paratyphoid B fever in Rakkestad, Norway. This outbreak was traced to a dog which had been ill with a diarrheal disease for 14 days before the occurrence of the first human case. The organism was not isolated from the dog, but blood serum from the animal agglutinated with the organisms isolated from the infected humans in a 1-1280 dilution. H and O agglutinins were not found in the blood of 23 other dogs.

Magnusson (3) described an outbreak of *Salmonella* infection in a Swedish village in which the source of infection appeared to be a dog. *S. abortus canis* was isolated from three of the patients and from the dog. Kauffmann and Henningsen (4) isolated *Salmonella glostrup* from the feces of patients in an outbreak of gastroenteritis in a family and from the feces and blood of their dog, ill at the same time.

Among the individual case reports of the isolation of salmonellas from the dog is that of Castelo and Salsamendi (5) who obtained *S. newington* from the heart's blood in a fatal case of septicemia. Barto (6) reported the death of an elkhound from a hemolytic strain of *S. enteritidis*. The isolation of *Salmonella cholerae-suis* var. *kunzendorf* from a fox terrier and her pups was reported by Stafseth, Neu, and Sholl (7). The pups died of *S. cholerae-suis* septicemia 2 weeks after birth. The source of this infection was traced to swine, on a neighboring farm, that had suffered from necrotic enteritis. Craige (8) isolated *S. anatum* from the feces of a dog showing diarrhea and encephalitic symptoms. A search of the literature revealed only one instance of the isolation of *S. pullorum* from a dog. Brown, Bruner, and Moran (9) report the isolation of this organism from the lungs, liver, heart, and spleen of a dog that had been sick for several weeks. The animal had been fed raw eggs. Dolman (10) identified cultures isolated by Dr. E. G. D. Murray at McGill University from a fatal outbreak of septicemia in dogs as *S. bredeney*. Manifold (11) isolated *S. typhi-murium* from a dog and described it as the possible causative agent of canine typhus.

In a recent report on 2,788 *Salmonella* cultures derived from animals other than man or fowl, Bruner and Moran (12) noted that swine yielded the highest percentage of cultures. The dog was the next most frequent source of *Salmonella* cultures and yielded 103 strains. Among these 103 strains, 26 *Salmonella* types were found. The predominant types were *S. typhi-murium*, *S. cholerae-suis*, *S. Oranienburg*, *S. Newport*, and *S. anatum*. This study was a record of the identification of organisms received from a wide area over a period of 16 years, and it is probable that a large portion of the cultures were from sick dogs.

A study of the incidence and significance of *Salmonella* infections in dogs was undertaken in 1948 by Wolff, Henderson, and McCallum (13) at the Michigan Department of Health. These investigators isolated 16 *Salmonella* types from 18 of 100 dogs. Rejected eggs were believed to be the most probable source of infection of these animals. According to the authors, the pathological signif-

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icance of these organisms has not been determined. Their clinical data indicated some association of *Salmonella* with distemper or enteritis or both, although a considerable number were normal at the time of examination. It was suggested that the dog may be a frequent host of *Salmonella* organisms and that this animal should be considered as a potential source of the infection in man.

In the Ohio State Veterinary Clinic, Kintner (14) examined fecal cultures from 71 dogs. He isolated *Salmonella* from 13, or 18 percent, of these animals. The incidence of *Salmonella* infection was much higher in dogs suffering from distemper than in other dogs examined. In only one instance was any clinical significance attached to the presence of *Salmonella*. The author concluded that *Salmonella* organisms are capable of causing serious illness in dogs; however, he was unable to cause any illness or produce a chronic carrier by feeding organisms to healthy mature dogs. *S. typhi-murium* given intravenously to two dogs produced severe symptoms, but both animals recovered without treatment. Van Dorssen (15) was able to infect 6-week-old puppies by feeding them *S. enteritidis*. According to Bruner and Moran (12), records of isolations show that outbreaks of salmonellosis are more common and result in a higher mortality in young animals than in adults.

Reitler and Menzel (16) described a peculiar disease of dogs living in groups in Palestine. The disease resembles distemper in some respects. It is accompanied by diarrhea and may assume an acute or chronic form. It appears to be associated with tick infestation. Blood cultures from two dogs revealed a *Salmonella* identified by Kauffmann as *S. bovis morbificans*. *S. enteritidis* was isolated from one tick obtained from an ill dog.

A recent study of the incidence of *Salmonella* infection in dogs, cats, and pigeons in London was made by Cruickshank and Smith (17). These investigators examined five hundred fecal specimens from dogs obtained from the pound and from the streets of London, five hundred fecal specimens from cats, and one hundred thirty-three from pigeons. The majority of animals cultured were considered clinically normal and believed to represent an average sample of the London population of their species. Salmonellas were isolated from 5, or 1 percent, of the dogs; 7, or 1.4 percent, of cats; and 3, or 2.25 percent, of the pigeons.

In a recent study on the effect of fly control on diarrheal diseases, Watt *et al.* (18) have isolated *Salmonella* from ill children and from their normal dogs. During this study, 11 new *Salmonella* types were isolated. Of these, seven were from animals including dogs and cats.

Information obtained in a communication from Dr. T. F. Judefind, Loma Linda, Calif., states that Dr. Meridan Ball of the University of California has examined 148 fecal specimens from dogs in the Los Angeles area, Honolulu, and Bermuda, and isolated four *Salmonella*.

Currently, studies of the incidence and significance of *Salmonella* infections in dogs are in progress in California by Judefind, and in Washington State by Gorham. In Thomas County, Ga., Watt and DeCapito are continuing their investigations on salmonellosis in man and animals.

In the Florida State laboratory, the study of salmonellosis in dogs was begun in April 1949. As of January 1950, approximately 2,500 fecal specimens from dogs had been examined. The percentage of positive animals ranged from zero in some kennels to 100 percent in others. The average has been between 15 and 20 percent. Thirty-one *Salmonella* types have been isolated. Detailed results of the study will be reported at the American Veterinary Medical Association meeting in Miami in August 1950.

As a part of a broad study of the epidemiology of salmonellosis supported through a grant from the Armed Services Epidemiological Board, our study is being continued and extended with a view to defining clearly the role of dogs in the occurrence of *Salmonella* infections in man.

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## Rabies Incidence*

The following incidence of rabies occurred during the second quarter of 1950 (April-June):

**Rabies in humans** – Arkansas 1, Indiana 1, Tennessee 1

**Rabies in animals** – Alabama 117, Arizona 4, Arkansas 41, California 37, Colorado 32, Florida 5, Georgia 120, Illinois 35, Indiana 184, Iowa 140, Kansas 24, Kentucky 171, Louisiana 3, Michigan 62, Minnesota 1, New York 256, Ohio 89, Oklahoma 44, Pennsylvania 23, South Carolina 77, Tennessee 66, Texas 271, Virginia 47, West Virginia 83, Wisconsin 5 (total for animals : 1,937)

*Reported incidence of communicable diseases in the U.S., second quarter, 1950. Pub. Health Rep., (65)36: 1158-1166 (1950).