

## Leptospirosis Ballum Contracted from Pet Mice

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A PATIENT was recently treated in a hospital in Los Angeles County, California, for an illness clinically resembling leptospirosis. Laboratory tests were diagnostic for the serotype *Leptospira ballum*. Epidemiologic investigation revealed the source to be the patient's two pet white mice.

### Report of a Case

A 37-year-old Caucasian man, a parole officer, was admitted August 12 1971 to the Kaiser Foundation Hospital, Panorama City, California, with a history of headache, fever, myalgia, vomiting and diarrhea of three days' duration. On admission, the body temperature was 39.8°C (103.6°F) but there were no other positive physical findings. Pertinent admission laboratory data included leukocytes numbering 5,000 per cu mm of blood, with 69 percent segmented neutrophils and 11 percent banded neutrophils, and hemoglobin of 12.5 grams per 100 ml. Three days later leukocytes numbered 4,200 with 88 percent segmented neutrophils. Serum glutamic oxalic transaminase was 90 Sigma-Franklin units, total serum bilirubin was 0.9 mg per 100 ml, and alkaline phosphatase was 36 international units. Three days later serum alkaline phosphatase was 72 international units, SGOT 72 Sigma-Franklin units, and serum bilirubin 0.6 per 100 ml. Urinalysis and blood cultures were negative for pathogenic organisms.

During the first 24 hours after admission, a morbilliform rash developed over the patient's chest, and because of the possibility of rickettsial disease he was treated with tetracycline, 500 mg orally four times a day for 14 days. Twelve hours after this treatment was begun, fever began to

diminish and on the third day in hospital it abated completely. The rash cleared on the fifth day and the patient was discharged two days later.

On September 8 1971 the patient's temperature rose suddenly to 37.8°C (100°F) and headache, myalgia, and bilateral testicular tenderness developed. The testicles were enlarged and tender on physical examination. The leukocyte count was 9,700 per cu mm and hemoglobin was 14.7 grams per 100 ml. Results of urinalysis and urine and blood cultures were negative. Ampicillin, 500 mg four times a day, was given for ten days, and on the third day of treatment the symptoms disappeared.

Specimens of serum drawn during the acute and the convalescent phases were sent to the Center for Disease Control at Atlanta to be tested for antibodies to leptospirosis by the agglutinin-absorption method.<sup>1</sup> The specimen drawn August 13 at the acute stage was negative. The specimen drawn August 18 was positive for *L. ballum* at a dilution of 1:800, and that of September 7 was positive at a dilution of 1:25,600. This constituted a titer rise consistent with the diagnosis of leptospirosis, serotype ballum.

### Epidemiologic Investigation

The patient lives with his wife and three daughters, aged 9, 11 and 13 years, none of whom has had a similar illness. He denied any known contact with dogs, rats, or other animals while on duty as a parole officer. He had no history of swimming or of outdoor camping or hunting before the onset of illness. About two months before he became ill he had had contact with a sick dog at the home of his parents in Denver. A serum specimen obtained from the dog by the Colorado State Department of Health in mid-September 1971 was negative for all types of *Leptospira* antigens. The patient's own household had a pet cat, a parakeet and two pet white mice. The mice, which had been purchased at a local pet shop May 13 1971, were clinically well and housed in a cage. All members of the family took part in cleaning the cage and handling the mice. The mice were killed on September 14 1971, and examined at the County of Los Angeles Veterinarian's Office. Histopathologic examination of sections stained by hematoxylin and eosin revealed nephritis in both. Warthin's silver impregnation stain of renal sections revealed many leptospirae. Organisms from fresh kidney tissue were cultured on Vervood's medium and then inoculated into

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three guinea pigs. Serum specimens taken from the guinea pigs before inoculation and two weeks later were examined for antibodies to ballum and five other serotypes. A titer rise from negative to 1:48 against ballum was found in two of the three animals; the titer against the other five serotypes remained negative.

The pet shop owner stated that during May he had purchased mice from four persons who raised small litters for sale. Two of the four suppliers could not be traced. Two mice obtained from one of the available suppliers were killed and examined. They had normal kidneys free of leptospire on histopathologic examination. A brown mouse obtained from the other supplier had leptospire in the renal tubular epithelium. A serum specimen taken from that mouse was positive for antibodies to ballum at a dilution of 1:196. Serum obtained from the man and woman who owned this mouse were tested and showed no titer for leptospira antibodies.

On September 18 and October 2 1971 serum samples were obtained from the four members of the patient's family. All were negative for leptospira antibodies. The patient, when asked why he rather than other members of his family might have become ill, speculated that one of his daughters, after an argument, had used his toothbrush to clean the mouse-cage. The patient did not become aware of this until September. His daughter could not recall the exact date the toothbrush had been used in this way, but the best estimate appeared to be between the middle and the end of July.

## Discussion

The patient experienced a biphasic disease which was compatible with the textbook description of leptospirosis.<sup>2</sup> At first he had fever, rash, myalgia and gastroenteritis, which disappeared by the sixth day of illness. A month after the onset, he had a second phase consisting of fever, orchitis, headache and myalgia that lasted three days. Symptoms subsided each time shortly after the initiation of antibiotic therapy. This may have been coincidental, as the efficacy of antibiotic treatment initiated later than the second day of illness has not been proved.<sup>2</sup> The elevated SGOT and serum alkaline phosphatase are also compatible with the diagnosis.

Between 1947 and 1970, only 16 cases of ballum infection in humans were recorded in the United States.<sup>3-6</sup> Eight of these occurred at one

laboratory.<sup>5</sup> Detailed clinical descriptions of only five of the 16 cases are available in the literature.<sup>5,6</sup> In all five the patients had orchitis, a symptom not generally associated with leptospirosis. Orchitis occurred during the initial phase of the disease in one patient, while the other four had it during the second phase. All five contracted their illness through contact with laboratory mice. The patient in the present case is the first known to have become infected from contact with pet mice. Rats and mice are the common animal hosts for ballum, although the infection has been found in opossums, skunks, rabbits, foxes and wildcats.<sup>7</sup> The infection in mice and rats is inapparent and often persists for life.<sup>8</sup> Several colonies of laboratory mice have been found to harbor the organism.<sup>5,8</sup> However, no estimate is available as to the general carrier rate among laboratory and pet rodents within the United States. As the disease in humans is often difficult to diagnose, the incidence among owners of such animals and among laboratory workers may be much higher than is suspected.

## Summary

A patient was recently treated in a hospital in Los Angeles County, California, for an illness clinically resembling leptospirosis. Laboratory tests were diagnostic for the serotype *Leptospira ballum*. Epidemiologic investigation revealed the source to be the patient's two pet white mice. This case is only the sixth of *L. ballum* in humans described in detail in the United States literature. The five others were contracted through contact with laboratory mice. Since the diagnosis of leptospirosis in humans is often difficult to make, it is possible that the risk to laboratory workers and owners of pet mice might be greater than is currently thought. No estimates are available as to the carrier rate among laboratory rodents in the United States.

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