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## Canine, Murine, and Human Leptospirosis in California.

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In March, 1936, Dr. S. T. Michael of the hospital of the Society for the Prevention of Cruelty to Animals solicited assistance in the diagnosis of a highly fatal malady which affects with increasing frequency the older dog population of San Francisco and vicinity. Unfortunately, only dead animals or dogs in a moribund state were available until early in 1937. The examinations were consequently limited to autopsies, search of the tissues stained by the silver method, and attempts to isolate from the heavily contaminated organs by guinea pig passages, the leptospira readily demonstrable in dark field preparations of the kidneys, the spleen and occasionally the blood. The postmortem findings made on 67 dogs arranged themselves into 2 groups: the *Icteric Type* (24 females and 9 males), which corresponds to the so-called Weil's disease or "yellows" or canine jaundice observed in England by Okell, Dalling and Pugh,<sup>1</sup> and in Holland by Klarenbeek,<sup>2</sup> and the hemorrhagic type (27 females and 9 males) resembles greatly the Stuttgart disease or dog typhus.<sup>3</sup> Although leptospiras have been demonstrated in the kidneys and occasionally spleen, liver and blood, both in dark field preparations and in properly stained sections prepared from cadavers belonging to both types, cultures have only been obtained directly from the blood of 6 dogs which were definitely jaundiced. Contrary to the impressions conveyed by published reports, the isolation of these spirochaetes was connected with great difficulties since the organisms produced transitory non-fatal infections in very young guinea pigs. On passage the infectiousness was occasionally enhanced but the rodents rarely died, and then in exceptional instances with icterus or hemorrhages. One additional strain was secured in this manner. Since neither the original tissues from 40 dogs nor several of the pure cultures infected white mice and rats.

<sup>1</sup> Okell, Dalling, and Pugh, *Vet. J.*, 1925, **31**, 3; *Brit. Med. J.*, 1925, Feb. 7, 266; *Proc. Roy. Soc. Med.*, 1925, **18**, 17.

<sup>2</sup> Klarenbeek, *Tijdschr. v. Diergeneesk.*, 1935, **62**, 1182; *Twelfth Int. Vet. Congress, New York*, 1934, **3**, 349.

<sup>3</sup> Wirth, D., *Tierärztl. Bundschau*, 1935, **41**, 609; Lukes, J., *Prag. Arch. f. Tiermed. u. vergleich. Pathol.*, 1926, **6**, 233.

it was suspected that the leptospiras were probably different from the classical *Leptospira icterohaemorrhagica*. They were sent to Prof. W. A. P. Schüffner of the Section of Tropical Hygiene in the Royal Colonial Institute, Amsterdam, for a comparative study. He very kindly reported that the strains are identical with *Leptospira canicola*. That this type of spirochaete is the causative agent of the dog disease and probably widely distributed is further proven by the positive serum reactions (1:10,000) in a recovered dog from Northern California, and of a police dog (1:300) with renal lesions remarkably similar to those described by Dhont, Klarenbeek, Schüffner and Voet.<sup>4</sup> The California canicola leptospirosis is complicated by icterus and in this respect differs from that seen in Holland. It is repeatedly noted in the Dutch publications that jaundice is not observed in the *Leptospira canicola* infections of dogs or human beings who accidentally contract this spirochaetosis.

The history of a veterinarian, who infected himself while caring for dogs with leptospirosis and whose blood agglutinated in the eighth month after recovery *Leptospira canicola* in a dilution of 1:300 and *Leptospira icterohaemorrhagica* in a dilution of 1:30 (Prof. W. A. P. Schüffner), records a definite icterus and nephritis. According to Schüffner and Walch-Sorgdrager<sup>5</sup> and Esseveld,<sup>6</sup> *Leptospira canicola* infections may escape detection, since they are not complicated by icterus and masquerade occasionally with meningeal signs as a malady clinically distinct from Weil's disease. The experiences in Holland leave no doubt that the *Leptospira canicola* infections of the dog are frequently followed by a chronic nephritis accompanied by a urinary shedder state. With a relatively wide distribution of this canine disease transmissions to man may be anticipated.

Classical Weil's disease with jaundice in sewer workers and a gardener has been diagnosed in San Francisco with the aid of the usual serological methods. The sera specifically agglutinated or lysed *Leptospira icterohaemorrhagica*. Since the source of this type of leptospirosis is invariably the rat, surveys as to the extent of murine renal spirochaetal infections have been made with the assistance of the San Francisco Department of Public Health and the laboratory for plague suppressive measures, U. S. Public Health

<sup>4</sup> Dhont, Klarenbeek, Schüffner, and Voet, *Nederl. Tijdschr. v. Geneesk.*, 1934, **78**, 5197.

<sup>5</sup> Schüffner and Walch-Sorgdrager, *Bull. de l'Office internat. d'hyg. pub.*, 1937, **29**, 297.

<sup>6</sup> Esseveld, Thesis, Amsterdam, 1937.

Service. At random examinations of the kidneys of 420 rats (*Mus norvegicus*, *M. alexandrinus* and *M. rattus*) in dark field preparations yielded positive leptospira findings in 139, or 33%. In the vicinity of a stable, 42 of 44 old Norvegicus rats have been found infected. Twenty-two strains have been isolated by guinea pig passage. They all produced fatal infections with icterus on the first, second or third passage. Both the pathological effect and the serological tests in part conducted by Prof. W. A. P. Schüffner identify the rat spirochaetes as *Leptospira icterohaemorrhagica*. Since these preliminary observations have thus far failed to demonstrate *Leptospira canicola* in the rat population, one is justified in concluding that the host relationship of the two spirochaetes recognized in California is the same as in Holland. It has been repeatedly emphasized by Schüffner and Klarenbeek that the dog, the only reservoir for *Leptospira canicola*, causes aberrant human infections. On the other hand, the rat reservoir of *Leptospira icterohaemorrhagica* is equally the source of infections for both man and dog. Canine Weil's disease due to *Leptospira icterohaemorrhagica*, which spreads independently of exposure to rats by simple contact from dog to dog, has not as yet been identified in the United States.

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## Effect of Prontosil on Blood Cells.

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Despite the now voluminous literature on sulfanilamide and prontosil, little has been recorded on the cytological changes in blood or tissues taken from animals given doses of this drug over a prolonged period of time. In order to evaluate the tissue changes following administration of prontosil, the following experiment was undertaken with a desire to demonstrate the cytological changes in parenchymatous organs during the administration of moderate doses of the drug, and to follow the changes in the cellular elements of the blood throughout the experiment.

For this purpose, 12 rabbits were chosen of equal size and age, weighing 1200 gm. apiece. These were mixed males and females