SEROVARS AND RENAL PATHOLOGY OF LEPTOSPIROSIS IN DOGS, CATTLE AND WILD RATS, AND ITS PATHOGENESIS IN A GUINEA PIG MODEL

A THESIS SUBMITTED IN PARTIAL

FULFILLMENT OF THE REQUIREMENT

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CERTIFICATION

I certify that this work was carried out by **Dr. O. L. Ajayi** at the Department of Veterinary Pathology, University of Ibadan, Ibadan, Nigeria, under my supervision.

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DEDICATION

This work is dedicated to the great God of heaven, the giver of life and understanding. As Richard Baxter rightly put it when he said "Nothing can be rightly known, if God be not known, nor is any study well managed, nor to any great purpose, if God is not studied. We know little of the creature, till we know it as it stands related to the creator: single letters, and syllables uncomposed, are no better than nonsense and he who overlooked Him who is the Alpha and Omega, the beginning and the ending, and sees Him not in all, who is the All of all do not see at all. Such creatures are broken syllables and they signify nothing".

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ABSTRACT

In recent years, mortality due to leptospirosis in dogs has been of major concern in Southwestern Nigeria, but the prevalent serovars, pathology and pathogenesis have not been fully documented. The purpose of this study was to investigate the disease in the dog and reservoir hosts (cattle and wild rats), and its pathogenesis and pathology in a guinea pig model.

Between 2003 and 2010, 44 fresh and 60 formalin-fixed kidneys of tentatively diagnosed cases of canine leptospirosis obtained at necropsy from the two Veterinary Teaching Hospitals in Southwestern Nigeria, fresh kidneys of 108 asymptomatic cattle and 105 wild rats obtained from abattoirs were investigated histopathologically and for the presence of leptospiral organisms using Ellinghausen-McCullough-Johnson–Harris (EMJH) medium, microscopic agglutination test with monoclonal antibodies (MAT-Ab), polymerase chain reaction (PCR), Warthin Starry silver stain (WSss), and immunohistochemistry (IH). The chronicity of the canine infection was determined by renal histopathology. Forty guinea pigs were experimentally infected with 10^7 *Leptospira interrogans* serovar icterohaemorrhagiae, while 20 served as controls. The clinico-pathological changes, pathogenesis and pathology were investigated by sacrificing at 12, 24, 72, 96, 120 and 168 hrs post infection (p.i.). Data was analysed using descriptive statistics.

Interstitial nephritis and tubular nephrosis were the most common renal lesions in dogs (88.4% and 76.7%), cattle (77.8% and 74.1%) and wild rats (62.9% and 67.6%), respectively. Leptospires were isolated from 84.1% dogs, 82.4% cattle and 68.9% wild rats. Serovars identified in dogs, cattle and wild rats were icterohaemorrhagiae (29.7%, 9.7%, 33.0%), pomona (18.5%, 3.2%, 23.8%), bratislava (11.1%, 22.6%, 4.8%), hardjo (0%, 29.0%, 0%), canicola (14.8%, 6.5%, 14.3%) and grippotyphosa (14.8%, 9.7%, 14.3%); unidentified isolates were 11.1%, 19.4%, 9.5% respectively. The virulence gene (285bp) was confirmed in

31.3% of canine, 81.8% of wild rat and 61.9% of bovine kidneys. The IH and WSss showed that in acute canine infections, leptospires were present in different renal tissues, but were only found attached to tubular epithelium in the more chronic infections. The guinea pig infection was characterized by anorexia, dullness, slight icterus, normocytic normochromic anemia, and thrombocytopenia. The detection of leptospires in different organs was time-dependent, but persisted only in the kidney after 120 hrs p.i. In the pancreas, the organism could only be detected by cultural isolation and PCR (12-72 hrs p.i.). Renal tubular necrosis and interstitial nephritis, hepatic necrosis and cord dissociation, pulmonary haemorrhages, acute pancreatitis, adrenal vacuolar degeneration, non-suppurative myocarditis and encephalitis were observed. Immunohistochemistry showed leptospiral antigens in the brain from 12-24 hrs p.i.

Icterohaemorrhagiae and pomona were the two most frequently isolated serovars from canine leptospirosis in Southwestern Nigeria. Structural localisation of the organism within the kidney may be an indication of the stage of infection. Renal lesions of leptospirosis were present in asymptomatic reservoir hosts. In addition to the well documented renal, hepatic, and pulmonary pathology, lesions of leptospirosis were also found in several other organs.

Keywords: Leptospiral serovars, Renal pathology, Reservoir hosts

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