FELINE LEPTOSPIRAL INFECTION :

with particular emphasis on

leptospira interrogans serovar *ballum*.

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SUMMARY

Different aspects of feline leptospirosis including a study of the bacteriology, serology, histopathology and clinical pathology were investigated by inducing experimental infection by the oral and intraperitoneal (I.P.) routes.

Experimental inoculation with five of the six *Leptospira interrogans* serovars which are known to exist in New Zealand, revealed a symptomless infection in cats. A carrier state developed with *pomona* and *ballum* whereas with *hardjo* and *tarassovi* the infected cats showed only a serological response. A cat inoculated with *balcanica* did not respond, even serologically, to infection. Susceptibility of cats to different serovars was thought to be due to individual cat variation.

A further series of experiments was conducted, infecting cats with serovar *ballum*. The infectivity studies using two-fold increases in dose from 10^2 to 10^8 by the oral route established a carrier state in cats given more than 10^2 leptospires. Three cats with urinary carrier states did not have a detectable micro-agglutination (M.A.) titre at the time of euthanasia two and three weeks post-infection (p.i.) and there was a decrease in the titre with lowering the infective dose.

The longest duration of the carrier state was 122 days after oral infection and this was obtained with an infective dose of 10^8 leptospires. Leptospiruria commenced at 13 days p.i. A direct correlation between serological titre and urinary carrier state was hypothesised after demonstrating a consistently high titre in one cat which was related to a long duration of leptospiruria and observing in another cat a low titre which disappeared by the 12th week p.i. and in which no leptospiruria could be detected. Serological response in the cat consists of the

primary production of IgM and subsequent establishment of IgG and this latter immunoglobulin appeared to be related to the carrier state.

Comparative studies of histological, serological and cultural findings revealed that the I.P. route of infection produced more severe infection than the oral route. Leptospiraemia was detected after the same time interval for both routes with the longest duration being seven days in an intraperitoneally infected cat. Leptospires were recovered from some lymph nodes and the brain only during the leptospiraemic phase.

All the cats had M.A. titres by the 10th day p.i. and higher initial titres were recorded in the cats infected by the I.P. route. By the third week p.i. the M.A. titres of the cats infected by the oral route reached the same level as those infected by the I.P. route. Elevation of rectal temperature coincided with the first isolation of leptospires from urine and kidney seven to nine days p.i. There was also a concurrent decrease in specific gravity of urine. This was thought to be due to invasion of the kidneys by leptospires and consequent tissue damage.

Histological studies showed disseminated foci of fatty change in the straight portion of proximal tubules in the inner cortex of the kidney one week p.i. Infiltration of lymphocytes occurred around the urinary tubules two and three weeks p.i. and early tubular necrosis was seen by the fourth week p.i. These histopathological changes are related to the migration of the leptospires into the kidney, invasion of the tubules by these organisms and subsequent reaction of the host.

Prey-predator transmission studies showed that more severe infections were produced in cats when small portions of infected mice were fed as compared with feeding whole infected mice. This is most

likely to be due to the longer contact of infected ingesta with the pre-gastric portion of the alimentary tract. All the cats showed 0.5 to 1 degree elevation of temperature 9-12 days p.i. which appeared to be due to the kidney invasion and related tissue damage by leptospires. Neutrophils were first seen in foci of interstitial nephritis at 47 days p.i. in addition to lymphocytes, macrophages and plasma cells. Duration of leptospiraemia was longer in the cats infected with the smaller portions of ingesta (infected mouse kidneys and bladder) than in the cats infected with whole infected mice.

No inhibitory effect was observed using the growth inhibition test even when the serum had a very low M.A. titre, these results are different from those obtained in other animals. Gel filtration tests on serum samples of the infected cats showed the specific antibody to be comprised of IgM and IgG in those cats which showed kidney lesions histologically, but in the cats with no detectable kidney lesions the only immunoglobulin detected was of IgM class. In all these experiments the cats showed a rapid decline in their M.A. titres after reaching a maximum level.

A serological survey of 225 cats from various sources in the North Island using 11 live leptospiral serovar antigens detected 25 (11.11%) of sera with an M.A.T. of 1/12 or greater. The prevalence of serological reactions to the different serovars which exist in New Zealand was determined. These were as follows: eight (3.55%) to *ballum*, six (2.55%) to *copenhageni*, five (2.22%) to *hardjo*, four (1.77%) to *pomona*, two (0.88%) to *balcanica* and one (0.44%) to *canicola*. No *tarassovi* titres were recorded at 1/12 or greater.

It is of interest that titres to *ballum* and *copenhageni* showed the greatest prevalence, both of which have rodents as their maintenance hosts. It is hypothesised that prey-predator transmission has been responsible for infection with these serovars, while with the other serovars direct contact with infected animals or a contaminated environment is presumed. There was no obvious relationship between the titre and the clinical disease as the majority of the cats with positive titres were apparently healthy. The results of this survey combined with experimental studies suggests that in feline serological surveys a low initial dilution should be used.

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