

LEPTOSPIROSIS IN PHILIPPINE MONKEYS

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INTRODUCTION

In the Philippines, leptospirosis is widely distributed in the animal population such as: rats, dogs and pigs (Alojipan 1961, Aragon *et al.*, 1965, Topacio *et al.*, 1971); carabaos, cattle and horses (Beran and Arambulo 1967; Topacio *et al.*, 1966; Carlos *et al.*, 1970) So far, the disease has not yet been reported in Philippine monkeys. The purpose of this paper is to present serologic evidence of leptospirosis in monkeys found in Philippine forests. Their close association with man makes them one of the possible sources of human infection. In the country, occupational leptospirosis has been associated with abattoir workers, farmers, fish handlers, garbage collectors and public work laborers (Famatiga *et al.*, 1972). However, people, both rural and urban, may also become directly or indirectly exposed to leptospiral reservoir of infection in the forests. Based on this report, monkeys can be one of the sources.

MATERIALS AND METHODS

Serum: The sera used in this study was part of ten-year (1960-1969) serum collection of the Virus Laboratory of the Institute of Public Health. The sera were preserved at -60°C .

Antigens: Live, 7-day-old cultures of the usual 13 leptospira serotypes were used. In addition, a local isolate belonging to pyrogenes group was also included.

Test: Microscopic agglutination test was employed in this study. Screening of the samples for leptospira agglutinins was done

at a 1:100 dilution. All the positives were further titrated.

The monkeys studied were caught in Bataan, Cavite, Davao, Zambales and Zamboanga, and grouped into two: A and B. Group A were those brought to the virus laboratory 2 to 3 days after their capture. Group B were those kept in captivity by the dealer for 1 week to 3 months before they were bought for use in the laboratory.

RESULTS

Out of the 132 samples tested, 13 or 9.84% showed agglutinin titers to leptospira serotypes. The results are shown in Table 1. The titers ranged from 1:100 to 1:3,000 against one or more of the following serotypes: *L. batavia*, *L. hyos*, *L. australis*, *L. pyrogenes*, *L. manilae*, *L. grippityphosa*, and *L. icterohaemorrhagiae*.

In 7 out of the 13 positives, monotypic antibodies were detected. The rest showed antibody titers to more than 1 serotype as presented in Table 2.

In both groups of monkeys, leptospira agglutinins were detected. Group A monkeys showed titers of 1:100 to 1:1,000 while Group B were found to have titers of 1:100 to 1:3,000.

DISCUSSION

In leptospirosis, titers up to 1:3,000 of single serum samples can hardly be interpreted as indicative of active infection. In fact even a 1:1000 agglutinin level may only be due to the presence of residual antibodies

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Table 1

Leptospira serotypes involved in 13 monkey sera positive for antibodies.

Positives	Reciprocal of antibody titers to leptospira serotypes						
	Bat	Hyos	Aust	Py	Ma	Grippa	Ict.
4	-	-	-	3000	300	-	-
8	3000	300	-	-	-	-	-
12	100	-	-	-	-	-	-
21	3000	100	-	-	-	-	-
58 ^a	300	-	-	-	-	-	-
60	300	300	-	-	-	100	-
63 ^a	-	100	-	-	-	-	-
65	1000	-	-	-	-	-	-
79 ^a	1000	300	-	-	-	-	-
156 ^a	-	100	-	-	-	-	-
158	-	-	100	-	-	-	-
7520	1000	-	-	-	-	-	100
J.L.	-	-	100	-	-	-	-

@ = these monkeys were bled 2 days after their captivity.

Bat = *L. batavia*; Aust = *L. australis*; Py = *L. pyrogenes*; Ma = *L. manilae*; Grippa = *L. grippotyphosa*; Ict. = *L. icterohaemorrhagiae*.

Table 2

The types of antibodies detected in the 13 monkey sera positives.

Monotypic	
<i>L. batavia</i>	3
<i>L. hyos</i>	2
<i>L. australis</i>	2
Heterotypic	
<i>L. batavia, L. hyos</i>	3
<i>L. batavia, L. hyos, L. grippa</i>	1

due to past infection. It has been shown in man that leptospira agglutinins persist for 5 years or more at detectable level of 1:100 (Cockburn *et al.*, 1954; Famatiga, 1970), and for at least 6 and 15 months at titers of 1:1000 and 1:300 respectively (Famatiga, 1970).

Higher titers like 1:3000 and above in both man and animal can be interpreted as indicative of active infection. The detected titers therefore in monkeys included in this study

mean that Philippine monkeys are being infected with the leptospira serotypes in their natural habitat as well as while in captivity. Group A monkeys which were bled almost soon after their capture only showed residual antibodies to leptospira serotypes. Recent past infection before its capture may explain the titer of 1:1000 in one of the positives in this group.

Group B monkeys were kept in captivity for a long period of time, hence higher titers were detected in some of them. The agglutinins shown by the positives are either residual antibodies or antibodies because of active infection. Infection during their captivity is not remote since their food and water supplies can easily get contaminated with the leptospira. One of the possible sources of contamination is rat's urine. It was highly suspected that the 3 monkeys with 1:3000 titers shown in Table 1 got infected with one of the serotypes after their capture. However, it can not be ignored that the same monkeys

were shown positive also for antibodies against other serotypes at lower levels. Although cross reaction occurs between members of the same groups like *L. manilae*, and *L. pyrogenes*, it is hard to believe that it happens between members of different groups like *L. batavia* and *L. hyos*, and *L. icterohaemorrhagiae* or *L. grippotyphosa*. In those cases where cross reaction is remote, the most probable explanation for the presence of agglutinins to more than one serotype is multiple infections. Such reactions are also shown by the positives in Group A.

Table 2 presents the types of antibodies detected among the positives. There is no significant difference in the pattern of antibody types found in both groups to indicate where the infections occurred, during captivity or in the forests. In both groups of monkeys positive for leptospira agglutinins monotypic and heterotypic antibodies were detected. Again the explanation could be any of the following: (1) antigenic cross reaction, (2) multiple infection, (3) repeated infection with different serotypes.

SUMMARY

In 9.84% of 132 monkeys studied, agglutinins to *L. batavia*, *L. hyos*, *L. australis*, *L. pyrogenes*, *L. manilae*, *L. grippotyphosa* and *L. icterohaemorrhagiae* were detected. Monotypic and heterotypic antibodies were shown among the 13 positives. There is a strong evidence indicating that monkeys in Philippine forests are getting infected in their natural habitat.

ACKNOWLEDGEMENTS

The author would like to express deepest gratitude to Dr. Lourdes E. Campos who made this study possible, and for providing the Virus Laboratory monkey serum collection and the Department's supplies and materials used in this study.

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