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Chlamydia (Psittacosis) Antibody Study in White-tailed Deer[1]

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ABSTRACT

Deer sera collected during special post-season hunts were tested for group antibody to *Chlamydia* (psittacosis-human pneumonitis) antigen by the complement-fixation test. The deer came from one area in Quebec Province and two areas of New York State. Over 50 percent had complement-fixation titres greater than 1 to 16. Results of these tests are given along with a discussion of their probable implications in wildlife and human health.

Although human illness resulting from a disease of birds has been recognized for over 80 years, [1] only within the last thirty years has disease caused by *Chlamydia* organisms [2] been recognized in domestic animals and wildlife other than avian species. Organisms of the Chlamydial group were isolated from the feces of normal sheep[6,2,25] and from the feces of normal cattle.[27,24] Various disease entities in domestic animals caused by these agents are: in cattle, sporadic bovine encephalomyelitis,[9] pneumonitis,[7] epizootic abortion[14,5] and polyarthritis;[21] in sheep, enzootic abortion,[18] pneumonitis[8] and polyarthritis;[10] and in pigs, fibrinous pericarditis [4] and enzootic pneumonia.[16,22] Agents of this group have been isolated also from wildlife: opossums (*Didelphis marsupialis*),[13] muskrats (*Ondatra zibethicus*), snowshoe hares (*Lepus americanus*),[17] and fur seals (*Callorhinus ursinus*).[3]

Storz[19] showed the affinity for placental tissue by members of the Chlamydial group from differing sources by inducing abortion in ewes inoculated with these agents isolated from clinically normal sheep.[20] Dungworth and Cordy[2] induced similar lesions in the lungs of sheep by inoculating fecal, abortion, and pneumonitis strains. Pan[12] induced pneumonitis in pigs with the sheep pneumonitis strain, and Omori et al[11] produced pneumonitis lesions in goats and pigs with a bovine encephalomyelitis strain. Dungworth and Cordy[2] postulated that the agents found in sheep feces are identical to those causing pneumonia and abortion in sheep, and this is supported by the work of Storz.[20] Wilson,[23] with a serum neutralization test in eggs, classified ten strains of cattle and sheep Chlamydial agents in three groups: (1) cattle fecal; (2) sheep fecal and sheep pneumonitis; and (3) abortion. How-

[1] Presented at the Annual Meeting of the Wildlife Disease Association, University of Illinois, Urbana, Illinois, June 15-16, 1967.

[2] The Subcommittee on the Chlamydiaceae of the Taxonomy Committee of the American Society for Microbiology recently approved the inclusion of the Psittacosis-Lymphogranuloma venereum-Trachoma group of bacterial agents in one genus, *Chlamydia*.

[3] Psittacosis-Human Pneumonitis, Markham Laboratories, Chicago, Illinois.

[4] Standard positive human sera, Markham Laboratories, Chicago, Illinois.

ever, members of the sheep strains he studied could induce pneumonia or abortion.

There have been no reports of isolations of Chlamydial agents or the detection of complement-fixing antibodies to these organisms in white-tailed deer (*Odocoileus virginianus*). Results of tests of deer sera for *Chlamydia* antibodies with a group antigen are presented here.

MATERIALS AND METHODS

Deer Sera

Deer sera were collected during special post-hunting seasons. The following are general descriptions of the areas from which sera were collected:

Anticosti Island, located at the mouth of the St. Lawrence River is a privately owned island in the Province of Quebec, Canada. It has approximately 3100 square miles and an estimated deer population of 30 to 50 deer per square mile. Serum samples were collected between February 23 and March 19, 1966.

Seneca Army Depot is a United States government installation in central New York State of 15.4 square miles. The estimated deer population is 40 per square mile. Deer were collected on January 8, 1966 and January 7 and 14, 1967.

Lordville is a wintering deer yard situated in Delaware County, New York. The hunting area is about 25 square miles, all of which, however, is not used. It is estimated that in the winter the deer population may be 100 or more per square mile with about 75 percent coming from Pennsylvania. This area was hunted between January 10 and 14, 1966.

Dutchess County, where the pertinent area is known as the Clove Valley, is a wintering deer yard with an approximate ten-mile radius. The hunting area consists of about 40 square miles and the deer population is approximately 40 per square mile. This area was hunted on January 30 and 31. 1967.

Antigen

A commercial group antigen supplied in liquid form[3] was used for the complement-fixation test. It is prepared from eggs inoculated with the human pneumonitis agent.

Complement-Fixation Test

The complement-fixation test was performed by the microtiter method[18] with 0.025 ml. of each reagent. Antisera were heated at 56° C. for 30 minutes and two minimum hemolytic doses of preserved guinea pig complement were used. Fixation of complement was effected at 37°C. for 90 minutes before addition of the hemolytic system. The controls were a commercial standard control serum[4] and known positive serums kindly supplied by Dr. Storz, Colorado State University. The serum titer was considered as the dilution of serum with which greater than 50 percent hemolysis (2+ fixation) occurred.

RESULTS AND DISCUSSION

The results of the complement-fixation tests for *Chlamydia* antibodies are given in Table 1. Serum samples with anticomplementary reactions were discarded. A complement-fixation titer of 1:16 or higher was considered positive. Serum dilutions were carried out as far as necessary for fixation, but the highest dilution giving a positive result was 1:512.

Isolation of *Chlamydia* agents was not attempted because at the time of collections we were unaware of the high titers to the group antigen. Except for a few deer observed to have greatly enlarged spleens, the animals appeared in fair health. The cause of these enlarged spleens in under investigation.

Since the results of the tests are based on only one serum sample per animal, the state of infectivity is unknown. Also unknown is which agent (or agents) in the group is involved. A significant number of deer sera, however, had high titers to *Chlamydia* antigens.

Little can be said as to comparative antibody titers in the years 1966 and 1967, since the Seneca Army Depot area was the only area sampled in each year. The 23 percent positive sera at Anticosti Island in 1966 has no comparison for 1967. However, the sharp decrease in positive sera at Seneca, from 84.7 percent in 1966 to 31.1 in 1967, suggests some significance in the difference between Lordville in 1966 with 88.4 percent positive sera and Dutchess County in 1967 with 6.4 percent. These latter two areas are in southern New York, 70 miles apart.

There is no apparent significant difference in the number of positive sera by age or sex. The number of positive re-

TABLE 1. *Results of the complement-fixation tests for* Chlamydia *antibodies in deer sera collected from Anticosti Island, Quebec and New York State.*

	Total Tested	Total Negative	Total Positive	Serum Dilutions 1/16		1/64		1/256	
					1/32		1/128		1/512
Anticosti Island, Quebec	74	57(77%)	17(23%)	7	1	3	1	3	2
Lordville, New York	124(12)*	13(11.6%)	99(88.4%)	21	24	15	27	11	1
Seneca Army Depot 1966	59(3)	9(15.3%)	50(84.7%)	6	7	16	14	7	0
Seneca Army Depot 1967	154	106(68.9%)	48(31.1%)	22	12	11	3	0	0
Dutchess County, N.Y.	126	118(93.6%)	8(6.4%)	4	2	0	2	0	0

* Numbers in parenthesis refer to sera that were anticomplementary and not tabulated in the results.

actors follows closely the total number of deer taken in each age and sex class in the areas studied in both years.

The presumptive evidence of changes in incidence from year to year and the differences in incidence from one area to another suggest the desirability of continued epizootiologic investigation. Since Chlamydial agents have been isolated from feces of clinically normal domestic ruminants, the same factors may play a part in wild ruminants. The antibody titers of sheep and cattle with enteric infection, however, are usually much lower, rarely above 1:64. The findings reported here may represent a systemic infection not readily noticed by gross postmortem examination, resembling the findings of Wilson and Plummer[26] in pigs.

The large number of positive reactors and the wide range of high titers warrants continued investigations of whitetailed deer to determine which agents are involved and what effect these may have on deer, other animals, and man.

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