

MICROSPORIDA OF THE GENUS PARATHELOHANIA OCCURRING
IN THREE SYMPATRIC SPECIES OF MOSQUITOES, CULISETA INORNATA,
CULEX PIPIENS AND CULEX TERRITANS IN SOUTHERN ILLINOIS

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ABSTRACT — Microsporida of the genus Parathelohania were found in the adipose tissue and haemocoels of three sympatric species of larval mosquitoes, Culiseta inornata, Culex pipiens and C. territans, from southern Illinois. Because the number of characters for separation of species were few and the intraspecific variation was extensive, accurate identification was extremely difficult. Comparison of mean spore size was considered the most reliable character. Microsporida from all three hosts resembled P. opacita morphologically and showed no significant statistical difference in spore size. Specimens from all three hosts were identified as P. opacita. New host records were established for Culiseta inornata and Culex pipiens. A new locality record was established for P. opacita infecting C. territans.

INTRODUCTION

Microsporidan parasites have been reported from each of the mosquitoes Culiseta inornata, Culex pipiens and C. territans of North America. Parathelohania inimica was described from Culiseta inornata from California by Kellen (1962) and later reported from the same host in Louisiana (Chapman, 1966). Culex pipiens has been reported as the host of Stempellia magna in Illinois (Kudo, 1920). Parathelohania opacita has been reported from Culex territans in Louisiana (Chapman, 1966), New York and Alabama (Kudo, 1924) and Connecticut (Anderson, 1968). Culex territans was also found parasitized by S. magna in Pennsylvania (Kudo, 1921), Pleistophora chapmani in Louisiana (Clark, 1971) and Pleistophora sp. in Louisiana (Chapman, 1966).

Microsporidans are difficult to identify positively as there are few known taxonomic characters. Thompson (1960) clarified much identification by demonstrating the invariability of spore size of a microsporidan species in several host species. This character depends upon accurate measurement of spore size and calculation of means in a set way. Useful comparison cannot be made between a set of extremes given by the author of the species and the mean and standard error of subsequent investigators. Inasmuch as comparison for identification must be made from the author's measurements or type material, positive identification depends upon the amount of variation the later worker considers acceptable.

MATERIALS AND METHODS

During May, 1972, mosquito larvae were collected from a pond-overflow area on the Southern Illinois University campus at Carbondale, Illinois. In the laboratory the mosquito larvae were placed in white enamel trays and observed for infections. Larvae appearing abnormal in shape, color or behavior were identified by utilizing the keys of Ross (1965), smeared on microscope slides, air dried, fixed in absolute methanol for 1 minute and stained in a 1:3 solution of Giemsa's stain and buffer solution for 5 minutes.

All spores were examined under a compound light microscope (1000X), and forty spores were measured from each of the stained smears with the aid of an ocular micrometer. The analysis of variance technique at the 0.01 level of significance was applied to the measurements for statistical comparison.

RESULTS

A total of ten fourth instar larvae and one pupa of Culiseta inornata, one fourth instar larva of Culex pipiens and one fourth instar larva of C. territans were found to be infected with a species of Parathelohania. All infected hosts came from the same temporary pool, a tire track about 8 inches deep, in the overflow area.

Table 1 shows the measurements of the stained spores, and the measurements of stained P. opacita of Anderson (1968). All the spores were similar in morphology, except for a few in each population without a truncated end. All are in the general size range of P. opacita, and the extremes of each population of spores are nearly the same; they approximate the 5.5-4.5 x 4.0-3.3 μ m extremes described by Kudo (1924) in C. territans. There was no statistically significant difference between the means of the spores in the four representative Culiseta inornata populations (Table 1), the Culex territans population and the C. pipiens population. These spores are all similar in morphology to those microsporidan spores identified as P. opacita by Weiser which were made available by the Department of Pathobiology of the University of California, Irvine.

In all cases the infection occurred in the adipose tissue and had filled the haemocoel with spores and pansporoblasts. The spores poured out when the body cavity was opened.

The Parathelohania collected from the three species of mosquitoes is P. opacita. This identification is based on spore size and shape. These findings establish new host records for P. opacita in Culiseta inornata and Culex pipiens. A new locality record is established for P. opacita infecting C. territans.

DISCUSSION

The experiments of Thompson (1960) suggest very little variation in spore size between host species. The data of Bailey (1967) show a continuation of mean spore sizes in populations of P. inimica (s. str.) and P. inimica canadensis between two statistically different extremes by placement of samples in an order in which adjacent spore measurements were not found to be significantly different (using the "t" test to compare adjacent pairs). The analysis of variance technique used in this study is a more robust test than the "t" test and at the stringent 0.01 level of significance accounts for both biological and artificial variation among the spores in a population. There may be a relatively large amount of variation within species of Parathelohania and little host specificity, as shown by Hazard (1968) in a redescription of P. legeri. The correlation between statistical variation and biological variation is not clear. The identity of many species of Parathelohania will be doubtful until a redescription of P. opacita is made and more biological data accumulated, particularly by an oral infection technique for Parathelohania.

TABLE 1. — Measurements of Fixed Spores of Parathelohania opacita. n = 40

Host	Length μm		Width μm	
	Extremes	Mean	Extremes	Mean
<u>Ca. inornata</u> (Illinois)	6.0-4.4	5.02 \pm 0.06 ¹	4.2-3.0	3.90 \pm 0.04
<u>Ca. inornata</u> (Illinois)	6.0-4.0	5.00 \pm 0.07	4.4-2.8	3.80 \pm 0.07
<u>Ca. inornata</u> (Illinois)	6.1-4.0	4.90 \pm 0.08	4.4-3.0	3.70 \pm 0.08
<u>Ca. inornata</u> (Illinois)	6.0-4.0	5.04 \pm 0.05	4.4-3.0	3.80 \pm 0.05
<u>C. territans</u> (Illinois)	5.4-4.2	4.90 \pm 0.06	4.2-3.0	3.80 \pm 0.04
<u>C. pipiens</u> (Illinois)	6.0-4.0	5.20 \pm 0.06	4.8-3.0	3.80 \pm 0.06
<u>C. territans</u> ² (Connecticut Anderson, 1968)	—	5.30 \pm 0.13	—	4.10 \pm 0.06

¹ Standard error of the mean

² n = 100

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