

To justify the above new taxon, comparison with other known uniseptate species has been made as in table 1.

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### HOST-PARASITE RELATIONSHIP: POSTHELMINTH INFECTION MUSCLE PROTEIN CHANGES IN BAT, *HIPPOSIDEROS SPEORIS*

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THE posthelminth infection macromolecular content changes were substantially worked out at the site of infection<sup>1-4</sup>, and even in uninfected organs like liver<sup>5,6</sup> and blood<sup>7-10</sup>. In view of the meagre information regarding the posthelminth infection changes

on the macromolecular contents of muscular tissue, it was thought worthwhile to investigate the protein and protein fraction contents in the thigh, flight and cardiac muscles of *Hipposideros speoris* during the intestinal infection with *Prosthodendrium dinanantum*<sup>11,12</sup>.

The hosts of the present study were caught from Pakhal and starved for a day. Animals of uniform body weight were decapitated and the intestines were screened for helminth infection. In the isolated thigh, flight and cardiac muscle tissue, the total protein content was determined by the method of Lowry *et al.*<sup>13</sup> and protein fractions were assayed by the method of Helander<sup>14</sup>.

The results presented in table 1, indicate the drastic decrease in the content of total proteins, sarcoplasmic, contractile and stroma fractions in all the three types of muscle tissue of the present investigation, during helminth infection.

The decrease in the total protein content in the infected liver was reported during fascioliasis<sup>3</sup> in cattle and opisthorchiasis<sup>15</sup> in dogs. Similar protein decrease in the muscular tissue of the present host, with intestinal infection suggests that the trematodes with their suckers attached to the intestinal wall interfere with the digestive and absorptive functions, thereby causing the depletion of proteins in the tissue and the

Table 1 Post-helminth infected muscle protein changes in bat, *Hipposideros speoris*

Muscle	Nature of study	Protein Fractions							
		Total	Proteins	Sarcoplasmic		Contractile		Stroma	
		1	2	1	2	1	2	1	2
Thigh	a	146.6	130.2	50.6	41.9	31.5	24.9	61.4	58.7
	b	±3.2	±1.6	±5.0	±4.8	±1.5	±0.5	±3.6	±3.8
	c	—	-16.4	—	-8.7	—	-6.6	—	-2.7
	d	—	-11.2%	—	-16.9%	—	-21.1%	—	-4.4%
	e	—	0.05	—	0.05	—	0.01	—	0.02
Flight	a	152.1	134.0	59.9	52.3	44.7	33.5	48.8	46.5
	b	±1.4	±1.7	±4.7	±2.8	±4.7	±4.2	±4.7	±4.8
	c	—	-18.1	—	-7.6	—	-11.2	—	-2.3
	d	—	-11.9%	—	-12.6%	—	-22.7%	—	-4.6%
	e	—	0.01	—	0.05	—	0.001	—	0.05
Cardiac	a	153.1	133.8	61.5	50.5	37.1	31.6	39.9	36.0
	b	±7.6	±8.3	±3.9	±4.1	±1.6	±3.5	±4.6	±3.7
	c	—	-19.3	—	-11.0	—	-5.5	—	-3.9
	d	—	-12.6%	—	-17.8%	—	-15.6%	—	-9.7%
	e	—	0.01	—	0.01	—	0.01	—	0.01

1 = Control 2 = Trematode infection

a = Content b = Standard error c = Change d = Percentage of change e = P' value  
(Values are expressed in mg/gm (mean of 10 samples ± S.E.))

organ systems of the host. It is also possible that nutrients may be withdrawn from uninfected tissues (like muscle) which has nutrient reserves next to liver. While tapping muscle for nutrients, the total content is uniformly decreased in all the three types of muscular tissues. The sarcoplasmic fraction is tapped to a greater extent from thigh and cardiac muscles. In flight muscles, the small decrease in the sarcoplasmic fraction may not interrupt the regular supply of energy for high frequency movements during the flight. In spite of infection, the contractile fraction is less decreased in the cardiac muscle of the host which is presumably an adaptive measure in host-parasite relationship.

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## ASSOCIATION OF TEMPERATURE WITH ESTABLISHMENT AND SURVIVAL OF PSEUDOPHYLLIDEAN CESTODES IN HILL-STREAM FISH

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PARASITOLOGICAL data on 3083 hill-stream fish of 6 genera and 12 species were collected during May 1979 through April 1981 in the two rain-fed rivers, Khoh (325–450 mASL) and Nayar (600–650 mASL) in the Garhwal Himalayan ecosystem. The water temperature at 7th day interval, and monthwise pH of river water were recorded during the period of study. Egg production and maturation of cestodes in hill-stream fish appeared to be a water-temperature associated phenomenon. *Polyonchobothrium armatii*<sup>1</sup> was the most prominent cestode (1979–80, 76.7%; 1980–81, 71.2%), while *Senga nayari*<sup>1</sup> showed the highest index of infection (1979–80, 6.7%; 1980–81, 44.8%). The parasite's optimum for egg production and maturation of cestodes was 26–27°C for *Bothriocephalus teleostei*<sup>1</sup> in *Labeo dero* (Ham.) and *Schizothorax plagiostomus* (Heck.), 16–20°C in *S. richardsonii* (Gray), 15–20°C and 23–27°C in *Barilius bola* (Ham.), the fish spawning twice a year during February–March and October–November; 20–26°C for *P. armatii* in *Mastacembelus armatus*; 24–26°C for *S. nayari* in *Mastacembelus armatus* (Lac.) and *M. pancalus* (Ham.); 15–18°C for *Ptychobothrium nayarensis*<sup>1</sup> in *B. bola* and *S. richardsonii*; and 17°C for *Mackiewiczia satpuliensis*<sup>1</sup> and *Guptaia garhwalensis*<sup>1</sup> in *S. richardsonii*. Range of pH of river water (in parentheses) during the infection period for different cestodes viz. *P. nayarensis* (7.8–8.6), *P. armatii* (5.4–9.4), *S. nayari* (5.4–9.4), *B. teleostei* (7.4–9.4), *M. satpuliensis* (8.5–8.6), and *G. garhwalensis* (8.5–8.6).

The suitable water temperature was between 16 and 27°C for egg production by the cestodes in fish of tropical streams in India while the optimum water temperature, 4.4–15.5°C for egg production by *Caryophyllaeus laticeps* in *Leuciscus leuciscus* L. and 4–18°C for the same cestode in *L. idus* were described from varying temperate regions<sup>2,3</sup>. Crane and Mizelle<sup>4</sup> reported population peaks of *Urocleidus ferox* (Mueller) in *Lepomis macrochirus* (Rafinesque) in California pond at 8°C; Rawson and Rogers<sup>5</sup> recorded temperature optimum as 9°C and 28°C for *U. furcatus*, *U. principalis* and *Actinocleidus fusiformis*, and 9°C for *Clavunculus bursatus* on largemouth bass