Acta Parasitologica, 1992, 37(4), 179–181
ISSN 1230-2821

75

Opisthorchis noverca Braun, 1902: First record from a bovine host and a comparative stereoscan study of the surface topography of flukes of swine and cattle origin

B. Roy and V. Tandon[1]

Department of Zoology, North-Eastern Hill University, Shillong-793014, India

Abstract. *Opisthorchis noverca*, a parasite of canine hosts and man, has been recovered from pigs on several occasions. One cow, of a total of 1012 slaughtered cattle, examined in Shillong, India, was found infected with this fluke along with a heavy infection of *Fasciola gigantica*. A comparative SEM study on the surface topography of the flukes originating from pigs and cattle revealed differences in the shape of the tegumental spines. *Opisthorchis* infection hitherto has not been reported from bovine hosts.

Introduction

Members of the genus *Opisthorchis* (syn. *Notaulus* Skrjabin, 1913; other synonyms - ref. Mehra 1980) are known to parasitize piscivorous vertebrates, as their infective metacercarial stage exists in piscine intermediate hosts (Yamaguti 1971, 1975). The natural definitive hosts for *Opisthorchis* spp. are dog, cat, rat, pig and man. Experimental infections are reported in guinea pigs, hamsters and rabbits (Yamaguti 1975). This communication presents a chance report of the occurrence of *Opisthorchis noverca* Braun, 1902 in the bile ducts of cattle. Differences in the surface topography of the flukes recovered from cattle and those from swine are also noted.

Material and methods

Morphological examination was carried on duly fixed and Mayer's carmalum stained specimens. For scanning electron microscopy (SEM), six specimens from each host were fixed in 4% cold buffered formalin (pH 7.2) for 12 h. Following primary fixation, the specimens were washed in phosphate buffer and post-fixed in 1% buffered $0s0_4$ for 1 h. Dehydration was carried out using an ascending series of acetone. After dehydration, the flukes were treated with tetramethyl silane following Dey et al. 1989, metal coated with gold and observed under a Joel JSM-35 CF electron microscope using accelerating voltages of 10-15 kV.

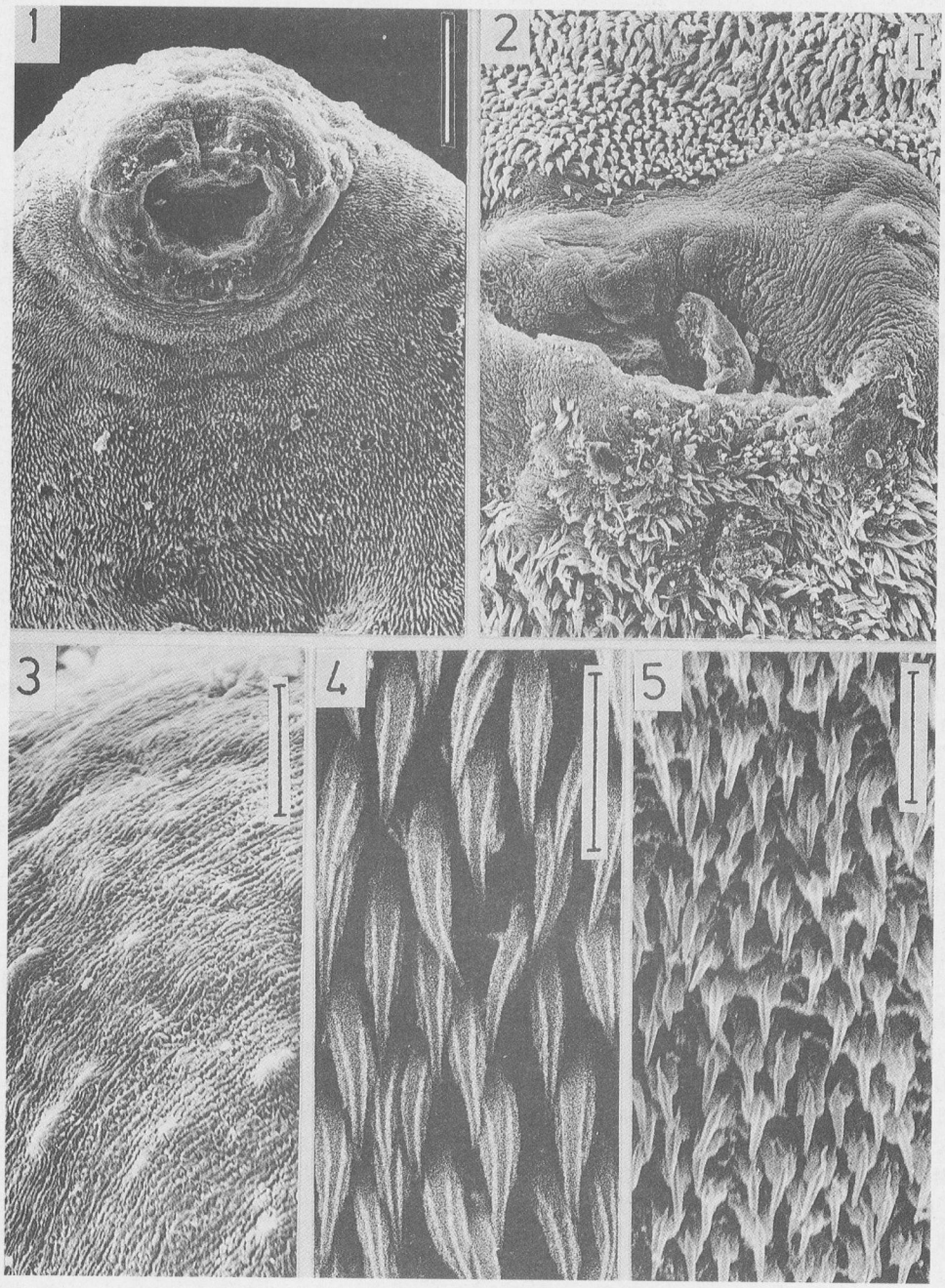
Results

During a three year survey of helminths in animals of food value in north-east India, *O. noverca* was recovered from the liver of pigs (*Sus scrofa domestica* L.) on several occasions. One cow, out of a total 1012 freshly slaughtered cattle (*Bos indicus* L.), examined at Shillong during this period, was found to harbour in its bile ducts 12 specimens of an opisthorchiid fluke along with a heavy infection of *Fasciola gigantica* Cobbold, 1855.

Specimens of *O. noverca* of pig and cattle origin appeared to be alike in gross morphology. Stereoscan observations on their surface topography, however, allowed certain differences in their tegumental spination to be resolved.

In specimens originating from both cattle and swine, almost the entire body surface, except the rim of the suckers and genital pore, is densely covered with, mostly, posteriorly directed spines (Figs. 1 and 2). In the flukes of swine origin the spines are elongate, somewhat foliate with a broader base, and gradually tapering to a needle point; two ridge-like markings converging towards the spine tip delimit a conspicuous medial surface area from the lateral areas which extend up to about two-thirds of the length of the spine (Fig. 4). In flukes of cattle origin

[1]Offprint request to V. Tandon.



Figs. 1–5. Surface topography of *Opisthorchis noverca* revealed by SEM. 1–4 – flukes of pig origin; **1** – circumoral area showing spination throughout ventral surface (scale bar = 100 μm); **2** – acetabular region (scale bar = 10 μm); **3** – a portion of the acetabular rim under higher resolution (scale bar = 10 μm); **4** – tegumental spines under higher resolution (scale bar = 10 μm); **5** – shovel-shaped tegumental spines in flukes of cattle origin (scale bar = 10 μm)

the spines are somewhat shovel-shaped, their basal half being rectangular with truncated distal edges and a median pointed prong extending from the basal plate and forming the handle of the shovel (Fig. 5). The tegument of the spine-free areas in both specimens is revealed as highly corrugated, depicting closely packed fine tuberculations under higher resolution; the rim of the ventral sucker has irregularly scattered dome-shaped aciliate papillae (Fig. 3).

Discussion

The tegument of a closely related opisthorchiid, *Opisthorchis viverrini*, is characterized by the presence of numerous microvilli and dome-shaped ciliate, as well as aciliate, papillae but is not described as possessing spines (Sobhon et al. 1986). Of the other hepatic digeneans, the tegumental surface of adult *Clonorchis sinensis* and *Dicrocoelium dendriticum* is without spination (Fujino

et al. 1979, Becker et al. 1980, Cifrian and Garcia-Corrales 1988), while that of *Fasciola hepatica* is spiny (Bennet 1975). The nature of the spines is considered related to the age of the fluke, all spines metamorphosing from single-pointed to multipointed type with in a few weeks after infection (Bennet 1975). In the view of Koie 1977, the occurrence of simple or serrated spines is correlated with the migratory and non-migratory stages, respectively, of the fluke, though in flukes with serrated spines that still undergo translocation from one site to another, transfer may be passive (Shoop and Corkum 1984). The difference in the shape of spines in the fluke material of different host origins may possibly be accounted for by differences in their ages post-infection or in their microenvironment. Dome-shaped aciliate papillae, irregularly scattered on the rim of the ventral sucker are thought to be stretch, or contact receptors involved in mechanoreception (Otubanjo 1985).

Opisthorchis noverca, a common parasite in the liver and bile ducts of dog, swine and man, has also been recorded from the pancreas of pigs in India (Sinha 1986). The occurrence of this species in a cow seems to be a case of sheer accidental ingestion of metacercarial cysts from decaying fish contaminating the herbage. These ruminants, which thus are potential hosts for opisthorchiids, usually escape natural infection by virtue of their feeding habits, a barrier to recruitment of infection.

Acknowledgements. This study was supported by a research grant to VT from the North-Eastern Council, Govt. of India. Thanks are due to the Head, Department of Zoology, and the Head, R. S. I. C., N. E. H. U. for providing necessary laboratory and SEM facilities, respectively.

References

Becker B., Mehlhorn H., Andrews P., Thomas H., Eckert J. 1980. Light and electron microscopic studies on the effect of praziquantel on *Schistosoma mansoni, Dicrocoelium dendriticum* and *Fasciola hepatica* (Trematoda) in vitro. *Zeitschrift für Parasitenkunde*, 63, 113–128.

Bennet C. E. 1975. Scanning electron microscopy of *Fasciola hepatica* L. during growth and maturation in the mouse. *Journal of Parasitology*, 61, 892–898.

Cifrian B., Garcia-Corrales P. 1988. Scanning electron microscopy of adult *Dicrocoelium dendriticum*. *Parasitology Research*, 74, 235–242.

Dey S., Basubaul T., Roy B., Dey D. 1989. A new rapid method using tetramethyl silane for scanning electron microscopy: Application to the trematode parasite *Homalogaster paloniae*. *Journal of Microscopy*, 156, 259–261.

Fujino T., Ishii Y., Choi D. W. 1979. Surface ultrastructure of the tegument of *Clonorchis sinensis* newly excysted juveniles and adult worms. *Journal of Parasitology*, 65, 579–590.

Koie M. 1977. Stereoscan studies of cercariae, metacercariae, and adults of *Cryptocotyle lingua* (Creplin 1825)) Fischoeder 1903 (Trematoda: Heterophyidae). *Journal of Parasitology*, 63, 835–839.

Mehra H. R. 1980. The fauna of India and the adjacent countries. Manager of Publication, Govt. of India, Delhi.

Otubanjo O. A. 1985. Scanning electron microscopic studies of the body surface and external genitalia of a dicrocoeliid trematode, *Concinnum epomopis* Sandground 1973. *Zeitschrift für Parasitenkunde*, 71, 495-504.

Sobhon P., Wanichanond C., Saitongdee P., Koonchornboon T., Baubphaniroj P., Upatham E. S., Peungtomwatanakul S., Sirisinha S. 1986. Scanning electron microscopic study of *Opisthorchis viveriini* tegument and its alterations induced by amoscanate. *International Journal for Parasitology*, 16, 19–26.

Sinha B. K. 1986. *Opisthorchis noverca* Braun 1902 in the pancreas of domestic pig (*Sus scrofa domestica*) in Bihar. *Current Science*, 37, 22–23.

Shoop W. L., Corkum K. C. 1984. Tegumental changes of *Alaria marcianae* (Trematoda) during migration in the domestic cat. *Journal of Parasitology*, 70, 244–252.

Skrjabin K. I. 1913. Vogeltrematoden aus Russisch Turkestan. *Zoologische Jahrbücher, Abt. Syst.*, 35, 351–388.

Yamaguti S. 1971. Synopsis of digenetic trematodes of vertebrates. Vols. I and II. Keigaku Publishing Co., Tokyo.

Yamaguti S. 1975. A synoptical review of life histories of digenetic trematodes of vertebrates. Keigaku Publishing Co., Tokyo.

(Received July 10, 1991; accepted February 18, 1992)