

**Table 1** Effect of *S. cervi* homogenate on the level of protection against *P. berghei* in rats

Antigen for sensitization mg rat	No. of injections	No. survivors/No. Challenged		Control
		Male homogenate	Female homogenate	
0.1	1	0/6	1/6	0/4
0.1	2	1/6	1/6	0/5
0.2	1	1/6	1/6	0/5
0.2	2	1/6	2/6	0/5
0.5	1	2/6	3/6	0/5
0.5	2	3/6	4/6	0/5
1.0	1	3/6	4/6	0/5
1.0	2	3/6	4/6	0/5
2.0	1	3/6	5/6	0/5
2.0	2	4/6	6/6	0/5

lower dose of female homogenate-treated rats was found to induce only 16.67% protection while the higher dose provided 100% protection (table 1). The proportion of rats surviving with lethal challenge increased with repeated injections of male and female homogenates. The pooled numbers of survivors were 30% and 46.67% with two doses of homogenate of male and female respectively (table 1) ( $P < 0.05$ ). Since female worms contained microfilariae, it was the mixture of both adult worm and microfilarial antigen. A similar situation was observed in *Dirofilaria immitis*-infected dogs, *Litomosoides carinii*-infected cotton-rats and *Dipetalonema viteae*-infected hamsters, in which the infection was suppressed dramatically in animals immunized with homogenate from gravid females<sup>5-7</sup>.

Thus the level of protection induced by vaccination varied with the male and female homogenate, antigen dose and number of immunizing injections.

It is clear from this study that rats can be protected fully from virulent *P. berghei* challenge by vaccination with female homogenate of *S. cervi*.

The authors thank Mr. Anil Arekar for statistical analysis of the data.

11 July 1986

1. Murphy, J. R. and Lefford, M. J., *Am. J. Trop. Med. Hyg.*, 1979, 28, 4.
2. Clark, I. A., Allison, A. C. and Cox F. E. G., *Nature (London)*, 1976, 259, 309.
3. Clark, I. A. Cox, F.E.G. and Allison, A. C., *Parasitology*, 1977, 74, 9.

4. Storey, D. M. and Mettias, E. F. *Ann. Trop. Med. Parasitol.*, 1980, 74, 211.
5. Wong, M. M., *Am. J. Trop. Med. Hyg.*, 1964, 13, 66.
6. Wegerhof, P. H. and Wenk P., *Parasitology*, 1975, 71, 19.
7. Haque, A., Chassoux, D., Ogilvie, B. M. and Capron, A., *Parasitology*, 1978, 76, 77.

## ECOLOGICAL CONSIDERATION IN THE CONTROL OF FISH DISEASE

K. L. SHAH and B. C. TYAGI

Cat Fish Culture Centre of Central Inland Fisheries Research Institute, Govt. Fish Seed Farm, Karnal 132 001, India.

AN infection of black grub disease caused by the metacercaria of digenetic trematodes of the genus *Diplostomum* spp. was observed in the nursery ponds maintained at this farm, in which 2.7 lakh fry of *Cyprinus carpio* was stocked in March 1981. Again during July and August 1981, fry of *Catla catla*, *Labeo rohita*, *Cirrhina mrigala* and *Hypophthalmichthys molitrix* stocked in the nursery ponds were infected with black grub.

The fish farm (latitude 29° 43'N, longitude 76° 58'E, altitude at 245 m above sea level) received its water supply from the Western Jamuna Canal which runs by the side of the farm. The farm had a thick population of various types of trees viz. *Eucalyptus* sp. (Safeda), *Dalbergia sisoo* (Shisham), *Acacia arabica* (Kikar), *Melia azadirachta* (Neem), *Ficus religiosa* (Pipal), *Cordia obliqua* (Lasura), *Eugenia jambolina* (Jaman), *Mangifera indica* (Mango), *Zizyphus Jujuba* (Ber). They were the nestling grounds of the fish-eating birds, *Ardeola grayii* (Sykes), *Ardea* sp. and Kingfisher *Alcedo atthis*. The number of nests actually counted were 223 and were observed mainly on 'safeda' 'shisham' and 'kikar' trees. The pond had a population of molluscs viz. *Vivipara bengalensis*, *Planorbis* sp and *Lymnaea* sp.

The fry and fingerlings of all the species *op. cit.* were infected with black cysts distributed all over the body and located in the muscles just beneath the skin. Even the eyes and the body cavity were infected. The cysts were oval in shape and black in colour. The number of cysts ranged from 3 to 41. Their diameter ranged between 1.0 and 1.52 mm. On opening the cysts, metacercaria of digenetic trematode belonging to the genus *Diplostomum* sp. were observed. The length of the cercaria ranged

between 0.36 and 1.1 mm. The body was bilobed with distinct oral and ventral sucker of which the latter was transversely elongated. On either side at the anterior end, there were conspicuous pseudo-suckers.

The intensity of infection ranged between 70% (*L. rohita*) and 91% (*C. carpio*). The length of the affected fish fry ranged between 20 mm (*L. rohita* and *C. mrigala*) and 180 mm (*H. molitrix*). The percentage of mortality was 8.4% in *C. catla*, 15.09% in *L. rohita*, 26.72% in *C. mrigala*, 43.06% in *C. carpio* and 6.67% in *H. molitrix*.

The black grub disease produced by *Diplostomum* sp. was first described in India by Ganpati and Rao<sup>1</sup> from the State fish ponds at Samalkot (Andhra Pradesh) and by Abraham and Anantaraman<sup>2</sup> from the same area. Their study was related to systematics and life history. Very little is known about the control of this disease in India. The dip treatment of the infected fish with 3: 100,000 picric acid as suggested by Gopalkrishnan<sup>3</sup> was tried and found to be ineffective.

The droppings from the birds *op. cit.* fell directly into the ponds providing favourable environment between snail, fish, nestling birds and the parasite. The ecological relationship was broken by removing 207 trees surrounding the ponds; thus destroying the nestling grounds of the birds. The measure helped in the non-recurrence of the disease thereafter at this farm.

The authors are greatly indebted to Dr A. V. Natarajan, Director, Central Inland Fisheries Research Institute, Barrackpore for encouragement and guidance.

3 June 1986; Revised 21 February 1987

1. Ganpati, P. N. and Rao, K. H., *Curr. Sci.*, 1954, **12**, 401.
2. Abraham, F. G. and Anantaraman, M., *Nature (London)*, 1955, **175**, 127.
3. Gopalkrishnan, V., *F. A. O. Fish Rept.*, 1968, **44**, 319.

---

## ANNOUNCEMENTS

---

### PROFESSOR HIRA LAL CHAKRABARTY AWARDS—1987

Applications in prescribed forms are invited from Indian Scientists, below 40 years of age on December 31, 1986 and with Ph.D. degree for outstanding published work in any branch of Botany for Professor Hira Lal Chakravarty Awards of Rs. 4,000/-

each given by the Indian Science Congress Association. Forms and necessary information are available at the Indian Science Congress Association, 14, Dr Bireswari Guha Street, Calcutta 700 017. Last date of submitting application is **July 15, 1987**.

---

### NATIONAL SYMPOSIUM ON RADIATION BIOLOGY

The National Symposium on Radiation Biology will be held during November 23–25, 1987 at the Kasturba Medical College, Manipal, Karnataka.

Participants interested in getting further informa-

tion may please write to: Dr P. Uma Devi, Organizing Secretary, National Symposium on Radiation Biology, Department of Radiobiology, Kasturba Medical College, Manipal 576 119.

---