

## EFFECT OF IVERMECTIN ON THE MIGRATION OF *BAYLISASCARIS TRANSFUGA* LARVAE INTO THE BRAIN OF MICE

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Infection with the ascaroid nematode *Baylisascaris transfuga* Sprent, 1968 is widespread in free-ranging and captive bears (Addison E. M., Pybus M. J., Rietveld H. J. 1978: Can. J. Zool. 56: 2122-2126; Abdel-Rasoul K., Fowler M. 1979: Proc. Am. Assoc. Zoo Vet., October 1979, Denver, CO. American Association of Zoo Veterinarians, Philadelphia, PA, pp. 165-169; Dies K. D. 197: J. Wildl. Dis. 15: 49-50; Abdel-Rasoul K., Fowler M. 1980: Verhandlungsbericht des XXII. Int. Symp. über die Erkrankungen der Zoo- und Wildtiere, Arnhem (Netherlands), Akademie Verlag, Berlin, pp. 273-277; Duffy M. S., Greaves T. A., Burt M. D. B. 1994: J. Parasitol. 80: 478-480). In certain countries, bears are frequently found in association with humans, frequenting many rural and recreational areas included camping and picnic sites, and the implication of *B. transfuga* in human visceral larva migrans may be possible (Sprent J. F. A. 1964: Proc. First Int. Congr. Parasitol., Rome, September 1964, Vol. 2, pp. 802-803; Davidson W. R., Nettles V. F. 1988: Field manual of wildlife diseases in the southeastern United States. Southeastern Cooperative Wildlife Disease Study, Department of Parasitology, College of Veterinary Medicine, The University of Georgia, Athens, Georgia, pp. 126-127).

Several anthelmintics have been proved effective against adult *B. transfuga* (Kuntze A., Buchwalder R. 1988: In: Verhandlungsbericht des XXX Int. Symp. über die Erkrankungen der Zoo- und Wildtiere, Sofia, Akademie Verlag, Berlin, pp. 303-307), but there is no information on the efficiency of larvicidal drugs. For this reason, we tested the anthelmintic effect of Ivermectin on the migration of *B. transfuga* larvae into the brain of mice experimentally infected.

*Baylisascaris transfuga* adult females were recovered from two captive brown bears (*Ursus arctos* L.), living in the city park of Leghorn. Eggs were obtained and cultured as described by Papini and Casarosa (1994: Rev. Med. Vet. 12: 949-952).

Fifty five Swiss mice of both sexes, aged 6 weeks and weighing 25 g each were used. The different sexes were kept separately during all the experimental time. Each mouse was orally infected with 3000 embryonated eggs as described by Papini and Casarosa (1994 - op. cit.). Mice were randomly divided into group I of 30 mice (treated) and group II of 25 (control), and maintained on commercial diet and water *ad*

*libitum*. Doses of suspension of Ivermectin (IvomecR, MSD Agvet, Merck & Co., Inc. Rahway, N. J. U.S.A.) were prepared to obtain concentrations of 1 mg of active substance/ml according to the method of Carrillo and Barriga (1987: Am. J. Vet. Res. 48: 281-283). Group I mice were treated with 1 subcutaneous dose of 2 mg/kg on day 1 p.i. Mice were examined daily for clinical signs. Six mice from group I and 5 from group II were killed on days 4, 8, 12, 16 and 20 p.i. At necropsy, gross lesions of relevant organs were recorded. The brain was directly examined under a stereomicroscope after squashing between two large glass slides. The arithmetical mean  $\pm$  standard deviation of the larvae and percent efficacy per group were calculated. The significance of differences between groups was determined by the Student-test where a probability value of  $P < 0.05$  was considered significant.

Results are shown in Table 1. Larvae were recovered from both groups irrespective of the duration of the infection. However, the mean numbers of larvae recovered from brain of group I mice were significantly lower ( $P < 0.05$ ) than those recovered from group II each time. None of the group I mice had any sign of infection till day 20 p.i. inclusive, when the experiment was terminated, whereas 18 (72 %) group II mice showed clinically respiratory symptoms in the early stages of infection. At necropsy, gross differences were evident on the surface of the lungs. Group I mice had relatively few localized

**Table 1.** Numbers (mean  $\pm$  SD) of larvae recovered on various days post infection (p.i.) from the brain of mice orally infected with 3000 *Baylisascaris transfuga* embryonated eggs, treated with a subcutaneous dose of 2 mg/kg of Ivermectin on day 1 p.i. (group I) or untreated (group II).

Days p. i.	Group I* (n = 6)	Group II (n = 5)	Percent efficacy
4	2.8 $\pm$ 12.1	4.8 $\pm$ 3.6	58.3
8	2.6 $\pm$ 1.8	4.4 $\pm$ 2.8	59.0
12	2.0 $\pm$ 2.0	6.0 $\pm$ 4.5	33.3
16	4.6 $\pm$ 3.8	6.8 $\pm$ 3.9	67.6
20	5.3 $\pm$ 3.4	8.0 $\pm$ 3.0	66.2

\*Values were statistically significant at  $P < 0.05$

hemorrhagic spots at all periods of observation. In group II spotty haemorrhages could be seen on day 4 p.i., became confluent on day 8 p.i. and began to clear on day 12 p.i.

Our results show that there was significant reduction in the number of *B. transfuga* larvae found in the brain of the treated mice. According to the manufacturer, Ivermectin is effective at the single dose of 0.2 mg/kg as anthelmintic in domestic animals. In this investigation a subcutaneous dose of 2 mg/kg was employed. Therefore, the treatment we used was over the recommended therapeutic level. Despite this it was not completely satisfactory to eradicate *B. transfuga* larvae. However, in agreement with Abdel-Hameed (Abdel-Hameed A. A. 1984; J. Parasitol. 70: 226–231), a chemotherapy targeted at limiting the migratory activity of larvae would be an alternative in the absence of a completely effective larvicide. The numbers of *B. transfuga* larvae in other organs were not

estimated, since it was not the purpose of this brief study. Certainly further investigations would be needed to determine whether the treatment may produce more marked effects on their migratory activity.

Although the central nervous system does not represent the predilection site, a proportion of *B. transfuga* larvae can reach the brain of abnormal hosts (Sprent J. F. A. 1955: Parasitology 45: 41–55; Matoff K., Komandarev S. 1965: Z. Parasitenkd. 25: 538–555) and high numbers of migrating larvae have been shown able to cause nervous disorders in mice (Papini and Casarosa – op. cit.). At the tested dose rate, Ivermectin may kill some of the larvae, even if not all, and considerably reduce their migration into the brain. Therefore, we are inclined to believe that such action may be important to prevent clinical effects in cases of known infection with *B. transfuga*.

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