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THE INFLUENCE OF METACERCARIAE OF *DIPLOSTOMUM* (TREMATODA) ON THE RESPIRATION OF *HETEROPNEUSTES FOSSILIS* (BLOCH)

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Oxygen consumption increases in *Diplostomum* infected *H. fossilis*. The rate of increase is dependent on the intensity of infection. The percent increase in a given grade of infection is more in surfacing prevented than in surfacing allowed condition.

INTRODUCTION

The various factors that affect the oxygen consumption in fishes are, age and body size (Kramer, 1972; Munshi & Dubey, 1973; Ojha & Munshi, 1975; Munshi *et al*; 1976; Ojha *et al.*, 1977), temperature (Beamish, 1964; Raja Gopal & Kramer, 1974) and season (Privolnev, 1948; Pandey, 1978).

The effect of various pollutants on the respiratory physiology of fishes have been investigated by several workers (Waiwood & Jonson, 1974; Hughes, 1975; Lunn *et al.*, 1976; Singh & Singh, 1979). But the effect of parasitic infection on the oxygen consumption of the fish host has not been properly investigated (Lester, 1971) although parasitism may affect the energy requirement of fish in the form of food uptake and oxygen requirement from water. This altered bioenergetics of fish may threaten the economics of pond management and husbandry. The present work was undertaken to record the influence of *Diplostomum* infection on the oxygen consumption of *Heteropneustis fossilis* (Block) with a view to gain a better understanding of the pathophysiological response of the host to *Diplostomum* infection.

MATERIAL AND METHODS

Normal and parasitised *H. fossilis*, averaging about 55 g each, were collected from the derelict swamps of Darbhanga. The animals were sorted out on the basis of visual and autopsy examination, into slightly, mildly and heavily infected groups. These fishes were maintained in plastic pools and were daily fed with properly cleaned pieces of goat liver. The details of the method employed in the determination of VO_2 through gills and skin under experimental conditions in which surfacing either prevented (free access to air not allowed) or allowed (free access to air allowed) were those of Munshi & Dubey (1973). The concentration

of dissolved oxygen in water samples was determined by Winkler's volumetric method (Welch, 1948). Five animals from each group, were used to determine the rate of oxygen consumption. The feeding of the animals was stopped 24 hours before the experiment. Student's t - tests at a level of 5% were applied to the parameters analysed to record the difference of significance.

RESULTS

The results of oxygen consumption have been shown in Fig 1. The Vo_2 under

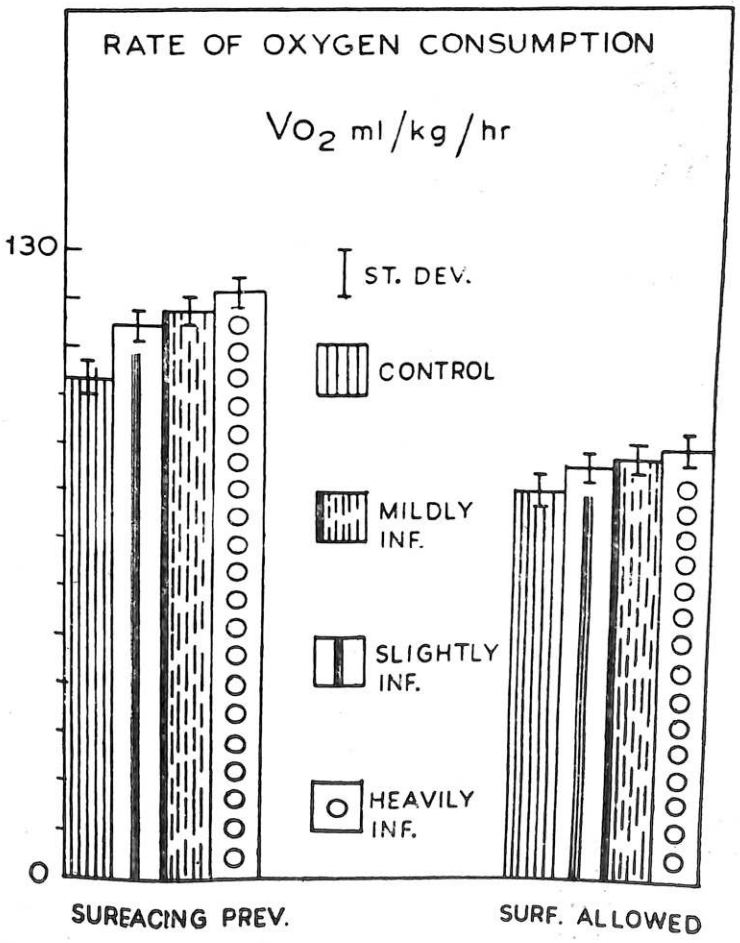

Fig. 1. Influence of *Diplostomum* infection on the Oxygen consumption of *H. fossilis.*

surfacing prevented condition in control animals were 103. 12 ± 3.26, which significantly increased to 117.44 ± 2.98 and 121.31 ± 3.12 respectively in mildly and heavily infected animals. Under surfacing allowed condition also, the Vo_2 increased in all the infected groups. But these increase were non-significant The rate of increase in oxygen consumption was more unde surfacing prevented than in surfacing allowed condition.

DISCUSSION

The measurement of metabolic rate as expressed in terms of oxygen consumption, provides estimates of the energy requirement of fish. The oxygen consumption of *H. fossilis* has been related with respiratory surface area (Munshi *et al.* 1976), body size (Munshi *et al.*, 1978), season (Pandey, 1978) and an organophosphate pollutant, malathion (Choudhary, 1980). Review of literature indicates that a number of factors operate together, influencing the rate of oxygen consumption and it is difficult to single out a factor of prime importance.

In fishes the respiratory areas of the gas exchange machinary is smaller in comparison to terrestrial animals. In *H. fossilis*, the gills and skin are supplemented with a pair of air - sacs which help in extracting oxygen directly from air. The oxygen consumption in case of air - breathing fish, is measured under surfacing prevented condition to ascertain whether the gills alone are efficient to extract adequate oxygen for the survival of the fish when the accessory respiratory organs are not allowed to function. Munshi *et al.* (1976) observed in *H. fossilis*. that the efficiency of gills and skin in gaseous exchange mechanism, under normal condition, is more than in prevented condition. Choudhary 1980) reported the effect of an organophosphate, malathion on the rate of oxygen consumption in *H. fossilis* and observed a decrease in VO_2 in both the conditions of the experiment.

In the present work the oxygen consumption increased in *Diplostomum* infected *H. fossilis*, the rate of increase being dependent on the intensity of infection. However, the percent increase in any considered grade of infection, was more, in surfacing prevented than in surfacing allowed condition. This observation may be an important finding considering the report of Munshi *et al.* (1976) on the same fish regarding the efficiency of the respiratory organs in the two experimental conditions. The results of the present work appear to be in confirmity with the work of Lester (1971) on *Gasterosteus* sp. infected with *Schistocephalus plerocercoides*.

The difference in the efficiency of oxygen extracting capacity seems to be imposed by parasitism and it is probable that the *Diplostomum* metacercariae exert

an extra stress on the fish host which begin consuming more oxygen in order to maintain the equilibrium of host-parasite relationship.

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