

# EFFECT OF THYROID FEEDING ON THE RATE OF OXYGEN CONSUMPTION OF *TILAPIA MOSSAMBICA* (PETERS)

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## ABSTRACT

It has been shown that thyroid feeding influences the rate of oxygen consumption of *Tilapia mossambica*. Fish fed with  $\frac{1}{4}$  grain thyroid tablet (BDH) showed considerable increase in the rate of oxygen consumption on the first day after feeding and the maximum rate of oxygen consumption was observed on the second or the third day. Later there was a gradual decrease to reach normal rate on the sixth or the seventh day. Change in the nature of diet of the same weight (100 mg of rice) did not affect the metabolic rate.

## INTRODUCTION

Several authors have investigated the role that endocrines play on the metabolic rate of animals. In mammals it has been demonstrated that thyroid administration raises the basal metabolic rate (Prosser *et al.* 1950). However the results regarding the effects of thyroid hormone on the metabolism of cold blooded vertebrates are contradictory (Drexler and Issekutz 1934; Etkin 1934; Etkin, Root and Mofshin 1940; Prosser *et al.* 1950; Matty 1954; Mohsen and Godet 1960; Pritchard and Gorbman 1960). Huxley (1929) suggested that the thyroid might be acting as a buffer to reduce the accelerating action of heat on the rate of metabolism of cold blooded animals. Etkin *et al.* (1940) working on the Goldfish found no increase in the rate of oxygen consumption on feeding with thyroid ( $\frac{2}{3}$  grain) every day with dry food. Recently Mohsen and Godet (1960) have investigated the action of thyroxine upon the rate of oxygen consumption of the Lungfish, *Protopterus*. They found a remarkable rise in the rate of oxygen consumption one day after the injection of 0.5 cc thyroxine (Roche). The present investigation is initiated to determine the effect of thyroid feeding upon the rate of oxygen consumption of *Tilapia mossambica* (Peters), the results of which are given below.

## MATERIAL AND METHODS

*Tilapia mossambica* is a mouth-breeding cichlid, which has been recently introduced to South Indian waters (Panikkar and Tampi 1954). It is a quick

growing species exhibiting a remarkable adaptability to varied ecological conditions. It is an omnivorous fish and constitutes a suitable form for culture in India. Young individuals (fingerlings) of *Tilapia mossambica* were purchased locally. Immediately after bringing to the laboratory they were put in fresh water aquaria. Each fish was fed daily with 100 mg of dry fish meal purchased from a local commercial dealer. The fishes were maintained on this food for several days before, and during the period of experimentation. The experiments were started two weeks after the fishes were brought to the laboratory. The initial weights of the animals were taken before the experiments were started. The fishes were blotted with absorbent paper and the weights were taken with a sensitive balance to the nearest milligram. The rate of oxygen consumption was measured by determining the dissolved oxygen following Winkler's procedure (Madanmohanrao 1960). The respiratory chambers were painted black outside to prevent any possible influence of light. The normal rate of oxygen consumption was followed for three days prior to thyroid feeding. On the third day immediately after measuring the rate of oxygen consumption, each fish was fed with 80 mg thyroid tablet ( $\frac{1}{4}$  grain BDH) and 20 mg dry food. Afterwards the rate of oxygen consumption was determined each day at the same hour (10 a.m.) before the fishes were given normal food. This allowed a period of at least 24 hours after food is given and before measurements were made. The temperature during the period of experiments varied between 30° and 31° C.

### RESULTS

The fishes fed with thyroid tablets have shown considerable increase in the basal metabolic rate in all cases on the first day after feeding thyroid (Fig. 1). The maximum increase in the rate of oxygen consumption was noticed on the third day in most cases and on the second day in two cases. Later there was a gradual decrease to reach normal level. The rate of oxygen consumption touched normal on the sixth or the seventh day after thyroid feeding. Four fishes were then fed with another thyroid tablet (80 mg) and 20 mg dry food on the seventh day after the administration of the first tablet. This resulted again in a considerable increase in the rate of oxygen consumption, the maximum being reached on the second day after administration of thyroid, in three out of the four cases.

Another batch of four fishes were fed with boiled rice (100 mg) on the seventh day instead of the second dose of thyroid. This does not result in any increase in the rate of oxygen consumption (Fig. 2). No adverse effects were noticed in fishes fed with thyroid.

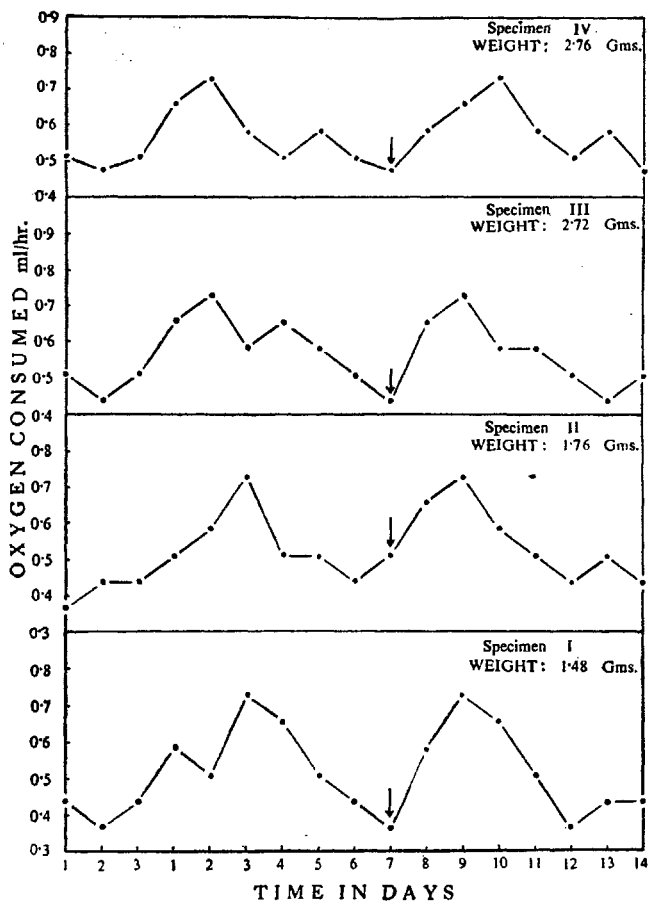


FIG. 1.

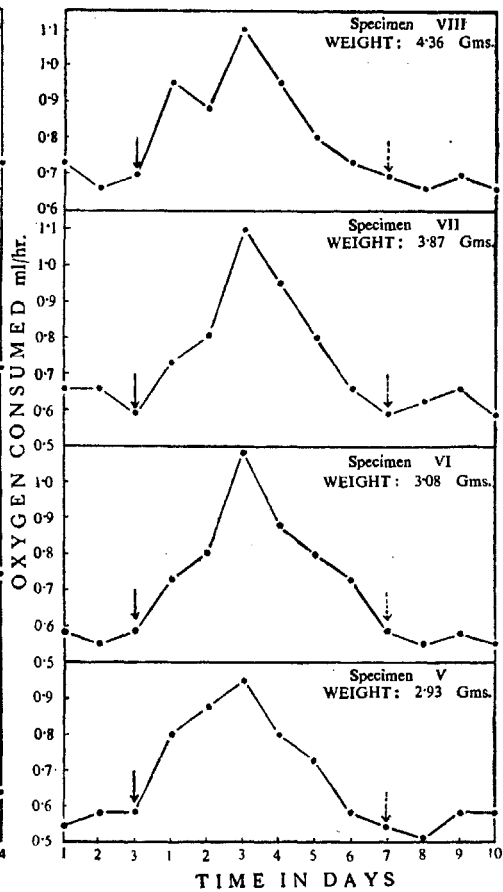


FIG. 2.

FIG. 1. *Tilapia mossambica*: Oxygen consumption before and after thyroid feeding. The ↓ indicates the days on which the fish is fed with thyroid tablet (BDH).

FIG. 2. *Tilapia mossambica*: Oxygen consumption before and after thyroid feeding. The arrow ↓ indicates the day on which thyroid is fed. ↓ indicates the feeding with boiled rice instead of a second dose of thyroid.

## DISCUSSION

In the present investigation on *Tilapia mossambica* the factors suggested by Spoor (1946), viz. feeding and activity of the animal during measurements, were brought under control. The feeding has been regulated by giving 100 mg of dry food every day. The activity of the animal during measurements has been minimized by keeping it in respiratory chambers painted black outside at the time of measurements. In these experiments each fish served as its own control.

The results show that the thyroid hormone exerts considerable influence on the metabolism of *Tilapia mossambica* and it is possible that thyroid is

concerned with the regulation of metabolism. In this regard the results agree with those obtained by Mohsen and Godet (1960) with the Lungfish, *Protopterus*, except for the fact that they noticed maximum oxygen consumption on the fourth day after the injection of thyroxine, whereas in the present study on *Tilapia mossambica*, maximum oxygen consumption was observed on the second or the third day after thyroid feeding. The fact that feeding with a second tablet seven days after the first resulted again in an increase in the metabolic rate, while a similar feeding with rice does not result in any change in the metabolic rate, shows that the increase in the rate of oxygen consumption is due to the thyroid and not due to any effects of the food or the feeding pattern. This conclusion is supported by the fact that the oxygen consumption gradually diminishes with time after reaching a maximum in spite of the normal feeding being continued on days subsequent to thyroid feeding. Hence the gradual rise in oxygen consumption after thyroid feeding is due to the effect of the thyroid which diminishes with time after the peak and completely disappears after six days.

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\* Not consulted in original.