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HAEMATOLOGICAL RESPONSES OF FISH, ORIOCHROMIS MOSSAMBICUS SUBJECTED TO HYPOXIA

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ABSTRACT

Oriochromis, mossambicus, when subjected to hypoxia, showed stress reaction and thus swimming speed and the behavioural patterns affected. This stress mobilized the stored energy in muscle and liver causing hyperglycemia.

Key words: Haematological Fish response, Hypoxia.

Introduction

The transfer of gases between blood and tissues in fish has received very little attention, except for a few special exchange sites which have been studied by Robinson et al., (1983). Extensive studies concerning haemoglobin can be found in the reviews of Sheid and Meyer (1978), Nikinamaa et al., (1984), Perry and Vermette (1987) and Walker et al., (1989).

Some accessory respiratory surface are associated with the movement of fish from hypoxic acquatic environment to an aerial environment and are thus designed for gas exchange between blood and air (Smith. 1982). The hypoxic condition in the fish causes a severe stress and as a result increases the demand of oxygen consumption. The activity often increases as the fish appear to struggle for ways to leave the hypoxic area (Agrawal et al., 1979(. The hypoxic condition primarily affects the heart rate, stroke volume and the ventilation volume of the fish (Hughes et al., 1983).

Materials and Methods

Specimen of Oriochromis mossambicus total length (6-8 cm), body weight (25-30 gm) used in the experiments were brought to the laboratory in live condition. The fish were acclimatized to the laboratory conditions in a big glass trough. Fish were fed to satiation with fish pallets available from the market, 10 fishes were kept in hypoxic (surface breathign not allowed) condition and same number of fishes were taken as a control which were allowed to surface for normal breathing in an open glass tank.

After every hour of asphyxiation up to six hours, the blood sample was removed from the caudal vein after an esthetizing with MS 222. The blood was collected in the heparinized capillary tubes and centrifuged (2000 rpm for 10 minutes) to obtain plasma. The parameters for blood sample were analyzd on the auto analyzer (Backman CX-5) center off excellence, University of Sindh, Jamshoro.

Result

The swimming behaviour of the fish subjected to hypoxia was normal at the initial stage. During the asphyxiation period, a spiral swimming behaviour was commonly observed. The demand of O_2 by the hypoxic fishes was more as compared to the control fish. The haemoglobin concentration tends to increase with the increase of asphyxiation period. The serum glucose also increased as compared to the central table (1).

Variation in the blood parameters and glucose content due to the effect of hypoxia at different inervals of time.

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Time of Asphyxiation	Haemoglobin (g/100 ml)	Serum glucose (g/100ml)
Control	4.00	32.17± 05
1	5.8	44.0 ± 0.7
2.	6.0	49.12 ± 0.28
3	6.4	55.28 ± 0.15
4	7.2	58.14 ± 0.15
5	7.7	62.08 ± 0.12
6	8.0	66.13 ± 0.13
7	8.2	69.08 ± 0.4

Discussion

It was observed that sudden hypoxic condition produces stress reaction resulting in hyperexcitation and changes in behaviour pattern. The fish kept in hypoxic condition performed more efforts and required more oxygen (Robinson et al., 1983). In hypoxic conditions, the heart rate decreases while the stroke volume increases maintaining the cardiac output in trout, (Swift, 1982).

In such hypoxic conditions, there is a stress mediated release of new erythrocytes from the erythropocitic organs and synthesis of haemoglobin older cells to improve the oxygen carrying capacity of blood (Meleay and Gordon, 1977, Yamamoto, et al., 1980, Schindler and Devries, 1986, Murad and Mustafa, 1989(. The haemoglobin oxygen association is a very special one since the bonding must be strong enough to take large amount of oxygen in the gills yet weak enough to release most of the oxygen in the tissue.

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