

Studies on Water Blood Diffusion Barrier and Diffusing Capacity of The Gill of *Danio Acquipinnatus*



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ABSTRACT

Gills are primarily water breathes and integuments for gaseous exchange from water. They perform the dual function for maintaining osmotic balance and gas exchange. The exchange of respiratory gases (O_2 and CO_2) in the gills of the fishes take place in the 2nd Lamellae of *Danio acquipinnatus*.

Keywords : Water blood diffusion, Diffusing Capacity, water barrier, operculum chamber, Buccal Cavity.

I. INTRODUCTION

Gills are supplied with blood vessels and are continuously flushed by water and blood of the gills. The exchange of gaseous takes place in the secondary Lamellae where blood and water come into close contact with each other being separated only by a very thin diffusion barrier which is well known as Blood – water diffusion barrier.

II. MATERIALS AND METHODS

Danio acquipinnatus (Mc. Chell) is a hill stream fish of

Family - Cyprinidae

Order - Cypriniformes having silvery body.

- ✓ Gill arched having 1st to 4th arch were fixed in Zenker's fixative.

- ✓ Paraffin section were cut at 6 μ m thickness in horizontal plane and stained with Haematoxylin counter stained with eosin.
- ✓ Magnification of the photomicrographs of secondary Lamellae was determined.

Diffusing Capacity :- The diffusing capacity of the Gill was obtained by the modified Flicks evaluation a mathematical representation of the relationship of oxygen uptake of O_2 with respiratory area A and thickness of water blood barrier t.

Methods using are Regression analysis using logarithmic transformation which find out the relation between

- ✓ Body weight and thickness of water and blood barrier in Secondary gill Lamellae.
- ✓ The equation they follow :

$$y = aw^b \text{ of } \log y = \log a + b$$

(where y and w are Dependent and Independent variables)

III. RESULT

RESULTS :

The water blood barrier in the secondary gill Lamellae of *D. acquipinnatus* limits gaseous exchange between the three district layers.

The data on gill diffusing capacity per unit time ($MIO_2 - \text{min}^{-1} \text{mmHg}^{-1}$) and per unit body weight ($MIO_2 . \text{min}^{-1} . \text{mmHg}^{-1} . \text{Kg}^{-1}$) are different in *Danio acquipinnatus*.

- ✓ Relationship between body weight and the gill diffusing capacity :-

The statistical relationship between these two are

$$\log y = \log - 3.587 + 0.872 \log w$$

or

$$y = 0.00026 w^{0.872}$$

where y = gill diffusing capacity

w = body weight

- ✓ Relationship between body weight and weight specific gill diffusing capacity :-

The correlation coefficient between these two parameters was high. The relationship can be shown by following equation :

$$\log y = \log - 0.586 - 0.130 \log w$$

where y = gill diffusing capacity

w = body weight

DISCUSSION :

Water blood diffusion plays an important role in determining the efficiency in O_2 uptake.

Gaseous exchange of secondary Lamellae has been found to be inversely proportional to the thickness of blood water barriers.

The impact if the length of diffusion barriers at secondary Lamellae on O_2 uptake has been mathematically interpreted in terms of the diffusion capacity of gills (Hughes 1972, Hughes – etal 1973, 1974).

IV. REFERENCES

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