Uttar Pradesh J. Zool. 17(1) : 50 - 52, 1997 ISSN 0256-971X

LONG-TERM EFFECT OF LIGHT ON HAEMATOLOGY OF A FISH *CLARIAS BATRACHUS* (LINN.)

SAGAR KUMAR, SHALINI CHAUHAN AND R.R.S. CHAUHAN
DEPARTMENT OF ZOOLOGY, JANTA MAHAVIDYALAYA, AJITMAL 206121, INDIA.

Effect of constant light on the blood of *Clarias batrachus* (Linn.) exhibited a general elevation in R.B.C. count, blood urea, haemoglobin percentage, blood sugar, bilirubin, alkaline phosphatase and serum transaminase while the levels of cholesterol and serum protein value were depleted.

INTRODUCTION

Light plays an important role in the biology of fishes. The changes in photoperiod affects the activity of various physiological activities such as spawning, migration, swimming etc. The light acts as a sort of stress factor and the hormomal regulation as well as enzymatic activity in the body of fish is changed. But very little is known about its haematological implications. The present investigation shows the effects of light stress on certain haematological parameters such as R. B. C. count, haemoglobin percentage , blood sugar, cholesterol, blood urea, total proteins, bilirubin, alkaline phosphatase and both the serum transaminases (SGOT & SGPT) in *Clarias batrachus* (Linn.), together with recovery.

MATERIALS AND METHODS

Fishes were arranged from local fish catchers of Distt. Etawah who had collected them from lakes and ponds in the area. These were treated with 0.2% KMnO4 solution to remove any dermal infection and were acclimatized for a week before transferring them to the experimental aquaria. They were divided into 8 sets of 12 fishes in each aquarium. Four sets were treated as control and the remaining four as experimental. The experimental sets were kept in constant light flooded with electric lamps. One set was sacrificed after 24 hr and another set after 5 days and the remaining two sets were allowed for the recovery during which the photoperiod was maintained as 12 hr darkness and 12 hr in light. The fishes allowed for recovery were sacrificed after 24 hr and 5 days separately. The blood was collected from the heart and EDTA was used as an anticoagulant. The R.B.C. count and haemoglobin percentage was determined by Dacie & Lewis (1975). The estimation of blood sugar was done by Ortho-toluidine method of Cooper & Daniel(1970) and cholesterol was estimated by Zak & Epstien (1961). The blood urea was determined by Diacetyl monoxine method (Kaplan & Teng, 1976) and the total protein was done by the method suggested by Henry *et al.* (1956). Estimation of serum glutamic oxalacetic transaminase (SGOT) and serum glutamic pyruvic transaminase (SGPT) were determined by the method of King (1958) and serum bilirubin was done by the method of Zak & Epstien (1961) whereas alkaline phosphatase was determined by Wooton (1964).

RESULTS AND DISCUSSION

The fishes were found comparatively more active in light and swam rapidly. The rate of food consumption in experimental sets was higher than the control sets and the skin became pale in colour. The various haematological values have been presented in the Table I. The active

swimming indicates elevated levels of serotonin in the brain which increases the metabolism in the experimental animal. As such the food consumption also increased in the test fish. The pale colour of the skin indicates decreased secretion of melatonin from the pineal in light which causes dispersal of chromatophores.

During the present investigation the R.B.C.count, blood urea, haemoglobin percentage, blood sugar, bilirubin, alkaline phophatase and serum transaminases were found elevated while the cholesterol and total serum protein value were depleted. Hoar & Eales (1963) opined that the elevation of R.B.C. might be due to hypersecretion of pituitary. The pituitary hypertrophy results into increased oxygen consumption and the locomotory activities in fishes. The higher metabolic activity is also the ultimate cause of elevated level of haemoglobin which was also confirmed in the observations made by Pandey & Munshi (1976) in *Heteropneustes fossilis* (Bl.). The hyperglycemia indicates the transformation of liver glycogen to blood glucose. The depletion in cholesterol in serum is due to its utilization in synthesis of vitamin D and various other steroids whereas the elevation in blood urea in serum is due to increased secretion of ADH from pituitary which inhibits the excretion of urea. Brett (1972) reported the elevated levels of both the serum transaminases (SGOT & SGPT) due to hyperactivity of the pituitary and the thyroid under light stress. The elevation of alkaline phosphatases may be due to increased locomotory activity of fishes (Beitinger, 1975) and the causes of restlessness may be assigned to increased activity of thyroxine under the extended photoperiod.

Table I : Light stress on haematology of a fish *C. batrachus* at various intervals and recovery.

Parameters	Control	Effect/Recovery	
		24 hr	5 days
R.B.C. (10^6/mm^3)	3.02 ± 0.06	4.50 ± 0.12 3.28 ± 0.15	4.62 ± 0.11 3.08 ± 0.01
Haemoglobin (gm %)	14.80 ± 0.16	18.00 ± 0.20 15.50 ± 0.10	18.20 ± 0.15 15.50 ± 0.10
Blood sugar (mg/dl)	57.00 ± 1.58	76.80 ± 1.40 67.00 ± 1.50	78.20 ± 1.50 59.00 ± 2.00
Cholesterol (gm/dl)	400.00 ± 15.81	350.00 ± 8.20 360.00 ± 14.20	310.00 ± 11.70 380.00 ± 11.50
Blood urea (mg/dl)	6.00 ± 0.32	10.00 ± 0.20 12.50 ± 0.40	13.10 ± 0.20 9.00 ± 0.60
Total protein (gm/dl)	8.00 ± 0.16	6.20 ± 0.12 7.23 ± 0.10	6.00 ± 0.30 7.75 ± 0.11
Bilirubin (mg/dl)	3.00 ± 0.15	3.60 ± 0.14 3.40 ± 0.12	3.80 ± 0.08 3.20 ± 0.18
Alkaline phosphatase (KA units)	29.00 ± 0.79	41.80 ± 2.30 61.50 ± 6.80	74.20 ± 1.50 34.50 ± 2.40
S.G.O.T. (IU/L)	65.00 ± 1.58	65.00 ± 1.40 64.00 ± 0.40	66.00 ± 1.40 64.00 ± 0.50
S.G.P.T (IU/L)	78.00 ± 1.58	78.00 ± 1.30 79.00 ± 1.20	81.00 ± 1.20 77.00 ± 0.40

Values are mean ± S.D.

During recovery, the alkaline phosphatase value started to normalize but was still far off from the control value even after 5 days. The serum transaminase values were almost restored, which is possibly due to resumed normal metabolic activities as well as endocrine coordination. The total protein, cholesterol and blood sugar reached almost normal level within a period of 24hr to 5 days and the value of bilirubin came down to normal but slightly above the control value. However, the blood urea sharply elevated and did not come to normal level even after 5 days. The R.B.C. count and haemoglobin concentration were also restored to normal condition within 5 days.

ACKNOWLEDGEMENTS

The authors are thankful to Dr. V.P.S. Dwivedi, Head of Zoology Department, Janta Mahavidyalaya, Ajitmal for providing necessary research facilities and valuable suggestions.

REFERENCES

BEITINGER, T.L. 1975. Diel activity rhythms and thermoregulatory behaviour of blue gill in response to unnatural photoperiods. *Biol. Bull.* **149** : 98-108.

BRETT, J.R. 1972. The metabolic demand for oxygen in fish, particularly salmonids and a comparision with other vertebrates. *Res. Physiol.* **14** : 151-170.

COOPER, G.R. & McDANIEL, V. 1970. *Stand. Meth. Clin. Chem.* **6** : 159.

DACIE, J.V. & LEWIS, S.M. 1974. *Practical Haematology*. The E.L.B.S. & Churchill Livingstone.

HENRY, R.J., SOBEL, J.C. & SEGLOVE, M. 1976. *Proc. Soc. Exptl. Biol. Med.* **92** : 748-751.

HOAR, W.S. & EALES, J.G. 1963. The thyroid gland and low temperature resistance of gold fish. *Can. J. Zool.* **41** : 653-669.

KAPLAN, A. & TENG, L.I. 1976. Serum urea. *Stand. Meth. Clin. Chem.* **9** : 357-358.

KING, J. 1958. *Practical Clinical Enzymology*. D. Van Nostrand Comp. Ltd., London.

PANDEY, B.N. & MUNSHI, J.S.D. 1976. Role of thyroid gland in regulation of metabolic rate in an air breathing siluroid fish *H. fossilis* (Bl.). *J. Endocrinol.* **69** : 421-425.

WOOTON, I.P.D. 1964. *Microanalysis in Medical Biochemistry*. J. & A. Churchill Ltd., London.

ZAK, B. & EPSTIEN, E. 1961. *Clin. Chem. Acta.* **6** : 72-78.