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Research Article

COMPARATIVE HAEMATOLOGICAL STUDIES OF *CLARIUS BATRACHUS* IN BISALPUR RESERVOIR AND PUSHKAR LAKE

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ABSTRACT
The present study dealt with determination of haematological parameters in fishes of Bisalpur reservoir (control) and two sites "the Gau Ghats (site 1)and the Jaipur Ghat" (site 2) of Pushkar reservoir (polluted). The fish samples, from control as well as polluted waters, were analyzed for haematological study to assess the effect of water pollution on the fish health with extrapolation to hazards to human health. The fish collected from site 1 and site 2, when compared with the control had lower haemoglobin (38% and 12%, respectively), RBC count (35% and 11%, respectively), PCV ((21% and 7%, respectively), and MCHC (26% and 20%, respectively), and higher WBC counts (118% and 85%, respectively), and MCV (26% and 13%, respectively).

***Key Words**: Clarias batrachus, Environmental Pollution, Blood Collection, Ghats*

INTRODUCTION
Most of pesticides find their ways into rivers, lakes and ponds, and have been found to be highly toxic not only to fishes but also to the organisms which contribute to the food chain of fishes (Anees, 1975). In pursuant to this goal, many fish physiologists have turned to study fish haematology, probably because it has proved a valuable diagnostic tool in evaluating human health. Although fish haematology continues to offer the potential of a valuable tool, progress in establishing normal range valves for blood parameters has been slow and literature in this area is isolated and often incomplete (Mawdesley- Thomas, 1971). Only a few normal values for a small number of haematological parameters have been established for some teleosts, but these valves range widely due to the lack of standardized collecting and measuring techniques (Blaxhall, 1972). Perhaps further confounding these data are variables such as age, sex, dietary state, and stress, all of which may alter blood values (Barnhart, 1969; McCarthy *et al.*, 1973). The achieve the objective the investigation haematological study fish samples collected from Bisalpur reservoir (control) and two sites of Pushkar reservoir (polluted). The Bisalpur Dam is the important centre of Rajasthan state which is made on river Banas nearby Deoli, District Tonk. This dam lies between 26° 28' to 26° 29' north latitudes and 74° 37' 30" to 74° 38' east longitudes. It covers about 500 km perimeter area and its maximum depth is about 30.0 m when full of water. Bisalpur Dam supplies the water in seven cities i.e. Kekri, Sarvar, Nasirabad, Kishangarh, Ajmer and Beawar. The reservoir water is used for irrigation purpose. It is also a good source of drinking water supply. Besides this it is providing a good yield of fish especially major carps and cat Fishes.

Pushkar Lake has mythological significance and is a touristic delight, a holy place where people come from all over the world. The Pushkar Lake is surrounded by 52 flights of steps called Ghats, many having special legendary importance. Each Ghat has its own miraculous qualities and power of healing. People consider the water of the Pushkar Lake to be very sacred and the ritual of taking dips in the holy water is believed to bestow salvation. Offering of coconuts, flowers and even ash are made to the holy lake. Apart of theses, the water of the Pushkar Lake is used by the local people for regular drinking, bathing and washing purpose.

The fish samples collected from two Ghats- the Gau Ghat and the Jaipur Ghat. The Gau Ghat had been chosen for sample collection because of its aesthetic value. Most of the pilgrims take the holy dip in the lake at this ghat. The second site "Jaipur Ghat", at this Ghat, there is a pool especially meant for immersing human ashes. The fish samples, from control as well as polluted waters, were analyzed for

haematological study to assess the effect of water pollution on the fish health with extrapolation to hazards to human health.

MATERIALS AND METHODS

Fish samples

For haematology the fish species *Clarias batrachus* were collected from control as well as polluted waters.

Hematological Studies

Anticoagulant (EDTA) preserved blood was used for the estimation of various hematological parameters like hemoglobin (Hb), packed cell volume (PCV) and blood cell count. Estimation of hemoglobin content was done according to van kampan and Zijlstra (1961), packed cell volume according to microhaematocrit method of strumia *et al.,* (1954), red blood cell (RBC) count and total leukocyte count (TLC) according to routine clinical methods. These values were then utilized for calculating men corpuscular hemoglobin (MCH), mean corpuscular volume (MCV) and mean corpuscular haemoglobin concentration (MCHC) according to dacie and lewis (1977) as described below:

$$\text{MCV (dL)} = \frac{\text{Packed cell volume /dL x 10}}{\text{RBC/uB (in } 10^6\text{)}}$$

$$\text{MCH (pg)} = \frac{\text{Packed cell volume /dL x 10}}{\text{RBC/uL(in } 10^6\text{)}}$$

$$\text{MCHC (g/dL)} = \frac{\text{Hb/dL x 100}}{\text{PCV (\%)}}$$

RESULTS

Hemoglobin parameters in the blood of *Clarias batrachus* netted from polluted Gau Ghat (sample 1) and Jaipur Ghat (sample 2) area of Pushkar lake were studied and compared with control fish caught from Bisalpur reservoir to study the possible toxic effects of effluent pollutants. The parameters included hemoglobin (Hb), white blood corpuscles (WBC), red blood corpuscles (RBC), packed cell volume (PCV), mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH) and mean corpuscular hemoglobin concentration (MCHC). These parameters showed a drastic change in the treated samples when compared with control, revealing the adverse effect of pollution on hematological parameters of fish inhabiting Pushkar reservoir (Table 1).

Hemoglobin concentration showed a significant decrease of 37.75% and 12.25% respectively in polluted site 1 and 2 when compared to control. RBC contents were reduced 35% and 11% in polluted sites 1 and 2 respectively. WBC count showed a drastic increase 117.54% and 84.53% in polluted sit 1 and 2 samples. PCV decreased 21.37% in polluted sample 1 and increased 6.98% in sample 2 MCV increased 25.98% in polluted sample 1 and 12.64% in sample 2 MCH increased 3.83% and decreased 2.91% respectively in sample 1 and 2 when compared with control. MCHC value when compared with control decrease 25.75% in polluted sample 1 and 19.45% in sample 2.

DISCUSSION

Among hematological indices, the RBC count was lower in both the polluted samples, as compared with that in control waters. RBC count was 35% lower in sample 1 and 11% lower in sample 2. Similarly Hb was 38% lower in sample 1 and 12.25% lower in sample 2. Hematocrit (PCV) decreased 21.37% in sample, 1 while increased 7% in sample 2. WBC, on the other hand, increases 117.54% in sample 1 and 84.53% in sample 2. Likewise MCV increased 25.98% in sample 1 and 12.64% in sample 2. MCH increased 4% in sample 1 but decreased 3% in sample. The MCHC decreased 26% in sample and 19.5% in sample 2.

Table 1: Haematological parameters of *Clarias batrachus* caught from Bisalpur reservoir (control) and two sited of Pushkar (Site 1 Gau Ghat and site 2 Jaipur Ghat) receiving contamination

Parameters	Control	Site 1 (H = 5)	Site 2 (H = 5)
Hb (g / dL)	8.16±1.05 *	5.08±0.77*	7.16±0.53
RBC x 10^6 cells /ul	2.61±0.34	1.7±0.24	2.33±0.17
WBCx10^3 cell/ul	1.81±0.16	3.94±0.42**	3.34±0.24***
PCB %	23.2±2.44	18.22±2.30	24.8±3.13
MCV (fL)	92.61±11.26	116.68±4.09	104.32±7.31
MCH (pg)	31.48±1.57	32.69±6.79	30.57±0.16
MCHC (g/dl)	37.04±6.3	27.50±0.7826	29.89±2.21

*Mean ±Sem: student's't' test: *p<0.05, **P<0.01, ***P<0.001*
For statistical significance hematological parameters of test fish from polluted portion of the reservoir has been compared with control fish.
***Abbrev*: *Hb – Hemoglobin, RBC- Red Blood Corpuscles, WBC – White Blood Corpuscles, PCV- Packed cell volume, MCV- Mean corpuscular volume, MCH- Mean Corpuscular hemoglobin, MCHC – Mean corpuscular hemoglobin concentration, fl- femto liter, pg – pie gram, dl- deciliter, control fish sample from non polluted Bisalpur reservoir, site 1 Gau Ghat polluted portion of pushkar reservoir, site 2 Jaipur Ghat polluted portion of Pushkar reservoir.*

The decreased hemoglobin was apparently due to decreased RBC count, which in turn led to decreased PCB. The decreased RBC count may be due to inhibited RBC production and or due to hemoglobin synthesis, Ambient- toxicants might have caused disintegration of RBC cells, which in turn have caused reduction of hemoglobin and hematocrit count. This confirms the presence of anemia in the treated samples. Anemia of this type characterized by reduced RBC count, hematocrit and hemoglobin contents have also been reported by several workers after insecticide feeding (Mandal *et al.*, 1986; Ali, 1989).
Increase in MCV, MCH and unaltered or decreased MCHC was evident in the present investigations. This data confirmed that anemia produced was of macrocytic hypo chromatic type. The MCHC is a good indicator of red blood cell swelling (Wepener *et al.*, 1992 a.b.) The significant decreased in the MCHC after long term (6-8 weeks) exposure is probably an indication of red blood cell swelling and/ or to a decrease in hemoglobin in hemoglobin synthesis (Bhagwant and Bhikajee, 2000). WBC count increase, reflecting the occurrence of leukocytosis (WBC increase) in both the treated fish samples. This was perhaps, a typical defensive response of the fish against a toxic invasion and second most common probability may be leukemia or blood cancer during which the number of WBC increase. In another study Lohner *et al.*, (2001) reported leucopenia (reduced WBC counts) in sunfish inhabiting selenium laden coal ash effluents and associated it with increasing liver metal concentrations.
In the present study in treated sample 2 the amount of PCV also showed an increase of 6.89% which is same to the findings of Khalaf (1999). The effect of exposure to sub-lethal concentrations of cypermethrin, a synthetic pyrethroid pesticide on blood of the Indian major carp. *Labeo rohita* was studied.
Finally it is concluded that the fish hematological parameters. Such as HB, RBC and PCV are decreased showing anemia conditions, where as the WBC count is increased. Toxicants caused hyperproteinaemia, hyperlipaemia, hypoglycemia and hypochalesterolemia.
The data also confirms the presence of pollution plug in the Pushkar reservoir at nowhere, which has created a barrier between the fish population of Pushkar reservoir.
A general biomonitoring program is needed to be established where the hydrological and the chemical and physical water quality are taken in to consideration as these all affect the aquatic system.

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