CYTOLOGICAL SHIFT BETWEEN LYMPHOCYTES AND THROMBOCYTES IN THE FRESHWATER FISH, *BADIS BUCHANANI*

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The importance of haematology in the diagnosis of fish diseases and for the assessment of pollution has been widely accepted[1-5]. Leucocytic response in fish appears to provide a rapid, sensitive and quantitative method for determining stressful levels of pollutants to fish[6]. The acute effect of cadmium brought alterations in the white blood cells in fish[7] and mammal[8]. Cytological shift in lymphocytes induced by cadmium in mice and rats was related to its effect on the immune system[9].

Freshwater fish, *Badis buchanani* (Family: Nandidae) with an average weight of 4.6 g collected from local ponds were acclimated in the aquarium tanks in the laboratory. They were divided into 9 groups. The first *viz* the control group comprising 12 fish and the rest of the groups comprising 6 fish each were maintained for 24 hr in separate tanks under 10 to 80 ppm $CdSO^4$ concentrations. At the end of the experiment, blood samples were collected from caudal vein in asceptic condition by means of standard micropipette and subjected to standard methods of clinical hematology[10].

Cadmium sulphate (10 to 80 ppm) in solution induced a significant decrease in the number of thrombocytes and a corresponding increase in the number of lymphocytes in the freshwater fish *Badis buchanani* (table 1). The observation of Johansson and Larsson[11] on the flounder *Pleuronectes flesus* showing an increase in the number of lymphocytes as a

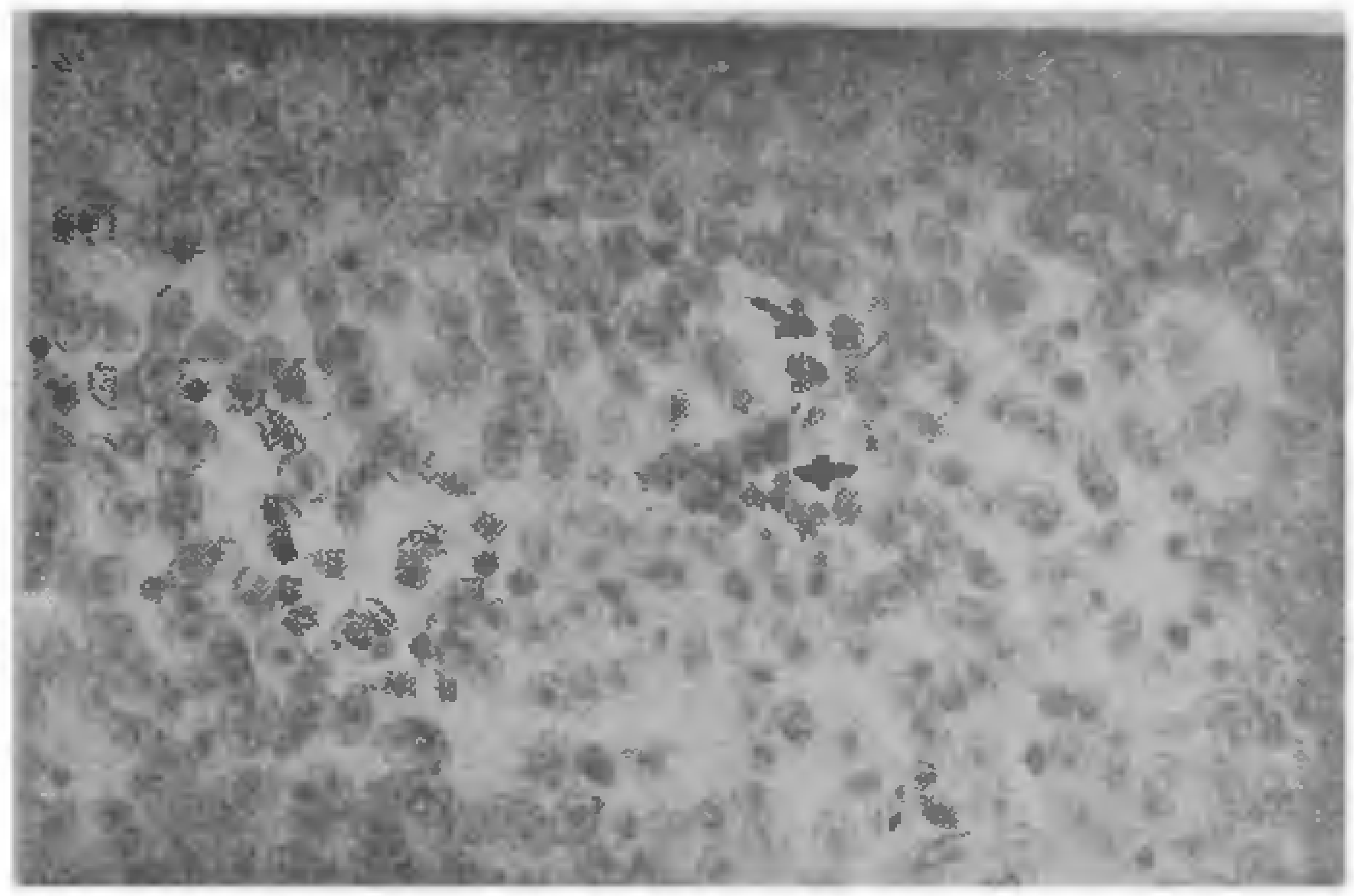

Figure 1. Aggregation of thrombocytes in control fish.

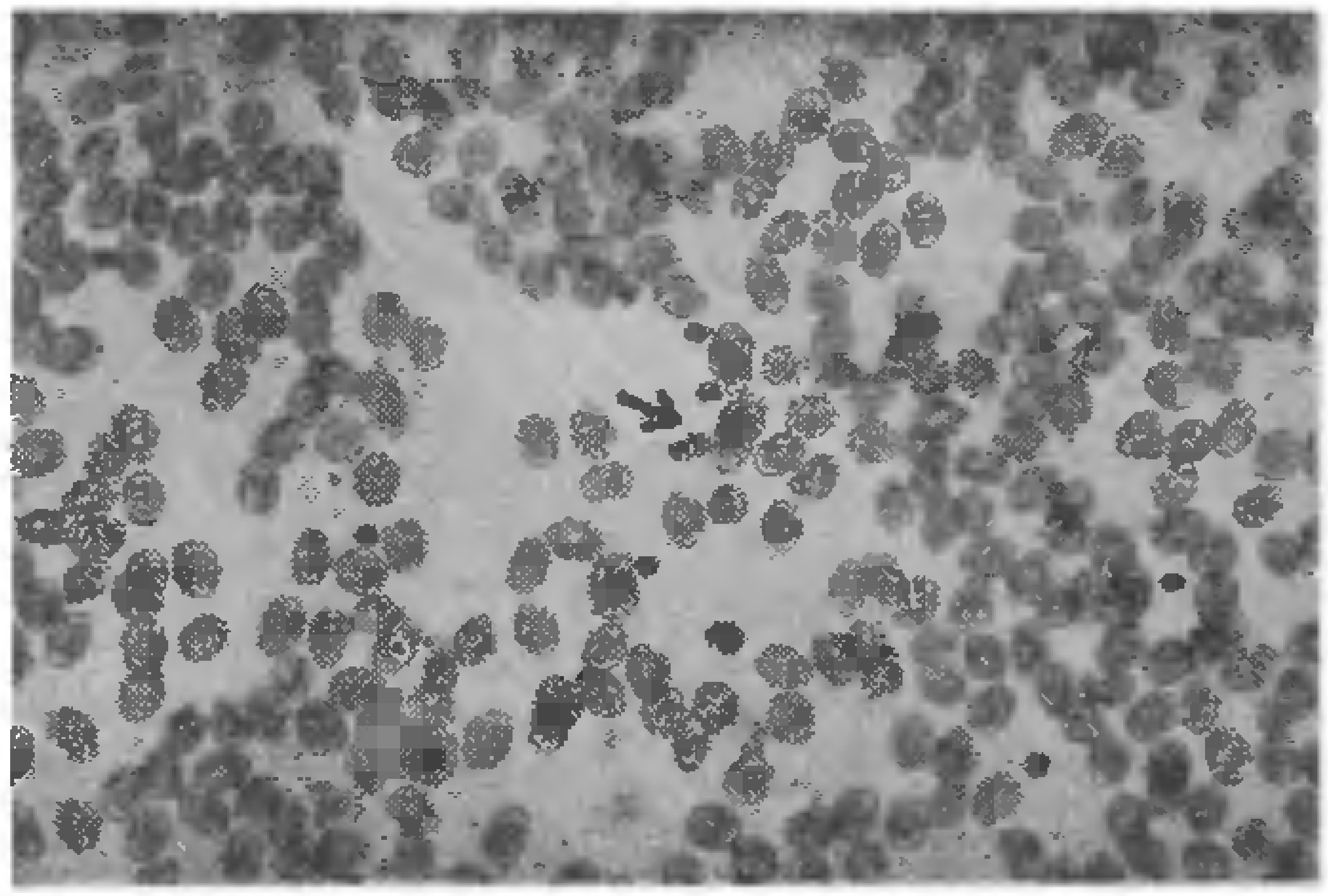

Figure 2. Disaggregation of thrombocytes in Cd-treated (70 ppm) fish.

Table 1

Differential WBC Count in the blood of a freshwater fish Badis buchanani exposed to cadmium

ppm concentrations of $CdSO^4$	Thrombocyte %		Lymphocyte %		Monocyte %		Neutrophil %	
Control	53.1	4.8	34.5	4.6	4.0	1.6	8.4	1.8
10	51,2	5.3	37.6	5.5	3.8	22.2	7.4	1.3
20	43.3	6.7	45.3	0.6	5.3	1.2	6.0	1.4
30	42.5	0.7	48.0	1.4	4.5	2.1	5.0	1.4
40	36.3	3.1	53.9	4.0	3.9	1.9	6.0	1.3
50	30.2	4.9	62.1	7.6	4.9	2.6	4.5	1.8
60	27.5	0.7	62.5	0.7	4.0	1.4	6.0	1.4
70	25.8	5.3	65.8	5.6	3.5	2.1	5.0	3.4
80	22.6	4.0	66.2	4.5	5.8	2.3	5.4	2.7

means of immunological defence of fish against cadmium may be attributed to our present observation. It is interesting to note the disaggregation of thrombocytes in the blood of fish treated with higher concentrations of $CdSO^4$ (figure 2) when compared to that of normal fish (figure 1). The *in vitro* observations[12] on the platelet disaggregating action of $CdCl^2$ strongly support our *in vivo* observation on the thrombocyte disaggregating capacity of cadmium in the fish.

The cytological shift in lymphocytes in mice and rats[9] towards an increase in lymphocytes as a means of immunological defense explains the leucocytic response to cadmium observed in the fish *Badis buchanani*. The dose response increase in lymphocytes and a corresponding decrease in thrombocytes may be related to an increase in the body defense or immunological competency of the fish against cadmium. Differential blood cell counts could usefully indicate early detection of adverse environmental effect of cadmium on fish.

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BIMODAL OXYGEN UPTAKE AND SOME BLOOD PARAMETERS IN THE BUBBLE NEST BUILDER, *TRICHOGASTER PECTORALIS* (REGAN)

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TRICHOGASTER *pectoralis* is an exotic species introduced in Tamil Nadu by the State Fisheries department. A native of Thailand and Cambodia, the species established itself in almost all the freshwaters of the state. The air breathing modifications of this fish include the so-called labyrinth organs and the well vascularized epithelium covering the labyrinth organs and the supra branchial chamber. The air breathing habit of the fish was first mentioned by Bader[1]. But no information is available on the bimodal oxygen consumption and blood parameters of this fish. In the present investigation an attempt has been made to study the bimodal oxygen uptake and the respiratory adaptations of the blood in *T. pectoralis* and the results are reported here.

Speciments of *T. pectoralis* weighing 10–15 g collected from local freshwater sources were maintained in plastic aquaria at 29 ± 1° C and fed with boiled eggs and earthworms alternatively, every two days. Feeding was discontinued one day before the fish were used in the experiments. The aquatic oxygen consumption of the fish was studied by measuring the loss of oxygen and the rate of flow of water through the respiratory chamber, in a continuous flow system as adopted by Job[2]. Oxygen content of water samples was estimated using Winkler's method. The aerial oxygen uptake by the fish was measured with a simple respirometer using manometric techniques. Oxygen uptake from air and water was also measured simultaneously, when the fish was in water with access to air using respiratory chambers designed by Reddy and Natarajan[3]. Oxygen consumption from water was determined by estimating the loss of oxygen using Winkler's method and oxygen consumed from the air was determined using a manometer connected to the gas phase. In all manometric measurements, pressure changes in the gas phase of the respiratory chamber due to extraneous factors were corrected by a thermobarometer. The respiratory chambers were thermostated by immersion in a temperature controlled bath throughout the period of experimentation. All measurements were made at 29 ±1° C and sex was considered only for blood analyses.

Blood samples were collected by cardiac puncture using a heparinised needle and processed for the estimation of haemoglobin (Hb), haematocrit (Hct), mean corpuscular haemoglobin concentration (McHc), oxygen capacity and standard bicarbonates following Lenfant and Johansen[4]. Red cell count was