tions. Mercury inhibits the permeability of nutritionally important molecules such as sugars and amino acids[2].

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ACTIVITY LEVELS OF SUCCINATE DEHYDROGENASE (SDH) IN CELL-FREE SYSTEM UNDER DIETARY STRESS IN *ANABAS SCANDENS* (CUVIER)

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THE activity levels of succinate dehydrogenase (SDH) under experimental conditions in fish tissues have not been thoroughly investigated. Any alteration in the intermediary metabolism due to dietary stress is bound to affect the activity of this enzyme since SDH is one of the key enzymes of Krebs cycle. An attempt was therefore made to study the activity levels of SDH under high protein and high carbohydrate diet as well as under starvation in a freshwater carnivorous teleost *Anabas scandens*.

Four groups of fish (comprising ten per group) of individual average weight of about 30 g were kept in well-aerated aquaria and acclimatized to the laboratory conditions. They were subjected to various experimental conditions for eight weeks. The first group was fed with 65% protein diet and the second group 65% carbohydrate diet and the third group was starved. The fourth group served as control and this group was fed with a modified commercial fish meal (table 1). Fish were fed once a day *ad libitum*. After the experimental period the fish were killed and the tissues of liver, muscle, kidney, gills and brain were dissected and a 5% homogenate was prepared in ice cold 0.25 M sucrose. The homogenate was centrifuged at 2500 rpm for 15 min and the clear supernatant was used to assay SDH by the modified method of Nachlas *et al*[1]. The data was computed with reference to the mean value, percent change and standard deviation.

All the fish survived throughout the experimental period. Under 65% protein diet and 65% carbohydrate diet the activity levels of SDH showed an increase in all the tissues. The increase was greater in the brain than in other tissues. Under starvation the enzyme level decreased significantly in all the tissues except in liver (table 2).

Under high protein diet, protein catabolism and gluconeogenesis takes place in the tissues of *A. scandens*[2]. In the absence of external supply of carbohydrates the excess of aminoacids is channelled into Krebs cycle for the production of energy and supply of glucose to vital organs; hence the increase in the SDH activity levels in the tissues of this fish and this is more pronounced in the brain. It has been shown in rats that the increase in liver SDH activity could be correlated with an increase in dietary casein[3]. This finding supports the observation made in the present study.

Under carbohydrate loading the carbohydrate metabolism is accelerated due to the high influx of substrates and the SDH which plays a vital role in the oxidative metabolism of carbohydrates shows elev-

Table 1 *Composition of Diets*

Ingredients	Percentage of dry weight		
	High Protein diet	High Carbohydrate diet	Control diet
Casein*	65	-	25
Corn Starch	-	65	30
Cod liver oil	10	10	10
Alpha cellulose	15	15	15
Vitamin mix	2	2	2
Minerals	3	3	3
Agar	5	5	15

* Centron laboratories.

Table 2 *Succinate dehydrogenase activity in the tissues of Anabas scandens under different nutritional status (values are mean ± S.E. of ten determinations).*

Dietary status	Liver	Muscle	Kidney	Brain	Gills
Control	0.93	2.18	0.36	0.90	0.39
	± 0.04	± 0.03	± 0.01	0.02	0.01
High protein diet	1.11**	2.64*	0.41**	1.24*	0.43
	± 0.02	± 0.01	± 0.01	± 0.01	± 0.03
%Change	19.37	21.04	12.77	38.21	8.90
High Carbohydrate diet	1.45*	2.70*	0.43***	1.24*	0.46**
	± 0.10	± 0.04	± 0.01	± 0.04	0.02
%Change	31.21	23.70	18.88	38.22	16.28
Starvation	0.88	1.21*	0.29*	0.80*	0.31*
	± 0.02	± 0.05	± 0.02	± 0.01	± 0.05
% Change	− 5.38	−44.52	−20.27	−10.88	−21.8

Values expressed as units. 1 Unit = moles of formazan formed/mg. protein/hour. * $P < 0.001$ ** $P < 0.01$, *** $P < 0.05$

ated levels of activity. Further, this increase is more than the values observed under high protein diet as a result of excessive intake of carbohydrates.

Under starvational stress the enzyme level falls in all the tissues except liver. The low level of activity coincides with the low metabolic rate due to the dearth of nutrients. The insignificant change in the activity levels of SDH in the liver tissue shows that this organ carries out its synthetic and catabolic function more or less at a steady state to regulate the adaptive mechanisms. The liver should continuously produce glucose to maintain a constant circulating level making use of all available sources and by gluconeogenesis. There is evidence of operation of gluconeogenesis during starvation in fishes[4]. Therefore it is probable that a similar mechanism is operating in the liver of *A. scandens* and consequently SDH level is not affected in the liver.

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ERYTHROCYTIC ANISOCYTOSIS DUE TO HELMINTHIASIS IN POULTRY

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ERYTHROCYTIC anisocytosis has been reported in several protozoan, bacterial, viral and nutritional deficiency diseases that affect the poultry. Microcytosis was observed by Gray *et al*[1] in haemorrhegic syndrome, Chandrasekharan and Krishnan[2] in ranikhet disease and Rajendran *et al*[3] in fowl pox. Macrocytosis has been reported by Hogan and Parrott[4] in Vitamin B_c deficiency, Goff *et al*[5] in riboflavin deficiency, Chandrasekharan *et al*[6] in pullet disease and Rajendran *et al*[3] in ranikhet disease, Caecal coccidiosis and erythroleucosis. Rajendran *et al*[3] stated that the increase of the mean corpuscular volume in the diseases studied by them is due to the presence of a large number of immature cells in the blood.

In the present study the effect of helminthiasis on the mean corpuscular volume of erythrocytes of the domestic fowl was assessed. The total erythrocyte count (TEC) and the haematocrit (PCV) were estimated in 400 birds[7] and from these values the mean corpuscular volume of erythrocytes was calculated. Visceral examinations were also carried out in these birds to record the number, sex, size and state of maturity of the various types of gastrointestinal helminths, if any, that were infecting the fowl.

The results (table 1) obtained with healthy fowls indicate that the corpuscular size of erythrocytes is