

on. On cooling the extract, a thick crop of crystalline needles resulted which were separated by filtration under suction and recrystallised thrice from 95% ethanol after treatment with active charcoal. Yield, 10.9%, m.p. 166° (corr.), *Anal.*\*:—Found: C, 39.67; H, 7.67. Calculated for  $C_6H_{14}O_6$  (mannitol): C, 39.56; H, 7.74. The details of chemical and chromatographic identification procedures will be published elsewhere.

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#### A NOTE ON THE FIND OF GYPSEOUS CLAYS AT RED HILLS, NEAR MADRAS CITY

IN a boring put down by a private party for water 0.4 km. south-east of Muttiripalaiyam village ( $12^{\circ} 10' 45''$ :  $80^{\circ} 09' 66''$  C/4) on the western side of the Red Hills lake, about 16 km. north-west of Madras City, the following lithological log was prepared by examining the material brought out by hand-drilling and in consultation with the Driller for the depths.

In metres	In feet	
0.00–0.60	0–2	Ferruginous gravel
0.60–2.74	2–9	White shales
2.74–18.28	9–60	Mottled clay
18.28–27.43	60–90	Yellow and mottled clay
27.43–32.58	90–107	Black (carbonaceous) clay with gypsum

The top 27.43 m. (90 ft.) of the material was identified as of Cuddalore age (Mio-Pliocene). The Cuddalore sandstones are regarded as of freshwater origin. The presence of gypsum in the black (carbonaceous) clay below 27.43 m. (90 ft.) suggests that it is perhaps part of a marine sequence of sediments underlying the Cuddalores. The correlation of this black gypseous clay horizon below the Cuddalores with the Eocene succession, which is unknown in this region, is being further studied.

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#### ACTIVITIES OF LACTIC DEHYDROGENASE AND CYTOCHROME OXIDASE IN RELATION TO THE CHARGE DENSITY IN THE AMPHIBIAN PECTORALIS MUSCLE

THE components of living cells were found to possess electrical charges either a net positive sign of the charge or a net negative sign of the charge.<sup>1,7</sup> Whole cells are normally found to exhibit a net negative sign of the charge and in some cases the pattern of orientation in an electric field is dependent on the charge distribution on the outer surface.<sup>8</sup>

A possible relation between charges on the enzyme molecules as well as the protein environment and the expression of the enzyme activity was suggested.<sup>1-4,11,12</sup> In the present study an attempt was made to investigate such relationship in the pectoralis muscle since the fibres run end to end.

*Material and Methods: Preparation of the material.*—*Rana hexadactyla* were double pithed and the pectoralis muscles from both the legs were isolated with least injury. The muscles were washed in amphibian Ringers medium<sup>9</sup> for 5 times to wash off the clot and injury substances and allowed to stand in Ringers medium for 10 minutes to recover from shock effects. Out of the two muscles isolated from one frog, one was used as control and the other, namely the experimental, was exposed to a direct current of 6 volts D.C./cm. along the long axis for 10 minutes. At the end of the experiment the muscle was cut transversely in the middle into two halves. The half which was at the proximity of the cathode pole was called as the cathode half and the other the anode half.

*Cytochrome Oxidase Activity.*—The enzyme activity was estimated by the "New colorimetric method"<sup>10</sup> in the control and the experimental muscle halves. This method was slightly modified owing to the low amount of cytochrome oxidase content present in the skeletal muscles, as follows: 0.3 ml. of 0.2 M *p*-phenylenediamine and 0.3 ml. of 0.2% neotetrazolium chloride were mixed and 0.3 ml. of 20% tissue homogenate prepared in 0.1 M phosphate buffer at pH 7.6 and 0.3 ml. of  $10^{-4}$  M cytochrome C was added. For the substrate control, i.e., endogenous enzymes, 0.3 ml. of distilled water was used in the place of *p*-phenylenediamine. For enzyme control, 0.3 ml. of 0.1 M phosphate buffer at pH 7.6 was used in place of the tissue homogenate.

*Lactic Dehydrogenase*—The activity was estimated in the control and the experimental

muscle halves by modified method of triphenyltetrazolium chloride test.<sup>11</sup>

**Results and Discussion.**—The lactic dehydrogenase activity was found to be  $4333 \pm 1581$ ,  $3137 \pm 1132$  and  $2883 \pm 1154$   $\mu$ g. per gram wet weight in the control, cathode and anode half muscle homogenates respectively. The activity was found to be less in the experimental muscle halves than in the control. Between the experimental muscle halves, the value was higher in the cathode half than in the anode half indicating the migration of the enzyme towards the cathode suggesting the existence of a net positive sign of the charge on the enzyme molecule. Activity per milligram of protein indicated an increase in the anode half and a decrease in the cathode half. Since it was found that the cathode and the anode half accumulate protein fractions having a net positive and the negative sign of the charges,<sup>1-4</sup> it is likely that the density of charges could be responsible for the alteration of activity in the experimental muscle halves.

The cytochrome oxidase activity was found to be  $287 \pm 58.51$ ,  $240 \pm 68.7$  and  $154.27 \pm 76.49$   $\mu$ g. per gram wet weight in the control, cathode and anode half muscle homogenates respectively. The activity decreased in the experimental muscle halves as was found in the case of lactic dehydrogenase. Between the experimental muscle halves, the activity was greater in the cathode half than in the anode half indicating the net positive sign of the charge on the enzyme molecule. Estimation of activity per mg. protein indicated an activation of the enzyme by positively charged protein environment.

TABLE I

Lactic dehydrogenase (I) and Cytochrome oxidase (II), estimated by the modified method of Govindappa et al. (1966) and Takuzo et al. (1958)

Muscle	(I)		(II)	
	A	B	C	D
Control	$4333 \pm 1581$	57.73	$280.0 \pm 58.57$	3.823
Anode half	$2883 \pm 1581$	55.09	$154.27 \pm 76.49$	1.898
Cathode half	$3137 \pm 1132$	38.60	$240.0 \pm 68.1$	4.598

A =  $\mu$ g. of formazon/g. wet weight of the muscle.

B = Activity of the enzyme expressed in terms of formazon/mg. wet weight of the muscle.

C =  $\mu$ g. of NTC reduce/g./hr.

D = Activity of enzyme expressed in terms of NTC reduced/mg. of protein.

Since lactic dehydrogenase and cytochrome oxidase were known to mark the localization of soluble protein and mitochondria<sup>16-18</sup>

respectively it is possible that these cell components are having a net positive sign of the charge in the living cells, consequently showing cathodal migrations.

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### GAMETES AND GERMLINGS OF *ULVA FASCIATA DELILE*

THE green seaweed *Ulva fasciata* grows commonly on the Jaleshwar Reef, Veraval (Saurashtra), on the margins of pools situated in the intertidal region and attains the maximum length of 1-2 m. during October-December. However, full growth is not necessary for swarmer formation as this has been observed frequently in earlier months. The plants shed swarmers during exposure in the mornings in very large numbers and these impart a yellow-green colour to the surrounding sea-water. A fortnightly rhythm in their formation associated with spring tides was also noted. A study of swarmer output and the early growth of germlings was undertaken.

A small plant (16.9 cm. long) with one prominent blade was chosen and six fragments were removed. Each fragment was placed over a slide immersed in sea-water in a petri dish. The fragments, marked serially, were placed under constant temperature (22° C.) and light (800 lux) conditions. Entire fragments taken from the apical portion and in the other fragments, the part corresponding to the margins