

CHAPTER 8

DIURNAL VARIATIONS IN THE GLYCOGEN AND FAT CONTENTS OF THE
PECTORAL MUSCLES OF THE BAT HIPPOSIDEROS SPEORIS

Observations on the diurnal variations in the glycogen and fat contents of the pectoralis muscle of the migratory starling (Sturnus roseus) during the premigratory and post-migratory phases, have been discussed in Chapter 6. It was found that normally there was substantial increase in glycogen during the day and decrease during night whereas the reverse was the case with fat. In another investigation it was shown that glycogen is practically depleted in the pectoralis muscle of pigeon de-feathered in the pectoral region during night and subjected to cold stress in a refrigerator (Chapter 7). Bats being nocturnal animals, it was considered to be of interest to obtain similar data on their pectoral muscles.

MATERIALS AND METHODS

The bats (Hipposideros speoris) used in this investigation were collected during day time from dry wells where they were found roosting and brought to the laboratory and kept in a dark room. Of the twenty bats collected on a day, half the number were sacrificed at 6 PM. on the same day and immediately pieces of muscle from the pectoralis major and pectoralis minor muscles were excised, blotted free of blood and dropped into weighed tubes containing 3 ml of 10% KOH. The tubes were immediately weighed to determine the weight of the tissue taken which was digested by

heating the tubes in a boiling water-bath. The rest of the procedure for the estimation of glycogen was the same as described in Chapter 6. The fat content was estimated in the remaining portion of the pectoralis major and minor muscles according to the same method already described in Chapter 6.

The rest of the bats were kept over night in a cage with provision of water. The bats which remained inactive during day time, showed active movements within the cage during the night. It should be admitted however, that their movement in the night were considerably reduced by confining them to a cage 1.5 X 1.5 feet in dimension. But even in the limited space available they showed active movements. These bats were sacrificed next morning at 6AM. and the muscle pieces were collected as before for the estimation^{of} the glycogen and fat contents. Data presented were obtained from four batches each containing 20 bats. The statistical significance of the difference between the glycogen values in the morning and evening was tested by employing the 't' test.

RESULTS AND DISCUSSION

The results obtained are presented in Table 1. In the pectoralis major the glycogen content in the evening was 0.352% and increased to 0.577% in the morning. This difference was found to be significant at the 1% level. In the pectoralis minor the glycogen contents were 0.492% and 0.493% respectively in the evening and morning which shows no significant difference. The mean fat content of the pectoralis major which was found to be 21.155% in the evening showed a slight decrease to 19.481% in the morning. However, the difference was not found to be

statistically significant. In the pectoralis minor also no significant difference could be noted between the fat contents between the evening and morning which was found to be 19.756% and 19.60% respectively.

From the earlier investigation (Chapter 6) on the diurnal changes in the fuel reserves of the pectoralis muscle of the Rosy Pastor (Sturnus roseus), it is seen that the bird builds up the glycogen store of the muscle during the day and that it is partly used up in the night. The reduction of the fat store of the muscle during the day and its increase during night suggested the utilization of fat during the day and synthesis of fat during night (Chapter 6).

It has been shown that the flight muscles of bats as those of birds utilize fat as the chief fuel for sustained activity (George and Jyoti, 1955b). Bats are nocturnal animals and so in the light of the data obtained on bird muscles (Chapter 6) one would expect that in the case of the bat pectoral muscle, the trend in the diurnal changes would be reverse of what was observed in the case of the bird muscle. This was indeed so as is seen from the results from the results obtained in the present investigation. The build up of muscle glycogen in the bat was seen during night instead of day and the slight reduction in the fat content during the night instead of the day. Had not the bats been ~~not~~ confined to the cage and allowed to fly about during night the reduction in the fat content would have been quite substantial.

It should be mentioned here that no significant diurnal differences were seen in the case of the pectoralis minor which is relatively a very weak muscle.

TABLE 1.

DIURNAL VARIATIONS IN GLYCOGEN AND FAT LEVELS IN THE PECTORALIS MUSCLES OF
THE BAT (HIPPOSIDEROS SPEORIS)

Mean body weight in Gm.	Percentage of glycogen per 100 gm wet muscle	Percentage of fat per 100 gm dry muscle	
	Pectoralis major	Pectoralis minor	Pectoralis major
	Pectoralis minor	Pectoralis minor	
	Morning:		
	0.577 ± 0.033 (40)	0.493 ± 0.072 (40)	19.481 ± 3.258 (40)
	Evening:		
	** 0.352 ± 0.110 (40)	0.492 ± 0.161 (40)	19.756 ± 3.527 (40)
13.856 ± 2.769			

** Denotes the difference is highly significant.

Figures in brackets denote the number of experiments in as many animals.