INTRODUCTION.

Nature of carbohydrate and lipid metabolism in hibernating animals have been studied extensively by Mayer and Bernick (1), Fawcett and Lyman (2), Wilber and Musacchia (3), Reach (4), Rasmussen (5), Weinland and Riehl (6), Rulot (7), Troyer (8), Zimny (9), Johnson (10), Zimny and Tyrone (11), Valentine (12), Lyman and Leduc (13), Smith (14), Atkinson (15), Dubois (16), Endres (17), Woodward and Condrin (18), Lyman and Chatfield (19), Dessauer (20), Deb and Mukherji (21).

From the study of habits and habitats of different species of hibernators, it seems that the exclusive use of fat during hibernation may vary from species to species (19).

Abey (22), Luchsinger (23), Voit (24), Dubois (16), Rulot (7), Weinland and Riehl (6), Dessauer (20), have observed an accumulation of glycogen in liver in the early part of hibernation followed by a decrease throughout the remainder of hibernation while, others have observed an accumulation of small amounts of glycogen which remained relatively constant during hibernation (Endres (17), (Ferdman et al) (25), (Stucky et al) (26), (Suomalainen) (27), (Woodward and Condrin) (18), (Dodgen and Blood) (28).

The significance of presence of different cytoplasmic constituents in liver is not definitely clear, but it may be expected that they have important metabolic role. Mukherji (29) has studied the distribution of different constituents present in liver of toad (Bufo melanostictus) and compared it with that of rat. He has observed considerable similarities
and dissimilarities between the two classes of vertebrate. The cytoplasmic constituents has also been observed by him to vary in this animal in hibernation and non-hibernation. Deb and Mukherji (21) have also studied the carbohydrate and lipid metabolism in toad both during hibernation and non-hibernation. They have remarked that only during the months of April, the toads utilised carbohydrate efficiently like mammals. During hibernation they have been observed to utilize mainly lipids. Chakravarty (30) has recently studied the changes in cytoplasmic constituents of liver in altered carbohydrate metabolism produced by malonate, carbon tetrachloride, para-aminosalicylic acid, alloxan and adrenaline. All the above agents produced profound changes both in metabolism and in distribution of different cytoplasmic constituents.

Comparative distribution of lipids, glycogen contents and enzymes in liver concerned in carbohydrate and lipid metabolism in different classes of normal and hibernated animals has not yet been carried out in detail. It is expected that such a study will throw some new light on the metabolic pattern of different vertebrates.

In the work presented in this thesis, a comparative study on the distribution of different cytoplasmic constituents present in liver has been made in the following classes of vertebrates:

1. **Ophiocophalus punctatus** (Lata fish of carnivorous type)  
2. **Cirrhina mrigala** (Mrigal fish of herbivorous type)  
3. **Bufo melanostictus** (Common toad)  
4. **Calotes versicolor** (Garden lizard)  
5. **Columba livia** (domestic variety of rock pigeon)  
6. **Rattus sp.** (domestic variety of white rat)

Of the above animals, toads and lizards have been observed to
undergo the process of hibernation. As considerable difference has previously been observed in the metabolic pattern of hibernating and non-hibernating animals. In the present study the distribution of cytoplasmic inclusions has been studied in toad and lizard in both the periods.

The work embodied in this thesis has been subdivided into five Chapters.

In chapter I, histological structure of liver in different classes of vertebrate has been presented, special emphasis having been given on the distribution of reticulin.

In Chapter II, a comparative study of nuclear and cytoplasmic volume of hepatic parenchymal cell has been undertaken to see if they are related to the process of evolution.

In Chapter III, a comparative histochemical study on the distribution of different lipid fractions (sudan, plasmal, unsaturated lipids, phospholipids and cholesterol) has been presented.

In Chapter IV (Part-1) studies have been undertaken to compare the fasting blood sugar level and glycogen value (histochemical) in liver of different classes of vertebrate. As the liver of lata fish contained lowest amount of glycogen, the glycogen values of this animal were compared to that of rat also by biochemical method to have a quantitative idea. The liver of this fish behaved differently from that of rat as regards neutral lipid and glycogen content, the effect of two carbohydrate regulating hormones, adrenaline and insulin on the blood sugar and liver glycogen of lata fish has been studied and presented in Chapter IV (Part-2).
In chapter V, a comparative histochemical study on the localization of the following enzymes have been presented.

A. Succinic dehydrogenase.
B. Glucose-6-phosphatase.
C. Esterase.
D. Lipase.
E. Acid phosphatase.
F. Alkaline phosphatase.
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