SUMMARY

Chapter 1

Glycogen body, a tissue located on the mid-dorsal aspect of the lumbosacral spinal cord of birds and known for the presence of enormous quantities of glycogen in its cells have received very little attention. There have been report regarding occurrence of diurnal variation in the levels of glycogen in glycogen body of adult blue rock pigeon during warmer months. However, a later report on glycogen content of glycogen body failed to exhibit any significant alteration in the load of glycogen during colder months. The present chapter, therefore, deals with evaluation of diurnal variation, if any, in the glycogen content of glycogen body of adult feral pigeon during the warmer months. The glycogen body did not exhibit any change in the glycogen load during the 24 hour period. Nonvarying levels of glycogen in the glycogen body may be due to absence of enzyme glucose-6-phosphatase. The tissue may be in a position to release free glucose to the C. S. F by the action of debrancher, albeit, in smaller quantities or divert its glycogen stores for the production of various components of extracellular matrix.

Chapter 2

Glycogen body has a very high activity of lactate dehydrogenase enzyme. Yet there has been no reports

regarding the distribution pattern of lactate dehydrogenase isoenzyme in the glycogen body and different regions of spinal cord. The present work was an attempt to study its isoenzyme profile in the post-hatched developing chicks (1- 50 days of age) and adult of domestic fowl as also the pattern in the adult pigeon. Glycogen body tissue yielded anodal bands H_4 and H_3M, through day 1 to 50 post-hatched chicks and also in adult fowl whereas glycogen body from pigeon showed presence of 3 anodal bands. Spinal cord regions of developing fowl showed the occurrence of 2 anodal bands like glycogen body initially, i.e till day 10. However, during the ensuing development (from 20 day to adulthood) a third band representing H_2M_2 molecular species appeared in them. Spinal cord of pigeon had four bands in place of three of fowl. Presence of an additional band in spinal cord of both the birds and lack of it in glycogen body could be attributed to the occurrence of fully differentiated neurons in former and to their absence in the latter i.e astroglial tissue. A notable feature of glycogen body of both the birds studied was the presence of a thick and uniform staining in the pre-band 1 region. Zinkham *et al.*(1966) have noted similar results in the heart of wild pigeons and ascribed them to be an allele of H subunit (B').

Chapter 3

A chromatographic study of amino acids (both free and bound) was done in the glycogen body of 15 days post-hatched chicks. For comparison, amino acids (free) in two regions of spinal cord *viz.* cervical and lumbosacral were tried out. The data on glycogen body revealed the amino acids glutamate and aspartate in large quantities whereas alanine was found only in very small quantity. Appearance of additional amino acids in hydrolyzed sample and spots of low Rf on chromatograms, indicate the presence of low molecular weight peptides in the glycogen body. Water content of glycogen body tissue is also included in the present chapter. A slight decrease was observed in juvenile fowl (50 day old) when the result was compared with two week *ex ovo* chicks.

Chapter 4

Ammonia, is known to accumulate in the brain of human with severe chronic liver diseases, as a result of metabolic abnormalities. Glycogen body has been thought to be a specific differentiation of glia, being composed of glycogen filled astrocytes. Astrocytes are active participants in the physiology of the brain and known to play a key role in detoxication of ammonia. The present chapter includes the effect of ammonia loading on the

glycogen content of these specialised astrocytes in 5 day old *ex-ovo* chicks. The study also includes work on glycogen synthase, phosphorylase and total protein. Result indicated a significant increase in the glycogen content following ammonia administration. Phosphorylase enzyme activity was seen to be inhibited. Glycogen synthase activity did not show a significant increase. Increases in glycogen following ammonia administration may be due either to inhibition of phosphorylase brought about by perturbation in β-adrenergic cAMP producing system or due to lack of pyridoxal phosphate needed for activation of phosphorylase enzyme. As there is no barrier for incoming glucose, glycogen synthase though does not show significant increases in the present study, possibly form glycogen. On the basis of the results obtained it is hypothesized that during early development production of ammonia between embryonic days E6-E12, concomitant with death of ventromotor neurons must have led to the formation of glycogen body mass dorso-medially.

Chapter 5

In the present chapter general histological and histochemical studies at light microscope level and detailed morphological study at the electron microscope level were undertaken. Histochemical staining of glycogen

body for RNA revealed the perinuclear region of glycogen body to contain RNA. Ultrastructurally, the glycogen body showed presence of mitochondria, golgi with its corresponding vesicles, rough endoplasmic reticulum, free and bound ribosomes etc. The vesicles were seen to be filled with glycogen like material. These appeared to be getting secreted out of the cell. During development of central nervous system astrocytes are known to play an important role in the formation various constituents of the extracellular matrix. The possible role of glycogen body in extracellular matrix formation has been highlighted.

Chapter 6

Fluoride, as an injurious agent affecting the central nervous system in man has been well established. Sodium fluoride is known to bring about metabolic alteration in the C. N. S. of mammalian forms. Little is known on the action of sodium fluoride on nervous system in birds. In the present study effort was made to evaluate the chronic effects of sodium fluoride on the metabolic profile of glycogen body in post-natal chicks (1-30 days of age). Fluoride poisoning brought about decreases in the tissue glycogen with a parallel decrease in glycogen synthase activity and an enhanced phosphorylase activity.

The present chapter also saw the activity of SDH to decrease indicative of an altered oxidative metabolism. The resultant increase of LDH also suggests a possible shift in the energy metabolism towards anaerobic pathway. The decreases in non-specific acid and alkaline phosphatases denotes a disturbance in transport activity and secretion which is supportive of an altered metabolism in fluoride treated growing chicks.