

SUMMARY

CHAPTER 1 :

The histological features of the various tissues of the normal and regenerating tail of the house lizard, Hemidactylus flaviviridis ^{pre}is reported. The component tissues of the normal tail are the epidermis, dermis, muscle, subcutaneous and submuscular adipose tissues, vertebral column and the spinal cord. The different phases of regeneration viz., the wound healing, pre-blastemic, blastemic, late blastemic, differentiation and growth ^{phases} are dealt with and the histological details are discussed. The neural canal remains cartilagenous without ossification throughout. No spinal nerves are observed from the regenerated ependyma. In the fully regenerated tail all the tissues except the cartilagenous neural canal and the spinal cord have a structure similar to that of the original tail.

CHAPTER 2 :

The distribution of lipids viz., neutral, acidic and phospholipids in the tissues of the normal and regenerating tail of the house lizard, Hemidactylus flaviviridis is studied. In the normal tail the neutral lipids were seen in the germinativum layer of the epidermis, subjacent to the epidermal basement membrane, in the

subcutaneous and submuscular adipose tissues, vertebral marrow and marrow cells and the spinal cord. The phospholipids were seen only in the blood cells, phagocytes and the spinal cord. The regenerated tissues also showed similar localization of lipids. The localization of the neutral lipids were found to be diffused in the cytoplasm and as lipid globules of varying size, whereas acidic lipids were seen only diffused in the cytoplasm. The possibility of lipid participation in protein synthesis and metabolism in the normal and regenerating tail of the house lizard, H. flaviviridis is discussed.

CHAPTER 3:

Histochemical localization of lipase and esterase was carried out in the normal and regenerating tissues of the house lizard, Hemidactylus flaviviridis, using the "Tween" method of Gomori (Pearse, 1954). Tween 85 and 60 were used as substrates for lipase and esterase respectively. In the normal tissues of the tail, lipase was found to be localized in the epidermis, vertebral marrow and the spinal cord, whereas, a more wide distribution was observed for esterase. During the early periods of regeneration like the wound healing, preblastemic and blastemic phases the lipase response was poor and dispersed uniformly in the epithelium and the subapical core of the blastema. A similar localization was observed for the esterase but the activity

was quite high. During the differentiation phase all tissues showed poor lipase activity but moderate localization was observed in the epidermis, blood vessel, blood cells and the ependymal tube. However, the esterase activity was high in the epidermis, dermis, adipose tissues and the ependymal tube. During the growth phase there was no noticeable difference in the lipase or esterase activity.

CHAPTER 4 :

The SDH activity in the normal and regenerating tail of the house lizard, Hemidactylus flaviviridis was studied histochemically. In the normal tail tissues SDH was found to be localized in the cells of the stratum intermedium and the stratum germinativum of the epidermis, muscle fibres and the spinal cord. During the early phases of regeneration viz., wound healing, preblastemic and blastemic, only the wound epithelium showed SDH activity. As differentiation commenced, the SDH activity gradually appeared first in the stratum germinativum followed by the muscle tissue and the ependymal tube. In the fully regenerated tail the SDH activity was almost similar to that in the normal tail in its distribution pattern and intensity.

CHAPTER 5 :

The distribution of glycogen and the glycolytic enzyme, phosphorylase in the different tissues of the normal

adult and regenerating tail of the house lizard, Hemidactylus flaviviridis has been studied. In the normal tail the glycogen and phosphorylase were found to be localized in the germinativum layer, muscle tissue and the nervous tissue. The role of glycogen and phosphorylase in the metabolism of these tissues are discussed. Soon after the amputation the disappearance of the glycogen was noted from the cut ends of the muscle fibres. This was followed by the disappearance of phosphorylase also, suggesting depletion of glycogen. During the early phases of regeneration viz., wound healing, preblastemic and blastemic phases the new epithelium showed glycogen or phosphorylase whereas the subapical tissues and the blastemal cells remained negative to glycogen and phosphorylase. Glycogen was observed early from mononuclear myoblasts. But phosphorylase appeared two or four days later. The possibility of synthesizing glycogen without the glycolytic enzyme phosphorylase has been discussed.

CHAPTER 6 :

Acid phosphatase activity in the different tissues of the adult normal and regenerating tail of the house lizard, Hemidactylus flaviviridis has been studied. High enzyme activity was noted in the stratum intermedium, stratum germinativum and the epidermal basement membrane.

The enzyme activity was moderate in the dermis and fascia. However, the subepithelial region of the dermis showed more enzyme activity. Intense enzyme activity was observed in the osteoclasts and fat cells of the vertebral marrow. The spinal cord showed a uniform and low enzyme activity. The wound epithelium was poor in enzyme reaction. Perceptible enzyme activity was noted in the subapical cells. A sharp increase in the enzyme activity was found in the dedifferentiating regions of the vertebral column and spinal cord. An elevated enzyme activity was observed at the time of the differentiation of the epidermal cell layer. The significance of the enzyme in the synthesis of keratin and ecdysis is discussed. An increase in the enzyme level was noted during chondrogenesis but in the fully differentiated neural canal, it was more in the perichondrial chondrocytes than those which formed the core of the neural canal.

CHAPTER 7 :

A histochemical study of alkaline phosphatase activity was carried out in the normal and regenerating tail of the house lizard, Hemidactylus flaviviridis. In the epidermis the enzyme was localized in the stratum intermedium, stratum germinativum and along the epidermal

basement membrane. The connective tissue fibres of the dermis showed poor enzyme activity. In the muscle fibres the enzyme was localized in the sarcoplasm and mitochondria. Three types of muscle fibres could be distinguished. The vertebral column showed high enzyme activity in the osteoblasts, osteocytes and marrow cells of the vertebrae. In the spinal cord the enzyme activity was low and uniform. The enzyme was perceptible in the wound epithelium and subapical cells. An increase in the enzyme activity was noted in the epithelium at the time of the differentiation of epidermal cell layers. The significance of enzyme in relation to keratinization is discussed. The chondrocytes of the cartilagenous neural canal showed positive enzyme reaction. But the perichondrial chondrocytes showed more enzyme activity. In the muscle fibres the enzyme was noted first in the sarcoplasm and then in ^{the} mitochondria. The possible role of the enzyme in relation with the phosphate metabolism and transport of glycogen is discussed.

CHAPTER 8 :

The histochemical localization of RNA and DNA was studied in the normal and regenerating tail of the house lizard, Hemidactylus flaviviridis, using the Methyl-Green Pyronin Y method. In the normal tail, RNA was localized

in the cytoplasm of all the tissues and its concentration was high in the epidermal cells, muscle fibres, inter-vertebral cartilage, bone marrow cells and spinal cord. The connective tissue fibres of the dermis, fascia and adipose tissues showed considerably low RNA content. During the regenerative period ~~there~~ it was high in the epidermis and the blastemal cells. However, the RNA in the epidermis was more than what was seen in the blastemal cells. At the onset of differentiation an increase in the RNA was observed in the mesenchyme cells. But when the tissues were fully differentiated, its level was reduced. It is suggested that the high concentration of the RNA is related to active protein synthesis for growth and keratinization of the outer epidermal cells. It is also suggested that the increase of RNA content is directly related to the mitotic activity of these cells during the formation of the blastema and the new generations of beta and alpha cells of ^{the}epidermis.

CHAPTER 9 :

The localization of the acetylcholinesterase and butyrylcholinesterase in the normal and regenerating tail of the house lizard, Hemidactylus flaviviridis was studied histochemically. In the normal tail, the muscle and spinal cord gave positive enzymatic response. In the skeletal

muscles both cholinesterases were found to be localised in the sarcoplasm, myoneural and myotendinous junctions. The spinal cord showed an intense activity for the acetyl- and butyrylcholinesterases in the grey matter as compared to the white matter. During the early phases of regeneration viz., wound healing, preblastemic and blastemic, cholinesterase activity was ^{di}nil or negligible. Only at the beginning of myogenesis, it was first observed in the cytoplasm of the mononuclear myoblasts and later was localized specifically at the myoneural and myotendinous junctions while some activity of the enzyme was still perceptible in the sarcoplasm. The early phase of ependyma differentiation showed low enzyme activity which gradually increased as the ependyma developed. However, in the fully regenerated spinal cord it did not reach the same level as that present in the original spinal cord. From these observations it could be stated that the cholinesterases do not initiate or stimulate regeneration as neurotropic^h_k agents.

CHAPTER 10 :

The histological features of the thyroid gland of the normal adult house lizard, Hemidactylus flaviviridis ^{was}~~was~~ studied. The changes in the thyroid activity during different phases of regeneration of the tail ^{were}~~was~~ studied using the cell

height and d/n ratio as the indices of the thyroid activity. It was found that the thyroid activity gradually decreased as the regeneration of the tail progressed.