SUMMARY

CHAPTER 1:

Aldolase was studied histochemically in the normal and regenerating tail of <u>Mabuya carinata</u>. The enzyme was found to be active in all stages of tail regeneration with an above normal increased activity during the differentiation phase suggesting an uninterrupted glycolytic process both in the normal and regenerating tail. In the normal tail, all the tissues showed a pronounced aldolase activity and ~~was~~ were found to be exclusively glycolytic. The mesenchymal cells of the blastema seemed to depand upon blood glucose for glycolysis as these cells demonstrated high aldolase activity in the absence of glycogen. The highly stepped up activity of aldolase during differentiation appears to be of importance not only for glycolysis but also for glyconeogenesis by its postulated reversible reaction. With the completion of differentiation and the commencement of the growth phase the enzyme activity gradually decreased till its activity in the fully regenerated tail tissues resembled that in the normal ones.

CHAPTER 2:

LDH and MDH were studied histochemically in the normal and regenerating tail of the lizard, Mabuya carinata. This study revealed an identical pattern of localization and distribution for these two enzymes during the various stages of regeneration. A slight initial fall in activity during the earlier phases was quickly followed by a gradual rise of activity during the later phases of regeneration. The high activity of MDH alongwith LDH in the light of hitherto reported low activities of SDH and ICDH is indicative of a strong pyruvate centered metabolism with lactate, oxaloacetate and malate acting as important coparticipants. The revelations of this investigation tends to indicate the existance of a short cycle similar to that of pyruvate carboxylase shuttle reported in vertebrate liver and muscle. This cycle has the advantage of supplying $NADPH_2$ an important cofactor for lipogenesis. Further significance of this cycle is discussed.

CHAPTER 3:

The histochemical localization of G6PDH and malic enzyme were carried out in the normal and regenerating tail of Mabuya carinata. Eventhough the activities of these two enzymes were identical and parallel during the various stages of regeneration, the G6PDH activity was noted to be slightly higher than that of malic enzyme. In the normal tail, the enzymes were poorly localized excepting for the G6PDH activity in the skin wherein it proves useful in the synthesis of nucleic acids. During the blastemic and early differentiation phases, the activities of both G6PDH as well as malic enzyme increased to a peak value. The high G6PDH activity during the blastemic and differentiation phases were construed to represent the operation of HMP shunt supplying $NADPH_2$ and pentose sugars necessary for the synthesis of lipids and nucleic acids respectively. The role of malic enzyme during these phases by its participation in the short pyruvate centered cycle together with LDH and MDH appears to be helpful both in the production of $NADPH_2$ necessary for fatty acid synthesis as well as in gluconeogenesis. With the completion of regeneration, both the enzymes fell back to the normal level in the fully regenerated tail.

CHAPTER 4:

The activity of α-GPDH and BDH was studied histochemically in the normal and regenerating tail of the scincid lizard, *Mabuya carinata*. α-GPDH which was well active in the normal tail components was found to rise to higher levels during the blastemic and differentiation phases. Whereas, BDH which was not represented well in the normal tail made its appearance felt during the blastema stage and finally attained its highest level of activity during the differentiation phase. With the completion of differentiation, both the enzymes registered a waning activity throughout the growth phase finally recording in the fully regenerated tail a localization and concentration identical and similar to that of the normal tail. The presence of BDH during blastema and differentiation phases appears to be in association with the lipid oxidations characteristic of the differentiation phase a beginning of which was made from late blastema phase itself. α-GPDH, due to its strategic position in the metabolic map appears to aid in both glyceride and phosphatide synthesis as well as their oxidation through the Embden Meyerhof pathway during the blastema and differentiation phases by its purported reversible reaction as per time and need. A probable secondary role for α-GPDH has been ascribed in the glycolytic metabolism of the normal and fully regenerated tail.

CHAPTER 5:

The enzyme distribution pattern of SDH and ICDH was studied histochemically in the normal and regenerating tail of Mabuya carinata. The study revealed a poor localization of both the enzymes in the normal tail tissues thus establishing the insignificant role of TCA cycle oxidations in the normal tail. After autotomy, the enzymes seemed to increase their activities through wound healing and preblastema upto blastema and finally registering the highest level of activity and localization during the differentiation phase. The low level activities of SDH and ICDH in the mesenchymal cells were construed to indicate the infancy of the TCA cycle during the blastemic phase. The observed high activity of both the enzymes during differentiation marked the fullfledged operation of TCA cycle for meeting the extra energy needs at this phase. The stronger activity of ICDH in comparison to SDH during the progressive stages of regeneration is discussed to be useful in both lipid as well as aminoacid anabolism. With the completion of the regenerative process and the attainment of the fully regenerate condition both the enzymes were observed to revert back to the original condition noticed in the normal tail.

CHAPTER 6:

Role of cytochrome oxidase and diaphorases during tail regeneration in Mabuya carinata were studied histochemically. The study highlighted a complete lack of cytochrome oxidase in the normal as well as the wound healing and blastemic phases of the regenerating tail thus indicating the non-involvement of cytochrome oxidase mediated oxidative metabolism during these stages. Cytochrome activity, worth noticeable was observed only during the differentiation phase. This too, when compared with the activity of other dehydrogenases including SDH and ICDH at this phase was quite poor and was suggestive of a possible participation of some other alternate respiratory mechanism in the regenerating system. On the other hand, the diaphorases were found to be well active in all the stages. All throughout regeneration, the NAD.D was noted to have a parallel distribution with its corresponding dehydrogenases. Whereas the NADP.D was noted to demonstrate a parallel distribution with its corresponding dehydrogenases in the normal and fully regenerated tail and during regeneration only in the differentiation phase. The low level activity of NADP.D noted during the wound healing and blastema phases was purported to represent the utility of reduced NADP in the various anabolic reactions characteristic of this phase of regeneration. Finally, the distribution pattern of diaphorases provided a definite clue to the existance of two distinct diaphorases in the regenerating tail of the lizard, *Mabuya carinata*.