SUMMARY AND CONCLUSIONS

CHAPTER 1:

A comparative study of the mammalian diaphragm was carried out with special reference to its cellular organization and histochemical nature. Three types of fibres were differentiated with the use of histochemical technique to localize SDH (Succinate dehydrogenase) in the diaphragm of all the mammals. The nature and distribution of three types of fibres in the mammalian diaphragm with respect to its dorsal (vertebral), lateral (costal) and ventral(sternal) regions have been studied. Histochemical studies on the enzyme activity like SDH and Lipase and the metabolite like fat have been made in the above mentioned three regions of diaphragm of various mammals. From the present comparative study it can be concluded that the diaphragm has a similar function in all the mammals but it varies in quantitative manner. Its activity (rate of contraction for breathing) is inversely proportional to the body size of the mammal. The relationship between the activity and the body size also involves the variations in the cellular organizations and the histochemical nature of the fibres constituting the diaphragm.

CHAPTER 2:

A histochemical study of alkaline and acid phosphatases have been carried out. The diaphragm of various mammals have

been investigated in the present studies. In the fibres of the mammalian diaphragm alkaline phosphatase activity is localized in the sarcoplasmic reticulum. No difference in the pattern of enzyme activity was seen between the red, intermediate and white muscle fibres. However the best results of the staining reaction for the enzyme activity were obtained in the dog diaphragm. With respect to the histochemical localization of acid phosphatase it was observed that the enzyme activity was found to be present in all the three types of fibres in all the regions and in all the mammals investigated. No marked difference in the enzyme activity was found amongst the three fibre types. The localization of alkaline phosphatase in the sarcoplasmic reticulum and that of acid phosphatase in the sarcoplasm revealed their importance in the muscle fibres. It was concluded that both the enzymes play an important role in the intracellular transport of metabolites.

CHAPTER 3:

The histochemistry of cholinesterases (AChE) and BuChE) and the morphology of the neuromuscular junctions in the mammalian diaphragm were studied. The activities of cholinesterases and the nerve-endings in the diaphragm of various mammals were compared. In the present investigation it was observed that the neuromuscular junctions

are of "en plaque" type only in the regions of diaphragm of all the mammals studied. The level of both the types of cholinesterases was found to be directly proportional to their respiratory rate and inversely proportional to their body size.

CHAPTER 4:

The histochemistry of cholinesterases (AChE and BuChE) and the nerve-endings in the human diaphragm were studied. The enzymic level of the cholinesterases and the morphological nature of nerve-endings were studied in the pre-natal, post-natal and adult human diaphragm. It was observed that the nerve-endings are of "en plaque" type only in all the cases studied. The general pattern of the adult nerve-endings and the activity of cholinesterases are laid down at about 9 months of development. During post-natal development the level of both the cholinesterases remains unchanged, while the size of the nerve-endings gradually increases along with the increase in the size of the muscle fibres.

CHAPTER 5:

Effect of exercise on succinate dehydrogenase (SDH) activity and glycogen content in the rat diaphragm was studied. In order to study the effect of exercise on SDH activity and glycogen in the three regions of the diaphragm, the rats were given the swimming exercise. For the control

experiments the rats were not given any exercise while the other rats were given the exercise for different periods in the bath tub, like 15 mins., 20 mins., 30 mins., 45 mins. and 1 hour. At the end of the period of exercise the rats were killed and the levels of SDH and glycogen were estimated. The significance of the findings has been discussed. These investigations revealed two facts: (1) The organ is synthesising more of glycogen in the early period of exercise because there are more red fibres. (2) The organ uses fat for long, sustained and strenuous activity with the help of oxidative enzyme.