PREFACE

Although the muscle tissue forms one of the most
dynamic systems in the vertebrate body having the important
function of motility yet much remains to be known regarding
cellular heterogeneity, growth, regeneration, innervation
and effects of several stress agents such as injury,
temperature variations, protein deficiency, inanition,
alloxanization and insulin treatments and hormonal influences
on muscle metabolism. The main theme of this thesis is the
elucidation that ascorbic acid (AA) functions as a source
of electron energy in muscle metabolism via the formation
of its free radical monodehydro-ascorbic acid (MDHA)
which is a more powerful reducing agent than AA by virtue
of possessing unpaired electrons.

The data of chapters I to X reveal that there exists
a unity in diversity so that a uniform physiological response
in the metabolism of muscle is manifested to various stress
agents involving enhanced utilization of ascorbic acid via
the formation of its free radical, MDHA which is mainly
responsible for maintenance of cellular metabolic
turnover by transfer of electron energy for biosynthetic
and oxido-reduction reactions, in addition to the conventional
breakdown of ATP. Ascorbic acid therefore has a beneficial
role to play in functions of muscle and as such this study
is a significant contribution to the advancement of existing knowledge in the subject. Chapter I comprises of studies on adaptive modifications in vertebrate skeletal muscle in two parts. In IA the existence of definite evolutionary trends at both the structural and functional levels have been elucidated whereas in IB cellular heterogeneity of guinea pig pectoral muscle has been demonstrated. Chapter II deals with the effects of four categories of commonly used drugs (A to D, Tranquilisers, Non-narcotic analgesics, Narcotic analgesics and Cholinergic drugs) on the functional activities of rat pectoral muscle. Chapter III in two parts (III A, B) elucidates the changes in muscle metabolism of rodents exposed to low level whole body X-irradiation. In chapter IV, the effects of direct and indirect electrical stimulation on ascorbic acid turnover in muscle are presented. The changes in muscle metabolism as induced by stress agents such as whole body exposure to cold and heat as well as inanition and protein malnutrition are discussed in chapters V and VI respectively. In chapter VII repercussions of unilateral traumatization by injury and subsequent regeneration of rat pectoral muscle are reported. The changes in total cholinesterase activity of rat muscle treated with drugs and in after traumatization (crush injury) are discussed in chapter VIII. In chapter IX, the effects of alloxan diabetes followed by insulin treatment on muscle metabolism are presented. Lastly in chapter X, the effects of hormonal replacements, an
antiandrogen, cyproterone acetate and vasectomy on metabolism of rat and guinea pig pectoral muscle are discussed.

It may be mentioned here that some repetition of facts and statements was unavoidable, since each chapter was presented with a view to published it as a paper.

The following papers have been published: