PREFACE

The challenges presented by population explosion have disclosed multiplicity of approaches for control of fertility. The physiologists have generally been called upon to undertake research which might lead to easily effective and acceptable means of birth control, but they face a herculean task. The present accumulated knowledge concerning reproductive processes indicates that the production of gametes, their transport and fusion and the fate of the fertilized egg involve an intricate and delicately balanced set of sequential events. Interfering with this sequence at any stage may have physiologic consequences that are not apparent on the surface. For example, production of male reproductive cells is dependent on sustained blood levels of pituitary gonadotrophins, so that the degree of their suppression, which is necessary to inhibit spermatogenesis is hard to achieve as it might suppress androgen synthesis and hence libido. Therefore, the contraceptive method should be simple, widely acceptable and as far as possible devoid of harmful side effects. This thesis is therefore an attempt to investigate various avenues of contraception in the male with special emphasis on means of minimizing the harmful side effects and thus making the contraceptive measure more conducive for application on a wide scale in our country.
The main theme of this work is therefore to elucidate the protective and beneficial role of ascorbic acid in reproductive physiology of animals under normal and altered physiologic conditions such as treatment with antiandrogen, antifertility drugs, vasectomy, vasoligation etc. Ascorbic acid plays a significant role in metabolism of reproductive tissues by being a source of electron energy via the formation of its free radical, monodehydroascorbic acid (MDHA). MDHA is a more powerful reducing agent than ascorbic acid (AA) itself by virtue of possessing unpaired electrons and participates in several oxido-reduction reactions including steroidogenesis. Thus the contraceptive purpose of vasectomy, of using antiandrogen and several antifertility drugs is made more meaningful and efficacious due to prevention of metabolic side effects by ascorbic acid. In Chapter I the synergistic effects of testosterone propionate (TP) + ascorbic acid (AA) on epididymal metabolism of castrated rats have been presented. In Chapter II the effects of cyproterone acetate, an antiandrogen on the metabolism of testis and epididymides are discussed. Chapter III elucidates the effects of vasectomy (III A) and ligation (III B) and the beneficial effects of ascorbic acid on testis and epididymal function. Chapter IV deals with the consequences of vitamin C deficiency on the reproductive functions of guinea pigs. Chapter V is divided into four parts (A to D) and reveal the effects of four categories of
commonly used drugs (tranquilizers/sedative) non-narcotic analgesics; narcotic-analgesics and cholinergic drugs) on the metabolism of testis and epididymides of rats which are capable of synthesizing vitamin C in their body. The two parts (A and B) of Chapter VI elucidate the reproductive physiology of normal and scorbutic, drug treated (tranquilizer and non-narcotic analgesic) guinea pigs. In Chapter VII the detrimental effects of cadmium chloride and the protective role of ascorbic acid (AA) for maintaining reproductive functions of rats are discussed while, Chapter VIII deals with the alterations brought about in the functional integrity of testis and epididymides by induced blindness in rats. In Chapter IX, the effects of castration, CA treatment and TP replacement on ascorbic acid metabolism of extragonadal tissues (liver, adrenal, kidney) of rat are discussed, since it is known that ascorbic acid biosynthesis in liver is androgen dependent and ascorbic acid in turn is involved in steroidogenesis in adrenals and gonads. Though the thesis predominantly portrays the work on mammalian testis and epididymides, one Chapter (X) has been devoted for presenting biochemical evidences on the possible steroidal hormone control of molluscan (slugs) reproductive system.

The Biochemical, Histochemical and Electron Spin Resonance Spectrometric data of Chapters I to X reveal for the first time: (i) a uniform physiological response of testicular and
epididymal metabolism to various antifertility stress agents and (ii) the vital role of ascorbic acid for maintaining the testicular and epididymal metabolism via the enhanced mobilization and formation of ascorbic acid free radical, MDAH, which is mainly responsible for maintenance of cellular oxido-reduction reactions by a direct transfer of electron energy, in addition to the energy obtained by the conventional breakdown of ATP. As such, the work embodied in this thesis is a significant contribution to the advancement of existing knowledge in the field of fertility control and can provide an important basis for understanding and finding out suitable contraceptive measures for human fertility control. The following papers have been published so far.


