The impending menace of population explosion and undernourishment warrants vigorous exploration of new frontiers of research. Recently considerable attention has been focussed on contraception. In fact during the past few decades it has developed into a new discipline inviting the collaboration of growing corps of endocrinologists, neurophysiologists and reproduction biologists.

The success of developing contraceptive methods is inherent in their simplicity, efficacy, acceptability and lack of undesirable side effects. Biologists are therefore faced with a herculean task. The rapid strides of progress in oral contraceptive research in females have paved the way for other potential techniques such as pregnancy vaccine, nasal sprays, copper IUCDs, use of prostaglandins and many others. In the males, on the contrary, there are limitations for applying contraceptive measures and it is possible only by inhibiting either spermatogenesis or maturation of the spermatozoa. Techniques which interfere with mechanism of hypothalamic-pituitary control of reproduction in the male are
difficult to envisage, although not impossible. The production of male gamete is dependent on sustained blood levels of pituitary gonadotropins so that the degree of their suppression which is necessary to inhibit spermatogenesis is hard to achieve as it might also suppress androgen biosynthesis and hence libido. But the rampant growth of human population, which if unchecked might lead to population explosion, necessitates continuous exploration of every possible avenues of fertility control in both males and females. However, the contraceptive method should be simple, reversible, widely acceptable, suitable for a particular ethnic group and as far as possible devoid of harmful side effects. Recent studies for suppression of spermatogenesis are those dealing with the use of testosterone, testosterone enanthate, antigonadotrophins and inhibin. Techniques for the interception of the passage of spermatozoa through the vas are also being investigated. These include vas occlusion, vasectomy, vas ligation etc. The need to study the effects of these methods in detail is all the more necessary since the technique of vasovasostomy is currently available, though not
cent percent successful. The reversibility of vas occlusion brought about by several sclerosing agents and metal devices also need to be studied in detail. Amongst the methods affecting sperm maturation and motility which are being developed or undergoing clinical trials at present include the use of anti-androgens, prostaglandins, antifertility drugs, chlorinated sugars, intravasal copper devices and the immunological approach.

The present thesis deals with the studies on the testicular and epididymal spermatozoa of rats and guinea pigs under normal and several altered physiological conditions. Special emphasis has been laid in studying the changes in sperm motility, metabolism and morphology leading to infertility. The main theme of the work is to elucidate further the metabolic role of ascorbic acid in mammalian sperm motility and metabolism as well as for the maintenance of the metabolic integrity of the spermatozoa, epididymis and testis by functioning as a source of electron energy via the formation of its free radical, monodehydroascorbic acid, which is a more powerful reducing agent than ascorbic acid by
The contraceptive purpose of vasectomy, of using antiandrogens and several antifertility drugs is made more meaningful and efficacious due to the prevention of the metabolic side effects by ascorbic acid. Ascorbic acid and its mechanism of action therefore, have important implications in the prophylactic treatment during and following a particular treatment without interference with its contraceptive purpose. Chapter I is introductory one, which includes survey of literature. In Chapter II, the details of the materials and methods used are presented. In Chapter III, the results and observations are given followed by Chapter IV, wherein the results obtained have been discussed in the light of recent data in the particular field. In Chapter V, the summary of the work done is presented followed by Chapter VI, which includes the overall conclusions which could be drawn from the work of the thesis. It also includes the possible future lines of work which could be undertaken. Lastly, the references have been listed in chronological and alphabetic order.
The work included in the thesis reveals for the first time the uniform physiological response of testicular and epididymal spermatozoa to various altered physiological conditions as well as the vital role of ascorbic acid in sperm metabolism via its enhanced turnover and formation of its free radical which is mainly responsible for the 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. The work therefore suggests that the testicular and epididymal spermatozoa metabolism is maintained not only by high energy phosphate but also via the paramagnetic electron flow from MDHA. The work included in the thesis also elucidates the importance of ascorbic acid in male contraception. As such this is a significant contribution to the advancement of the existing knowledge in understanding the metabolism of spermatozoa and in rendering male contraceptive techniques more efficacious.

The following papers/abstracts have been published.

1. Source of electron energy for animal metabolism.

IV. Turnover pattern of ascorbic acid in


