PRELUDE

The environment in totality represents the physical, chemical, biological, behavioural and socio-economical factors and conditions surrounding human. A harmonious interaction between the human being and the environment is indispensable for the physical and mental well being of the mankind. Man's sustained quest to conquer nature, and his selfish attempts to exploit natural wealth for this purpose from the beginning of his existence has been corroding the ecosystem and thus, human health. Mankind has been introducing noxious elements into the environment in the form of industrial waste and automobile exhaust, which pollute the environment with potential negative effects on all lives on the earth (see Skakkebæk et al., 1991).

One of the main concerns of World Health Organization (WHO) is the deteriorating human health, over a period of several hundred years (see Skakkebæk et al., 1991) due to environmental pollution. Human reproductive function is highly sensitive to changes in the environment (see Sever, 1997). Every stage of the complex process of reproduction can be disturbed by adverse/noxious external agents and may lead to increased rates of abortion, birth defects, growth retardation, functional deficits and perinatal death (see Skakkebæk et al., 1991). Steady decline in human semen quality over the past several years is considered to be the result of deteriorating environmental conditions (see Cheek and McLachlan, 1998), which may be attributed to technological and industrial growth. Therefore, identification and characterization of occupational hazards of the male reproductive health, and finding out prophylactic measures and ameliorative agents has become imperative (see Bonde, 1993). Animal models are the major tools for such studies as response of animals to environmental
pollutants are generally comparable to that of humans (see Skakkebæk et al., 1991), though animal data cannot be directly extrapolated to human beings.

There is growing evidence that heavy metal pollutants like lead, mercury, cadmium and chromium are toxic to reproductive and developmental health of human (Rodamilans et al., 1988; see Skakkebæk et al., 1991; see Bonde, 1993). Information on the exact mechanism underlying the reproductive toxicity of each of these metal toxicants is essential to protect the subjects being exposed to such toxicants at work spot or otherwise.

The present investigation deals with the reproductive toxicity of chromium, one of the major metal toxicants of tanning, chrome plating, ordinance, vulcanising, and aeronautical industries (Morns et al., 1990). The rationale for selecting chromium toxicity is that the metropolitan city, Chennai and its surroundings have a galore of vulcanising and chrome plating industries and tanneries, which release the effluents into the environment. Workers of these industries and people living around are exposed to chromium. It is known that occupational exposure to chromium affects male fertility adversely (see Bonde, 1993). Nevertheless, the mechanism underlying the reproductive toxicity of chromium is yet to be elucidated. The main emphasis of the present study is therefore, to unearth the mechanism(s) by which chromium affects male reproductive function and to identify an prophylactic agent.

Heavy metal toxicants like cadmium and lead are known to induce an imbalance in the ratio of oxidant–antioxidant status of the living system (see Sugiyama, 1994). It is not known whether reproductive toxicity of chromium involves this mechanism. Since reproductive organs and semen produce free radicals, it is hypothesized that the
reproductive toxicity of chromium is mediated by an imbalance in oxidant – prooxidant status of male reproductive organs. Testis being the major male reproductive organ, the same has been the main organ of studies in the present investigation.

Wistar rat is the animal model used as it is easy to handle and its reproductive physiology is well understood.

The thesis is divided into four chapters. The first chapter of the thesis deals with the effects of chromium exposure on rat testicular structure and function in vivo.

The second chapter deals with the changes in testicular pro-oxidant and antioxidant systems, as the role of free radicals, reactive oxygen species and antioxidants in metal-induced toxicity is well documented (see Sugiyama, 1994).

The third chapter deals with the comparative prophylactic efficacy of the supplementation of antioxidant vitamins C and E, in preventing chromium-induced reproductive toxicity.

The fourth chapter attempts to understand the direct effect of chromium and the prophylactic potency of vitamin C and E on isolated Leydig and Sertoli cell functions in vitro.