The goal of cancer therapy is to eliminate the neoplastic cells without causing any appreciable damage to the normal tissue of the host. Two possible approaches are there in this therapy:

1. Removal of the neoplastic cells/tissues from the host system.
2. Reversal of the process of cellular transformation.

Removal of the neoplastic cells is effected most efficiently by surgical means that has its own obvious fall out. Use of physical, chemical or biological cytotoxic agents are other avenues with their respective limitations. For instance, treatment involving cytotoxic agents is hazardous since they cause serious damage to normal cells. The possibility of reversing the neoplastic cellular transformation may be a better approach but much remains to be done before it can be applicable on population scale. Non-surgically eliminating cancerous growth may be a practical avenue open to us at the moment.

In this non-surgical approach, use of radiations has been one of the best possibilities. The ability of radiations to kill cells by an array of metabolic damages that it causes has been successfully employed to cure cancerous and malignant growth. Radiations, however, act as double edged sword. Since interaction of radiation with matter is random, the radiation interacts with all types of cell - both normal and transformed when a subject is irradiated. Thus, all cells accumulate damages. While the damages transformed cell may not survive and, thereby, cancer may be eliminated, the partially damaged normal cells become a problem. There exists a great probability that these partially damaged normal cell may undergo transformation in due course of time. Several improvisations in the radiotherapeutic protocols, use of different quantities and qualities of radiations and applications of fractionated irradiation schedules have only marginally improved the present clinical efficacy of radiotherapy. It appears that radiotherapy has reached its zenith.

To overcome the limitations of radiotherapy and to improve upon its clinical gains, use of radiomodulatory drugs along with radiation, appropriately named as chemo-radiotherapy, have yielded positive therapeutic advantages in cancer therapy. Two classes of radiomodulatory drugs are in existence in the context of radiotherapy:

1. Radioprotective drugs - this class of drugs essentially should protect normal cells/tissues from the undesirable damaging effects of radiation, thereby, paving way for application of higher doses of radiation for efficient killing of cancerous cells/tissues.

2. Radiosensitizing drugs - The drugs belonging to this class should, in principle, sensitive cancerous cells/tissues so that they are killed even by relatively low doses of
radiations, thereby, reducing the undesirable damages to normal cells.

Chemo-radiotherapy has, indeed, improved the rate of cure of cancer. However, the toxicity of drugs to other tissues, lack of control on the quantity of drug in cancerous tissues, metabolic alteration of drug, non-specific protection/sensitization of tissues, various other side effects have come in way of optimum application of chemo-radiotherapy regimes in clinical practice. In last about two decades, concept of drug delivery system has been tried to overcome the limitations of chemo-radiotherapy regimes to further improve upon it. The concept is based on the fact that certain biologically acceptable carrier may be used to carry the drugs to biological target cells/tissues. Of several possible carriers, liposomes have been found to be promising and convenient.

In the piece of work embodied in this thesis, attempt has been made to test the suitability of liposome as a vehicle for carrying a drug. As it is an exploratory work, 2-mercaptopropionylglycine (MPG), a radioprotective drug, has been used as a model drug. The liposome encapsulated MPG (LEM) is envisaged to be tested for its radioprotective efficacy in normal and transformed system vis-a-vis the free form of MPG. Attempt is also proposed to look into some molecular events triggered by MPG or LEM.

Aim and objectives

1. Development of suitable method for liposome preparation: Chapter 2 describes results of study designed to develop an convenient method of preparation of liposome to encapsulate MPG.

2. Biological activity of the liposome encapsulated MPG (LEM) and MPG in normal tissues: The biological effectivity of MPG and LEM as radioprotector are proposed to be estimated using suitable biological end-points to establish whether LEM offers advantage over MPG or not. This has been describe in chapter 3.

3. Biological activity of the liposome encapsulated MPG (LEM) and MPG in cancerous tissues: As normal and cancerous cells differ significantly in their biochemical characteristics, experiments are proposed to be designed to ascertain radioprotective benefits of LEM over MPG in cancerous situation as detailed in chapter 4.

4. Molecular events associated with radioprotection afforded by LEM and
MGT: Chapter 5 describes the effects of LuM and MPG on the organization of chromatin and a factor that influence it in order to attempt to understand the radioprotection at molecular level.