3.1 OBJECTIVE

So far, there is no cancer preventive formulation in the market. At present, the modern treatments for cancer are incomplete, costly, complex, dangerous (severe side effects) and unpleasant for patients as it requires long period of treatment. Allopathy still battles relentlessly to end of trauma of cancer patients. So far, there is no magic bullet that can win the cancer completely. On the other hand, chances for getting the cancer are increasing day by day and they were unavoidable. Various causes of cancer are current life style, decreased physical exercise, lack of micro, macro nutrients and antioxidants, in daily food, synthetic preservatives in tin foods. Environmental agents like ionizing radiation, pollution cause skin cancer. Alcohol, tobacco habituation contributes for liver and lung cancers. Increased mental stress and use of cell phones may initiate brain tumors. Oral cancer is results from betel quid chewing. Neglecting own health, careless usage of strong medicines, unnecessary use of antibiotics for long time, frequent treatment by steroidal drugs may impose the cancer. Early menarche, late menopause, obesity and hormone use are not easily modifiable cancer risks. Even diabetic patients have higher oxidative stress at their cellular level. Occupational carcinogens and viruses are one more threat of cancer.

However, avoiding or minimizing the human beings to expose these carcinogenic agents is practically not possible.
Prevention is better than cure. Hence, it seems, cancer chemoprevention remains as ideal strategy in anticancer arsenal. Hence the following are the objectives of the work –

- To develop safe and potential Herbo Mineral Formulation (HMF) for prophylactic use of cancer.
- To prepare conventional oral tablets, that is able to suppress the tumor incidences and multiplicity of lung, liver, skin and colonic cancers.
- To standardize the developed formulation according to regulatory guidelines.
- To quantify the efficacy (prominent effect) of the formulation in laboratory animals against above cancers.
- To prove its anticancer activity (reverse of cancer) in human cell line studies.
3.2 WORK PLAN

➢ **Procurement of Materials**
- Selection of Herbal and Mineral Compounds for formulation
- Preparation of Aqueous extract of Green Tea Leaves
- Standardization of Aqueous extract of Green Tea Leaves
- Quantification of Green Tea Catachin Contents by HPTLC
- Procurement of Mineral compound Sodium Selenite

➢ **Development of Formulation**
- Pre formulation Studies (Flow Properties & Derived Properties)
- Drug Incompatibility Studies by FTIR
- Preparation of Tablets by Wet Granulation (6 Formulations) and Direct Compression methods (6 Formulations)
- Packing of Tablets (Blister Packing)
- Evaluation of Formulation (Physico chemical Evaluation)
- Dissolution (8 basket dissolution apparatus, Paddle)

➢ **Standardization of Formulation**
- Standardization of Green Tea content in tablet by HPTLC Finger Printing (Comparing the peak areas with marker compounds)
- Standardization of Sodium Selenite in tablet by ICP-MS

➢ **Quality Assessment**
- Shelf life Estimation as per ICH guide lines
- Microbial Evaluation of Tablets (Microbial Load Determination)
➢ Safety Assessment

- Toxicological Evaluation of Tablets
  (Acute Oral Toxicity Studies as per OECD guidelines)

➢ Efficacy Assessment

- In-vivo animal Chemo preventive Studies

  Selection of an animal model which mimics or duplicates the human experience in experimental animals was selected for this study.

- Prevention of Lung Cancer Induced by Tobacco Smoke in Mice
- Prevention of Liver Cancer induced by alcohol in Mice
- Prevention of Skin cancer Induced by UV rays in Mice
- Prevention of Colon Cancer Induced by Azoxymethane in Rats
- Cancer Cell line Studies in human lung and skin cancer cells
3.3 CRITERIA FOR THE SELECTION OF HERBAL AND MINERAL COMPOUNDS FOR FORMULATION

Herbal and Minerals were selected based on following criteria.

3.3.1 Selection of Herbals for Formulation:

Among the various herbals, *Camellia sinensis* (Green tea) was selected due to its following extraordinary properties.

- Shows affordable protection against most types of cancers like lung, liver, esophagus, fore stomach, duodenum, pancreas, colon, and breast.\(^{81}\)
- Economical, widely available and Non toxic.\(^{82}\)
- All the constituents of the green tea possess antioxidant activity.\(^{83}\)
- Proved as chemopreventive in animal as well as epidemiology studies.\(^{83}\)
- It is in final stage of human clinical trials by U.S. National Cancer Institute.\(^{84}\)
- It prevents treats as well as reveres the cancer.
- It is interest of various researchers worldwide.
- Protective against genotoxic damage induced by anticancer drugs like Cyclophosphonamide, Methane sulphonate.\(^{85}\)
- Associated with many other major health benefits like lowering cholesterol, elevated blood pressure, elevated blood sugar and boosting of immune system.\(^{82}\)
3.3.2 Selection of Mineral for Formulation

Among the various minerals, Sodium Selenite was selected due to its following suitable properties.

- Selenium is present in our body as a part of various antioxidant enzymes.\(^{38}\)
- Recognized and listed by National Cancer Institute, United States.
- It prevents major cancers like Liver, Stomach, Oral, Colon, Lung, Prostate etc.
- Comparatively safe mineral.
- Have potential chemopreventive and anticancer effect.\(^{63}\)
- Proved in animal and epidemiology studies.\(^{34}\)
- It is in human clinical trails.\(^{34}\)
- Daily consumption of Selenium throughout the world is very less & this leads to cancer.
- Economical and wide available.
- Essential for our body.\(^{38}\)
3.4 TO WHOM THIS FORMULATION (TARGET PEOPLE)

- Individuals that engage in risk taking behaviors or lifestyles,
  (E.g. Smokers, Users of snuff, Alcoholics).
- Individuals that have received occupational exposure to known carcinogens (E.g. Asbestos workers).
- Those that are known to be genetically predisposed to the development of cancer.
- Individuals that possess premalignant lesions,
  (E.g. Oral leukoplakia in snuff users).
- Survivors of primary cancers with a high degree of recurrence or a high tendency towards formation of second primary tumors.
- Cancer survivors that received chemotherapy and/or radiation therapy.
- People with poverty i.e., Lack of micro and macro nutrients in the daily food can initiate cancer.
- People who are frequently exposing to environmental pollution and radiation.
  - Vehicle drivers.
  - Medical representatives, Shop keepers at polluted areas etc.,
  - Residents adjacent to polluting industries.