RESEARCH ENVISAGED AND PLAN OF WORK

1. Development and establishment of analytical method
   - Optimization of mobile phase
   - pH of mobile phase
   - Retention time

2. Preformulation studies
   - Determination of Physico-chemical properties
   - Drug excipient interaction studies

3. Preparation and optimization of enteric formulation
   - Preparation of Formulation(s) using Quasi emulsion solvent diffusion method
   - Adsorption to solid carrier
   - Box–Behnken experimental design

4. Characterization of optimized formulation
   - Surface Morphology
   - Solid state characterization
   - In vitro dissolution studies

5. Efficacy of formulation
   - In Vivo study
3. RESEARCH ENVISAGED

Melanosis coli (a disorder of pigmentation on the wall of the colon), is a type of local pathology that develops in the intestinal region (colon) due to prolonged intake of anthraquinone laxatives. Literature suggested the risk of colonic cancer due to apoptosis of colonic mucosa by anthraquinone laxatives (Chirio et al., 2011, Guri et al., 2013). Therefore, considering Melanosis Coli as a precancerous stage, it became important to develop suitable carrier that can successfully deliver the drug to inflamed colonic region. In this context, present study was designed to systematically develop, and evaluate novel drug delivery system for the treatment of colonic pathologies. It was hypothesized that the development of a lipoidal formulation would increase the accuracy of localized delivery of selected drug to the inflamed colonic region (Figure 6).

![Figure 6: Delivery of drug loaded formulation to inflamed colonic region](image)

To attain the above hypothesis, the following plans were drawn:

- Introduce colon specific formulations outlining the specific advantages and challenges involved.
- Design of polymeric Self-emulsifying nanocapsule formulation, nanoemulsion preconcentrates, and enteric nanospheres for the purpose of site specific drug delivery to the colon.
- Optimization of formulation variables using “design of experiment” (Box Behnken experimental design) to develop a robust formulation.
- Conducting *in vitro* drug release trials simulating the gastrointestinal conditions to assess the suitability of formulation for the desired application.
- Localized delivery of optimized formulation(s) for the prevention/treatment of colonic pathology (melanosis coli).
- Establishment of the 'proof-of-concept' for biopharmaceutical advantages, by means of *in vivo* animal experiment.
3.1. Plan of work

The work was carried out on the following lines.

- Literature survey, selection and procurement of drug and excipients
- Preformulation studies including
  - Physicochemico Characterization of drug by
    - Melting point
    - Partition coefficient
    - Thermal analysis
    - IR analysis
    - Diffraction analysis
  - Drug excipient interaction studies
- Design and characterization of novel drug delivery system(s) for selected drug candidate
  A). Preparation of Nanoemulsifying preconcentrate formulation
    - Characterization of developed preconcentrate formulation by:
      - Emulsification time
      - Mean globule size
      - Morphology study
      - Diffraction analysis
      - In vitro dissolution study
      - Stability study
      - In vivo study
  B). Preparation of Polymeric Self-emulsifying nanocapsule formulation
    - Characterization of developed nanocapsule formulation by:
      - Mean particle size
      - Encapsulation efficiency
      - Morphology study
      - Diffraction analysis
      - In vitro dissolution study
      - In vivo study
  C). Preparation of Polymeric Nanospheres formulation
    - Characterization of developed nanospheres formulation
      - Mean particle size
      - Entrapment efficiency
      - Morphology study
      - Diffraction analysis
      - In vitro dissolution study
      - In vivo study
Comparative evaluation of developed formulation(s) using
  - Stability study
  - In vitro dissolution study
  - Pharmacokinetic study
  - Roentgentographic analysis
  - Degradation analysis
  - Cell viability assay

In vivo study
  - Induction of melanosis coli
  - Localized delivery of drug to diseased colon
  - In vivo efficacy of developed formulation(s)
    - Physical observation
    - Histopathology
    - Determination of TNF-α level in tissues

Compilation and presentation of data