3. OBJECTIVE

The objective of the present investigation is to design and develop Nanoparticles (NPs) of Meloxicam (MLX) using various concentration of the polymer “Chitosan”. The prepared formulations were characterized for various properties like morphological studies, particle size, polydispersity index, zeta potential, Differential Scanning Calorimetry, IR spectroscopy, etc, followed by in vitro drug release studies and in vivo performance of the prepared nanoparticles in suitable animal models.

Selection criteria for the best batch were smaller particle size with low polydispersity index, sufficiently high zeta potential prepared with minimum quantity of carrier (chitosan). The prepared nanoparticles should be devoid of any chemical interaction, good physically stable colloidal dispersion with good in vitro and in vivo performance.

The selected formulations shall be evaluated for their anti-inflammatory effect, anti arthritic activity and ulcerogenic activity by rat paw edema, formaldehyde induced arthritis and pylorus ligation method using Wistar rats weighing (about 200 gm, either sex). The selected formulation was also evaluated for oral bioavailability in wistar rats and comparison with pure drug (meloxicam).

The method should be reproducible, versatile in application (capable of incorporating a variety of drugs with diverse physicochemical properties) and should have high drug entrapment efficiency, which may be a novel approach for formulation development of nanoparticles formulations.
4. PLAN OF WORK

Conventional oral liquid formulations like solution, suspension or emulsion suffer from certain limitations like physical or chemical instability, higher dose, low bioavailability, first pass effect, intolerance, etc. They exhibit fluctuations in plasma drug levels resulting in higher incidence of side effects and are unable to provide sustained effect. Hence, there is a strong need to identify novel carriers meeting ideal requirements of a drug delivery system. Recently, nanoparticles delivery system has been proposed as colloidal drug carriers which can be fabricated in order to serve diverse requirements of novel drug delivery systems. The nanoparticles may be coated by suitable polymer, resulting in release of the drug by controlled diffusion or erosion from the core across the polymeric membrane or matrix or tagged with ligand for targeting of therapeutic moiety to a particular location or organ or even cells. The membrane coating often acts as a barrier, therefore, the solubility and diffusivity of drug in polymer membrane becomes the rate controlling factor in drug release. Further, the drug release rate can also be affected by ionic interaction between the drug and auxiliary ingredients. When the drug is allowed for interaction with auxiliary ingredients to form a less water soluble complex, the drug release may be slow with almost no burst release effect. To develop a successful nanoparticulate system, both the drug release and the polymer biodegradation are important factors which should be considered before fabrication of nanoparticles. In general, drug release rate depends on (a) solubility of drug, (b) desorption of the surface bound/adsorbed drug, (c) drug diffusion through the nanoparticles matrix, (d) erosion/degradation of nanoparticles matrix and (5) combination of erosion/diffusion process. Thus solubility, diffusion and biodegradation of the drug as well carrier (matrix formers) govern the release process.

In order to achieve the objective of preparation and characterization of meloxicam nanoparticles, the detailed plan of work has been designed as follows:

- Preformulation studies
  - Identification of drug
    - Physical characterization
• U.V spectroscopic study
• I.R spectroscopic study
• X Ray Diffraction study
• Melting point determination
• Solubility assessment

❖ Preparation of calibration curve (standard plot) of Meloxicam

❖ Preparation of nanoparticles
➤ Chitosan Nanoparticles by emulsification cross-linking method.

❖ Characterization of nanoparticles
➤ Surface morphology (Scanning Electron Microscopy)
➤ Particle Size determination and polydispersity index
➤ Zeta potential
➤ Entrapment efficiency (%)
➤ In vitro drug release & kinetics of drug release

❖ In vivo studies
➤ Anti-inflammatory study
➤ Ulcerogenic study
➤ Anti-arhritic study

❖ Interpretation of data and Compilation of thesis