

PREFACE

The research work discussed in this thesis focused on two very important aspects of NLC, viz., detail physicochemical characterizations and potential applications as drug delivery. The NLC formulations has been introduced in the year 1990 and caught the attention of majority of pharmacist with its enormous advantages over the well established conventional drug delivery systems like emulsions, polymeric nanoparticles, liposomes *etc.* Though, NLC is advantageous, still they suffers from several serious limitations related to the solution phase stability, lower loading, unsatisfactory entrapment efficacy of the hydrophilic and amphiphilic drug molecules and unwanted expulsion of the incorporated hydrophilic drugs. Several attempts have been made to overcome the limitations associated with NLC. Though, more systematic work is needed for the further development of NLC as drug carrier. Present research work has undertaken innovative approach to overcome the stability issue and other related shortcomings of NLC. In the present work, phospholipid, diglycerides, triglycerides, saturated and unsaturated fatty acids were used to formulate NLC. Although, the mentioned lipid systems are very common for the NLC but use of various combinations of the mentioned lipid systems in appropriate molar ratio in investigating suitable lipid composition for NLC is very rare in the presently available literature. In addition to this, instead of natural lipid systems, synthetically prepared ion pair amphiphiles were also used to enhance the solution phase and thermal stability of NLC. The use of the synthetic ion pair amphiphile as an alternate of natural lipidic component in providing stability of NLC is a novel approach. The thesis also discussed the detailed investigation of the solution phase and thermal behavior of NLC. Different amphiphilic natural biologically active compounds as well as water soluble hydrophilic active compounds were used as drug in the described works. The loading capacity, incorporation efficacy and the release kinetics of the incorporated drug molecules from the different NLC systems were also investigated systematically to evaluate the patentability of the studied NLC as drug delivery systems. In addition to this, the application potential of the drug loaded NLC were investigated by monitoring the *in vitro* biological activity. The antibacterial and the anticancer activity of the studied formulations were investigated using the conventional cup plate method and the MTT

assay technique respectively. The thesis also contains the reprint of the published articles along with their supplementary sections.