ABSTRACT OF THE THESIS

Versatile amphiphilic block copolymers produce self-assembled nanostructures like spherical, cylindrical, lamellae, vesicles, and others with typical diameters of between 10 to 100 nm, which makes them specific nanomaterials in the field of drug solubilization and formulation. The versatile polymers, Pluronics (*PEO-PPO-PEO tri-block copolymers)*, are studied as a nanovehicle for solubilization and bioavailability of three lipophilic drugs. The physicochemical and biological evaluation of three different drugs, quercetin, curcumin, and glipizide, has been investigated using mixed Pluronic micellar systems composed of Pluronics as well as other biocompatible materials like phosphatidylcholine, vitamin E conjugate, and strearic acid as the nanovehicles for better solubilization and oral bioavailability. The micellar size, shape, and stability of drug-loaded mixed Pluronic micelles and their interactions with these potent drugs were characterised using modern techniques. *In-vitro*, *ex-vivo*, and *in-vivo* studies of cumulative drug release, DPPH scavenging antioxidant activity, cell proliferation, and cell viability have been done to test the biological activities of drug-loaded mixed Pluronic micelles.

Overall, the interest in applications of self-assemblies of Pluronics and its mixture with other Pluronic or biocompatible natural materials has emerged as a newer area of research due to its non-toxicity, availability, high solubilization and loading ability, and passive accumulation in tumour regions. Pluronic micellar applications have now shifted the focus of formulation research largely towards targeted nanomedicines, and in consideration of this, the present work thoroughly investigated these Pluronic mixed micellar assemblies for solubilization and oral bioavailability of important lipophilic drugs quercetin, curcumin, and glipizide. The current study advances research on Pluronic systems for biological and pharmaceutical applications.