Preface

Biofilm is a dense colonization of the microbes encased within the complex extrapolymeric substance secreted by the microorganisms. It is a microbial protective mechanism against the host environmental condition including pH, temperature, macrophages and also to escape the immune response. Biofilm induces the chronic disease condition and persistent inflammation at the site. Moreover, multispecies infection, multidrug resistance and poor antimicrobial response are the common complication associated with biofilm infections. Approximately 60% of chronic infection including diabetic wounds, burn wounds, catheters, artificial joint infection, cystic fibrosis and many other infections are biofilm mediated, which creates the difficult to cure. Basically, the extracellular DNA (eDNA) and alginate (specifically by P. aeruginosa in the cystic fibrosis) present in extracellular polymeric matrix (EPM) of biofilm are the key components responsible for the microbial cell adhesion, aggregation, biofilm proliferation and providing the strength as well as three dimensional structure to the adhered biofilm. The biofilm impedes the penetration and immune response, thereby reduces the antimicrobial susceptibility of the microbes. Therefore, the strategy, having the potential to dismantle the EPM and to facilitate the penetration of the antibiotics is needed. Different nanoformulation based approaches was studied to overcome the biofilm using two different enzymes. Therefore, DNase-I and alginate lyase was used to improve the antibiotics susceptibility against biofilm-associated infections by breaking the eDNA and alginate, respectively, present in the EPM.

The basic goal of study was to improve the biofilm treatment using the combination of nanoparticles along with enzymes. The entire study was comprised of three sequential

steps. Initially, the different component of formulation was screened to get the desired formulation. After successful screening of the excipient, the formulation was optimized to get nanoformulation with desired physicochemical property. Finally, the antimicrobial efficacy of prepared nanoformulation against the planktonic and biofilm associated bacterial was evaluated.

The overall purpose of this research was to provide the comprehensive knowledge to the readers about the potential of nanoformulation and enzymes in improving the antimicrobial efficacy of the antibiotics against the biofilm mediated infections.