INTRODUCTION

- The increasing amount of drug-resistant bacterial strains and pathogens has become a serious health threat, especially methicillin-resistant *Staphylococcus aureus* (MRSA).
- Lipid-based nanoparticles such as liposomes and nanoemulsions (NE) are usually employed for carrying antibacterial drugs.
- The NE prepared in this study incorporates fusidic acid and tea-tree oil.
- The surface charge of NE is measured by the zeta potential. It corresponds to the electric potential surrounding the oil nanodroplet at the plane of hydrodynamic shearing. It is measured by electrophoretic mobility.
- Cationic surfactants exhibiting antimicrobial activity can be intercalated in the surface of lipid-based nanoparticles; these include amino acid – based surfactants and quaternary ammonium salts.
- The combination therapy of more than one antibacterial agent can reveal the synergistic activity against MRSA; thus the dose can be reduced to minimize the adverse effects.
- This study describes the optimization of stearylamine-tea tree oil based nanoemulsions (NE) as cationic NE obtained by means of a spontaneous emulsification process used as topical antimicrobial therapy.

AIM OF THE STUDY

The aim of the current study was to formulate and characterize cationic-charged bilayer NE based on tea tree oil which may act in synergism with fusidic acid as the model drug to eliminate methicillin-sensitive *Staphylococcus aureus* (MSSA) and methicillin-resistant *Staphylococcus aureus* (MRSA) which could infect skin lesions.

METHOD

Preformulation study (screening of oil, surfactant, co-surfactant, emulsification capacity pseudo ternary diagram

- Formulation of nonionic NE with antibacterial agent
- Thermodynamic stability, pH, zeta potential, droplet size analysis
- Formulation of cationic NE with antibacterial agent by adding surface charge inducer
- Cellular uptake study

RESULTS

- The cationic bilayered NE was thermodynamically stable and showed promising physicochemical properties.
- Zeta potential was found to be in the range of +4.20 mV to +9.22 mV for the cationic NE as compared to -22.3 mV for the non-ionic NE.
- Cellular uptake of the cationic NE was higher than the non-ionic NE.
- Reduction in bacterial load was observed from the MIC and MBC study against MRSA and MSSA.

CONCLUSIONS

The results obtained encourages further exploration of cationic NE in the treatment of MSSA and MRSA infection for topical application. The NE may be further enhanced with the incorporation of suitable gelling agent.

REFERENCES