Abstract

Biomaterials impregnated into medical devices have a great impact on health care system in the twenty first century. Biomaterials are able to resolve several emerging issues in hospital acquired infections and surgical problems after implantation. Infections caused by multi-drug resistant pathogens are difficult to control where they have developed the resistance capacity due to biofilm formation. Moreover, catheter associated infections are found to be a great threat because pathogens are easily colonized over their surface and disseminated in the hospital acquired infections. To control the medical device associated infections, there is an urgent need to develop biocompatible coating materials for medical devices in order to inhibit the colonization and biofilm formation by the pathogens. A potent strategy aimed to address such healthcare and medical device associated common problem, is to make use of cardanol, tannic acid, tea tannins and lignin as structurally diverse plant phenolics for the development of new materials with lower toxicity and improved activity. They fulfill a variety of multipurpose biological activities such as antioxidant, anti-inflammatory, antimicrobial, chemical defense and so on.

Different types of phenolic derivatives and copolymers have been synthesized from selected precursor molecules. Self-assembled strategies are used throughout the study to expand the material diversity from nano to micro structure and hydrogel for efficient drug delivery, coating onto medical devices, antimicrobial, bacterial biofilm inhibition and wound healing activity. The self-assembled structures of different azo-amphiphiles have been developed from cardanol, showed enhanced antifungal activity and reduced toxicity. Further cardanol moiety incorporated polystyrene copolymer is coated over respiratory catheter. Self-assembled of N-glycidyl histidine complexes with tannic acid also coated on urinary catheter which significantly reduces the chance of catheter associated nosocomial infections. Moreover, self-assembled microcapsules from tea polyohenols revealed their potentiality in drug delivery and wound healing activity. A hydrophilic polyoxazoline graft lignin copolymer hydrogel is efficient for antimicrobial drug delivery and anti-biofilm activity. Hydrogel showed remarkable anti-inflammatory activity after the reduction of iNOS production and down regulates the IL-1β gene expression level in LPS induced macrophage cells. Thus, lignin derived polyoxazoline copolymer may open a scope for new generation ointment formulation in near future.

Kew words: Renewable phenols; Amphiphiles; Graft Copolymers; Self-assembly; Hydrogel; Drug delivery; catheter coating; wound healing.