

**Development of quaternary ammonium based acrylic copolymer
antimicrobial coatings for polyurethane tracheoesophageal voice prostheses**

Abstract

Tracheoesophageal voice prostheses (TEP) are soft polymeric devices and are used to restore voice of patients having undergone total laryngotomy (TL). TEPs are implanted on tracheoesophageal wall and come in direct contact with food, fluid and air. The environment of implant is a budding ground for growth of microbes leading to biofilm formation on the TEP surfaces. Biofilm formation is the leading cause of TEP failure because biofilm affects its functioning by clogging of air passage, in several weeks to few months. Short TEP useful life is cause of concern for the patients undergoing total laryngectomy. To increase useful lifespan of TEPs, it is imperative to prevent biofilm formation. The problem is addressed in the present study by developing an iodine release coating and a cationic crosslinked antimicrobial coating that prevents biofilm through contact killing, in order to prevent biofilm formation. The iodine release-based coating showed antimicrobial activity till two months while quaternary ammonium contact kill antimicrobial action-based coating showed antimicrobial activity for at least six months. Thermoplastic polyurethane based TEPs were successfully designed, fabricated using injection molding and evaluated through clinical evaluation on 20 patients at All India Institute of Medical Sciences Delhi (AIIMS Delhi).