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Development of Resorbable Middle Ear Ventilation Tubes Containing Silver Antimicrobials

In Vitro and In Vivo Studies of Resorbable Middle Ear Ventilation Tubes Containing Silver Antimicrobials

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Middle ear ventilation tube (MEVT) therapy is one of the most commonly performed pediatric surgical procedures in the United States[1]. Associated problems with this procedure are bacterial infection, recurrent bleeding, prolonged ventilation due to unpredictable extrusion of the tube, and persistent perforation of the tympanic membrane[2]. Such complications occur in 36% of implanted tubes[3], resulting in patient discomfort and often requiring additional surgical interventions. To address these drawbacks, this research investigated the performance of MEVTs constructed from three resorbable polymers: Carbylan™, polylactic acid (PLA), and poly(lactic-co-glycolic acid) (PLGA). Carbylan™ is a hyaluronic acid derivative used in otological packing to promote perforation repair and prevent tissue adhesion [4]. PLGA and PLA are used in a wide range of biomedical applications requiring resorbable polymers for tissue repair or drug release. These polymers were cast into grommet-style MEVTs using custom fabricated molds. The addition of silver antimicrobials, in the form of silver salt (AgNO₃) and silver nanoparticles, to the tubes was investigated as a means to control infection at the site of implantation and reduce inflammation. In vitro studies indicate tubes containing silver exhibit a zone of inhibition when challenged with *Pseudomonas chlororaphis* O6. Host response and inflammation were characterized by tube implantation into tympanic membranes of chinchillas. The release of antimicrobials as the tubes degrade, in addition to possible intrinsic

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