Biodegradable and Anti-microbial Diol-based Unsaturated Polyesters for Drug Delivery and Tissue Scaffolding Applications

Published date: Jan. 30, 2017

Technology description

Challenge

Fungal disease of organ systems such as the lungs, skin, and musculoskeletal tissues can be devastating in immunocompromised populations, such as patients suffering from cancer or recovering from organ transplantation. Furthermore, complications associated with medical implant and medical device-related infections have created a significant clinical need for novel materials capable of both stimulating tissue regeneration and mitigating fungal infections.

Solution

Rice researchers have designed a novel class of diol-based, unsaturated, aliphatic polyesters that biodegrade into monomers capable of mitigating infection. This new class of polymers, the poly(diol fumarates) (PDFs) and poly(diol fumarate-co-succinates) (PDFSs), can be cross-linked to form networks of scaffolds with antimicrobial degradation products. Both the diol carbon chain length as well as degree of available double bonds for functionalization are tunable, and provide for a highly controllable class of antimicrobial polymers.

Application area

The utility of this technology includes uses as cellular scaffolds and drug delivery vehicles for biomedical applications. This technology may find use in a number of devices ranging from regenerative medicine to drug delivery. Tunability of these polymers enhance the range of biomedical applications compared to existing biomaterials.

Advantages

Diol-based polyesters that are biodegradable, biocompatible, and funtionalizable.
Biodegraded monomers display antimicrobial/antifungal properties and complement their therapeutic payload.

Altering the chain lengths of diols and the ratio of fumaric acid to succinic acid allow for tunability of polymer networks.
Diol-based macromers can be cross-linked to form 3D polymer networks, including drug delivery vehicles and tissue engineering scaffolds

Institution

Rice University

Inventors

Antonios G. Mikos
Louis Calder