An Antimicrobial-Bacterial Cellulose-Manuka Honey Loaded Dressing for the Active Treatment and Monitoring of Wounds

Markowitz, Emma (School: Maine Homeschool)

Chronic wounds are a significant healthcare threat worldwide, affecting an estimated 6.5 million people in the U.S. and costing the healthcare system an estimated $25 billion annually (10). With the drastic increase in obesity and diabetes, there is a critical need for innovative wound care strategies that accelerate healing and recovery and limit the use of antibiotics through wound monitoring technology. The goal of this study was to develop a biodegradable, antimicrobial wound dressing, for the purpose of detecting infection and healing wounds. Bacterial cellulose (BC), a biopolymer derived from kombucha tea, was purified, and loaded with manuka honey (MH) to obtain long lasting antimicrobial properties. Alkaline pH within a wound bed is a strong indicator of infection or biofilm formation. A pH sensing indicator was fabricated by loading anthocyanin, a natural dye extracted from red cabbage (Brassica oleracea), into bacterial cellulose patches, which were incorporated into the MH/BC dressing for the purpose of detecting infections. BC's complex 3-D structure allows MH to slowly release, giving it a more prolonged effect at the wound site. T-test of disk diffusion results indicated MH/BC dressings functioned significantly better than 100% unloaded manuka honey at inhibiting both Gram-positive and Gram-negative Staphylococcus epidermidis and Escherichia coli, respectively at 48, 72 and 96 hours (S. epidermidis P= 0.0164, E. coli P= 0.200). This promising multi-functionalized dressing combines the proven antimicrobial benefits of manuka honey with the ability for patients and physicians to quickly identify wound infection.

Awards Won:

Drug, Chemical &amp

Associated Technologies Association (DCAT): DCAT First Prize

Fourth Award of $500