Characterization of Chitosan Coated Magnetoelastic Materials for Use in Percutaneous Implants

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There are upwards of 250,000 cases of infections due to the use of percutaneous devices in the US every year, with an estimated cost of $25,000 per incident. Improving the longevity of these devices is thus of significant clinical and economic importance. Current antimicrobial and junctional healing approaches do not allow for *in situ* modulation of therapeutic effects. In this work we are developing bioactive vibrational magnetoelastic (ME) materials for use as a remotely activated tunable coating promoting cell differentiation and inhibition of bacterial adhesion at the tissue-implant interface. ME sensors are currently used as an *in situ* method of measuring biological processes. The objective of this study was to develop an ME antimicrobial coating conducive to cell growth and characterize the antimicrobial and cell inductive response towards frequency-amplitude modulated vibrations. A thin film of Chitosan, a natural polymer with antimicrobial properties, was applied to the material using spin coating and quantified with profilometry and scanning electron microscopy. Custom built activation coils were constructed measuring resonant frequencies and amplitudes of coated and uncoated ME material. Based upon collected data a representative curve was created modeling the changes in resonant frequency and amplitude. Tunable vibrations induced a 30% decrease in bacterial adhesion when compared to non-vibrated controls. Currently we are testing the effectiveness of these coatings at promoting epithelial cell differentiation in addition to inhibition of bacteria adhesion.

