A Novel Approach to Bone Implant Infection Therapeutics Leveraging Proteins Derived From Lactobacillus acidophilus and Modulating Anti-Inflammatory Gene Expression

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Staphylococcus aureus bacteria is the world’s leading cause of bone implant infection causing osteomyelitis. Osteomyelitis accounts for half of all chronic diseases in people over 50 and this number has doubled by 2020. The risk for infection after a bone implant is more than 50%. Osteomyelitis causes multiple complications and may lead to death. Osteomyelitis treatment is notoriously difficult as antibiotics do not work. In this project the hypothesis being tested is about the proteins derived from Lactobacillus Acidophilus, will inhibit bacterial growth and inflammation when applied to Staphylococcus aureus and macrophages. The experiment was designed to extract the proteins from the Lactobacillus acidophilus by varying concentration of Ammonium sulfate precipitation. After gel electrophoresis was run, strips of the gels were then placed on a petri dish swabbed with Staphylococcus aureus and melted agar was poured over each petri dish. Zones of inhibition were measured after 24 hours. While, all the concentrations had significant zones of inhibition, it was found that the 40% concentration solution had the greatest zone of inhibition and therefore, inhibited the most Staphylococcus aureus growth. To test for the anti-inflammatory genes, macrophage was prepared and the protein solution was added. Not only did the macrophages survive, after qPCR, we could see that all the anti-inflammatory markers tested for, TGF ß, CD163, CD206 and IL-10 were seen to be upregulated. The derived proteins were successful in both inhibiting the bacteria and reducing inflammation. This solution not only combats osteomyelitis but also drastically reduces costs for complicated surgeries and aids in the recovery process of patients. A future protein spray therapeutics is envisioned.

Awards Won:

Drug, Chemical &amp

Associated Technologies Association (DCAT): $1,000 scholarship will will be awarded &#x0D

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