Inhibition of Staphylococcus epidermidis Utilizing Borate-Based and Silica-Based Bioactive Glass

Preston, Lindsey (School: Conrad Weiser High School)

The purpose of this experiment was to determine if bioactive glass (BG) would be a good substitute for antibiotics resistant to Staphylococcus bacteria. BG are bioceramics which can be used to repair and replace bone tissue, promote wound healing and are often used as a coating on implants because of their ability to not be rejected by the body. In this study, borate based BG and silica based BG was used. Borate based BG has been known for effectively promoting wound healing and skin growth, whereas silica based BG has been known for being osteoproductive. This study examines if certain types of BG have any antimicrobial properties against S. epidermidis, a common strain of staphylococcus bacteria that causes skin infections that can lead to serious health issues. An antibiotic sensitivity test was conducted on four different BGs, oxacillin, and a negative control of phosphate buffer saline (PBS). Three borate based BG were included (Mirragen (™), GL1605, GL 1550), as well as a silica based BG (45s5). Five grams of each bioactive glass was mixed with 100 milliliters of sterile PBS. Blank inoculation disks were soaked in the mixture and placed on the petri dish inoculated with S. epidermidis bacteria. The petri dishes were incubated for 24 hours before zones of inhibition were measured. The results showed that the borate based BG had significant inhibition compared to the silica based BG. The three borate based BG were not significantly different from each other, despite some physical and compositional differences. Oxacillin, as expected, had the largest zone of inhibition, meaning oxacillin had the greatest antimicrobial properties. It can be concluded that the borate based BG do have inherent antimicrobial properties in addition to their wound healing properties.

Awards Won: