Bioactive Glass Enhances Recovery of Drosophila and Sf9 Cell Mitochondrial Function Following Antibiotic Treatment

Pichler, Lacie

Sustained, repeated and empiric antibiotic treatments are therapeutic regimens developed to conquer bacterial infection. Broad-spectrum and long term use of antibiotics have known adverse side effects including antibiotic resistance and cellular deterioration. Consequently, while antibiotic treatment may successfully eradicate infection, it can be deleterious to the remaining cells and tissues. Previous research shows an accumulation of mitochondrial reactive oxygen species (ROS) following antibiotic regimens that ultimately interrupt ATP synthesis in otherwise healthy cells. Ideally, a recovery preparation to negate ROS damage and revitalize remaining cells is needed. Bioactive glass is a novel material that supports cellular recovery and healing following damage. Copper and zinc doped bioactive glasses have been shown to inhibit antibiotic resistant bacteria. A bioactive glass supplemental treatment has the potential to counteract ROS damage and promote cellular function. In this study, penicillin and neomycin treatments were administered to Drosophila and Sf9 cells. The antibiotic treatment significantly damaged Drosophila and Sf9 cells while impeding ATP synthesis. Following antibiotic treatment, experimental cell groups were enhanced with a bioactive glass supplement. ATP and cell toxicity assay were utilized to compare bioactive glass supplemented cells to the control group. Results of this study show bioactive glass to be an effective recovery supplement for cells damaged by antibiotic therapies. Cell number and ATP production increased significantly while cell toxicity decreased following bioactive glass supplementation. Taken together, this study presents an application for bioactive glass to be deployed as a codicil for antibiotic administration.

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