Preventing Staphylococcus epidermidis and Pseudomonas fluorescens Infection and Growth Using Fungal Volatile Organic Compounds with and without Lactobacillus acidophilus

Enriquez, Kyle

Every year, severe burns kill approximately 265,000 people due to opportunistic infection from normal flora, such as Staphylococcus epidermidis. This research studies the efficacy of using fungal-derived volatile organic compounds (VOCs) with Lactobacillus acidophilus, to prevent growth of S. epidermidis. VOCs (isobutyric acid (IBA), benzaldehyde, butanol, or cineole), with or without L. acidophilus, with appropriate controls, were added to S. epidermidis cultures. IBA and benzaldehyde significantly inhibited growth of S. epidermidis (Dunn's Comparison p-value less than 0.001). IBA with L. acidophilus significantly inhibited S. epidermidis growth over the VOCs alone (Mann Whitney p-value less than 0.01). L. acidophilus biofilm formation was not inhibited by benzaldehyde, butanol, and IBA (Dunn's p-value greater than 0.05). VOCs were then applied to Pseudomonas fluorescens to determine the efficacy of treatment in gram negative bacteria. Cineole, benzaldehyde, and butanol all significantly inhibited P. fluorescens growth (Dunn's p-value less than 0.01). When in the presence of L. acidophilus, benzaldehyde and IBA were again effective inhibitors (Dunn's p-value less than 0.01). VOCs with or without L. acidophilus were added to insect cell culture Sf9 to determine toxicity. Observations showed no change cell morphology and increased cell growth. Currently testing is being conducted to determine if VOCs and L. acidophilus will inhibit growth of S. epidermidis in insect cell cultures. Results pending. With the successful results in bacterial testing, future work will use imaginal disc cells and mammalian cells to generate a treatment that can be taken from bench to bedside to prevent the growth of these deadly bacteria.

Awards Won: