

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

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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.