Comparing the Efficacy of Alternative Treatments in Inactivating Escherichia coli O157:H7

Aznavorian, Bronson

The purpose of this project was to determine which alternative treatment is the most effective at preventing E. coli O157:H7 cell growth and/or Shiga toxin production. It was hypothesized that if E. coli O157:H7 is treated with essential oil from cinnamon (Cinnamomum zeylanicum), then it would produce fewer Shiga toxin and show less cell growth than if treated with (±)-L-Alliin from garlic (Allium sativum) or “Dragon’s blood” resin (Croton lechleri) or if left untreated. High (1:1), medium (1:10), and low (1:100) dilutions of each treatment were prepared with LB. E. coli O157:H7 was treated with each concentration. Controls were untreated E. coli O157:H7, a Shiga toxin producing strain, and E. coli DH5a, a non-Shiga toxin producing strain. The optical densities (OD) of the cell cultures were collected before and 20 hours after treatment. Messenger RNA was extracted from the cells, complementary DNA was made via reverse transcription, and the stx2A and GAPDH genes were amplified using real-time reverse transcription polymerase chain reaction (qRT-PCR). Statistical analysis was conducted for the OD and qRT-PCR data. The low concentration of essential oil from cinnamon, 6.25x10-5 g/mL, was found to be the most effective treatment at inhibiting both cell growth and Shiga toxin gene expression. The high concentration of essential oil from cinnamon, 6.25x10-3 g/mL, and the medium and high concentrations of Dragon’s blood were found to actually promote Shiga toxin gene expression by E. coli O157:H7. The hypothesis was supported by the data and confirmed the need for further testing.

Awards Won: