Engineering of a Delivery Truck System Integrated With Acoustic Wave Technology for E. coli Inhibition in Romaine Lettuce

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E. coli outbreaks linked to romaine lettuce in Yuma, Arizona, have been a persistent public health concern. This study explores a solution to mitigating bacterial contamination using sonification-based sterilization. The objective is to assess whether specific sound frequencies can inhibit E. coli growth on romaine lettuce during transit. For that purpose, a prototype truck was built equipped with a Bluetooth speaker to directly expose E. coli cultures and lettuce samples with white noise in a variety of frequencies and intervals. E. coli K12 was diluted and applied in both petri dishes and lettuce samples. They were exposed to white noise at 15,000 Hz for the treatment times of 5, 10, 15, and 20 min. Following incubation, bacterial colony growth was analyzed using the ImageJ program. The results indicated that the colonies of E. coli disappeared at a frequency of 15,000 Hz in a 20-minute period of exposure. A highly negative correlation was found which confirmed our hypothesis. The use of frequencies could lead to a simple, cost efficient, and contact-free method for reducing E. coli contamination during transportation. Our future plans include evaluating the effectiveness of this method on a larger scale, exploring the effects of different sound frequencies, and evaluating its effectiveness against various bacterial species. This can eventually help in developing a new alternative for sterilization by using traditional methods and thus guaranteeing better quality of life and improvement in public health.

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