Effectiveness of Using Different Liquid Misting Applicators to Kill Bacteria

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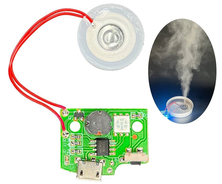
Introduction

Bacteria, the primary agents of infection in humans, are present on nearly all surfaces. To mitigate the spread of bacteria and infections, disinfectants are commonly used. This study explored the effectiveness of common disinfectants and different methods of disinfection, primarily focusing on the use of spray pumps and a transducer as a mechanism to disinfect surfaces using 70% IPA (Isopropyl Alcohol) or ethanol (often referred to by the brand name Lysol).

Testing Methods



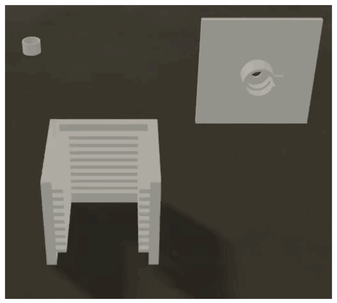
Transducer

When voltage excites a transducer at its resonant frequency, it produces mist by vibrating. Placing water on one side causes it to diffuse to the other side and

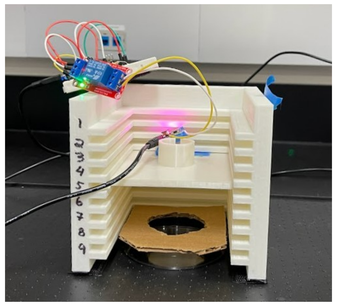
Atomizing Spray Nozzle

An atomizing spray nozzle is a device designed to break up liquid into a fine mist of tiny droplets for efficient dispersion.

Experimental Setup



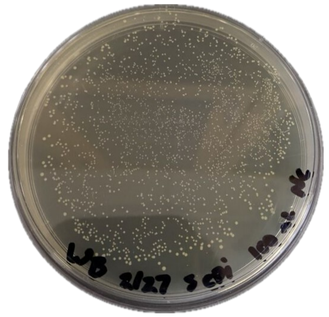
The Testing Housing shown on the left was used to keep consistency between testing. The multiple rows in the main housing allow for adjustable testing heights. Shown on the top right is the transducer slide. The transducer fits snugly in the hole and the plate can be slid onto any testing level.



The setup on the left captures testing in progress. An agar plate was inoculated 15 minutes before testing. Prior to bacterial incubation, the plate is treated with disinfectant. The main variables assessing disinfection effectiveness were **disinfection time**, **distance from the plate**, and **type of disinfectant** (Lysol or 70% IPA).

The bacteria Staphylococcus epidermidis was used for testing the effectiveness of disinfectants. Each disinfectant test included a positive control (plates treated with excess disinfectant) and a negative control (an untreated inoculated plate). Post inoculation, specimens were incubated for 24 hours; the resulting bacterial growth was then assessed to determine the effectiveness of the disinfection.

Results

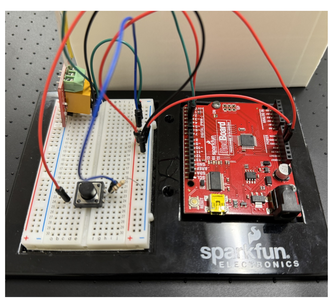


Negative Control

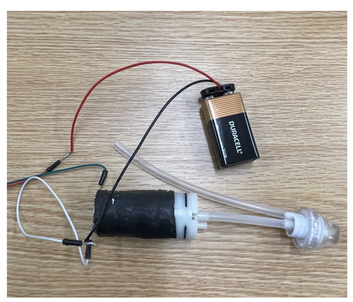
Post-Spray Results

The negative control demonstrates that without disinfectant treatment, the agar plate would have exhibited significant bacterial growth. Overall, the testing concluded that both Lysol and 70% IPA are effective in killing and halting the spread of bacteria. Both the transducer and atomizing spray methods proved equally effective. A disinfection time of 0.7 seconds was determined to be effective for both the transducer and atomizing spray methods. This duration was the shortest operational time that minimized the impact of air gaps in the spray tubing on the consistency of the spray.

Integrated Technology



For the transducer design, an Arduino and timer were employed to activate the device. The Arduino was programmed to respond to a button press by triggering the timer for the specified duration, powering the transducer accordingly.



For the automated spray, a dual-inlet nozzle was utilized. One inlet connected to a hose supplied disinfectant, while the other connected to a pump motor powered by an Arduino. The Arduino was programmed to respond to a button press by running the motor for .7 seconds.

Conclusions

The study shows that Lysol and 70% IPA are effective when used with either a transducer or an atomizing spray, only requiring 0.7 seconds to kill and stop bacterial growth. The ability to disinfect at a distance without saturation is particularly noteworthy, suggesting these methods are both practical and resource-efficient for different applications.

Refrences: Tingbowie. (n.d.). *Atomization Disc mist maker Ultrasonic Atomization Module Ultrasonic fogger DIY Humidifier with PCB 5V*. photograph, Amazon .

Lisapack. (n.d.). *LISAPACK 1oz Small Plastic Spray Bottle (12 Pack) Empty Mini Fine Mist Travel Size Atomizer, Tiny Sprayer for Little Perfume, Water, Cologne, Alcohol, Samples (Clear, 30ml)*. photograph, Amazon .