

## Optimising UV Exposure to Inhibit *Escherichia coli* Growth

**Research Question:** How does the UV exposure time and light intensity affect the growth of *Escherichia coli* measured by number of counted colonies after 24 hours incubation?

**Abstract:** *Escherichia Coli* is a pathogenic bacteria which secretes Shiga toxins which can cause neurological complications and acute liver failure. Its outer lipid layer may act as a barrier to permeation of antibiotics, making it increasingly resistant to treatment. Therefore, methods of inhibiting bacterial growth are crucial to processes like water treatment.

Ultraviolet light, specifically UVA, inhibits *E. coli* growth by creating reactive oxygen species which react with protein membranes and DNA leading to cell death. This investigation looks at optimizing bacterial inhibition by varying duration of exposure and light intensity. The results of this investigation may be used as an alternate method of water treatment in rural areas.

**Aim:** The initial idea for this investigation came from an article about rising cases of *E. coli* infections in Bangladesh arising from contaminated drinking water. Rural areas in places such as Bangladesh often do not have access to water sanitation and it is not feasible to readily implement industrial water treatment facilities. Therefore, this investigation looks at an alternate method of inhibiting bacterial growth: ultraviolet light. The practical looks at how the disinfection of *E. coli* can be optimized by altering duration of exposure and light intensity. This would allow for a more accessible form of water treatment which is at its most efficient.

**Methodology:** This investigation gathered data via a practical experiment in which *E. coli* K-12 is plated onto nutrient agar plates via spread plating and then exposed to UVA light under a UV torch. The duration of exposure was varied as well as distance between agar plate and UV torch to change the light intensity. The plates were then incubated for 24 hours at 30°C. The number of colonies was counted and recorded.

**Conclusions:** The number of counted colonies decreased as UV exposure time increased and decreasing light intensity showed an increase in number of counted colonies. This investigation can be expanded as a model for UV induced skin damage. Specifically instances and risks of melanoma from tanning bed exposure which also emits UVA