# CALIFORNIA STATE SCIENCE FAIR
# 2015 PROJECT SUMMARY

**Name(s)**

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**Project Number**

**J1520**

**Project Title**

## Preventing Major Viral Outbreaks: The Effect of Ultraviolet Radiation on Coliphage T4r

**Abstract**

**Objectives/Goals**

My objective was to learn which wavelength of UV radiation (253 nm, 365 nm, and 390 nm) had the greatest effect on Coliphage T4r.

**Methods/Materials**

Coliphage T4r, E. coli B, Micropipettes, hundreds of disposable micropipette tips, nutrient peptone broth, soy tryptone broth, LB agar, agarose, an incubator, a temperature-controlled water bath, 35 mm petri dishes, 100 mm petri dishes, a camera, an oscilloscope, two germicidal bulbs, a 365 nm LED, a 390 nm LED, Si photodiode, PCS software tool, UV ChiphEraser-20, Canon document camera

**Results**

The 253 nm UV radiation started inactivating the virus when it was exposed to at least 700 microjoules per cm^2. To inactivate at least 99 percent of the virus, it needed to be exposed to greater than 150,000 microjoules per cm^2. The plates containing virus exposed to the UV LEDs had little to no difference in plaque count. Finally, the percent of remaining plaques for the plates in the multiple trials of 253 nm UV radiation, versus the radiant exposure, fit to a power curve with an R^2 greater than 0.96.

**Conclusions/Discussion**

The data supports my hypothesis by indicating that ultraviolet radiation effectively inactivates Coliphage T4r with a wavelength of 253 nm because it is the closest wavelength to the germicidal point (264 nm) where the thymine bonds within the virus DNA is damaged the most by absorbing its maximum energy. The data helped obtain my objective by proving 253 nm UV radiation greatly inactivated the virus while the 365 and 390 nm UV radiation had little to no effect. My project proves that at 150,000 microjoules per cm^2, 253 nm UV radiation kills more than 99 percent of Coliphage T4r.

**Summary Statement**

Using E. coli B as an indicator, I found the point at which an exposure of UV radiation began inactivating Coliphage T4r.

**Help Received**

Borrowed micropipettes from science teacher; went to Ask-a-Scientist night to get ideas for project; loaned/purchased equipment from parents