

“Natural” Sunscreens Although More Expensive are Not More Effective at Preventing UV Exposure.

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Background

- Every year, 3.5 million Americans will be diagnosed with skin cancer (Zhou, 2015).
- Ultraviolet (UV) radiation from the sun is one of the biggest contributors to skin cancer prevalence the 21st century (Armstrong and Kricker, 2001).
- There are two different types of sunscreen available:
 - Physical sunscreen works to protect the skin by deflecting or blocking the sun's rays.
 - Physical sunscreens are made from either titanium dioxide or zinc oxide and are typically more expensive than its chemical rival (Skinacea, 2012).
 - Chemical sunscreen absorbs the sun's rays to help to protect the skin (Skinacea, 2012).
 - Chemical sunscreen may be comprised of various ingredients, making them less expensive than physical sunscreens (Skinacea, 2012).
- Consumers tend to view physical sunscreens as more natural, and as a result, may view them as a more efficient product.
- Green or organic personal care products have become increasingly popular in recent years
 - Second largest seller for organic product sales in the US organic industry (Kim, 2011).
- There are three main consumer values: health consciousness, environmental consciousness and appearance consciousness (Kim, 2011).

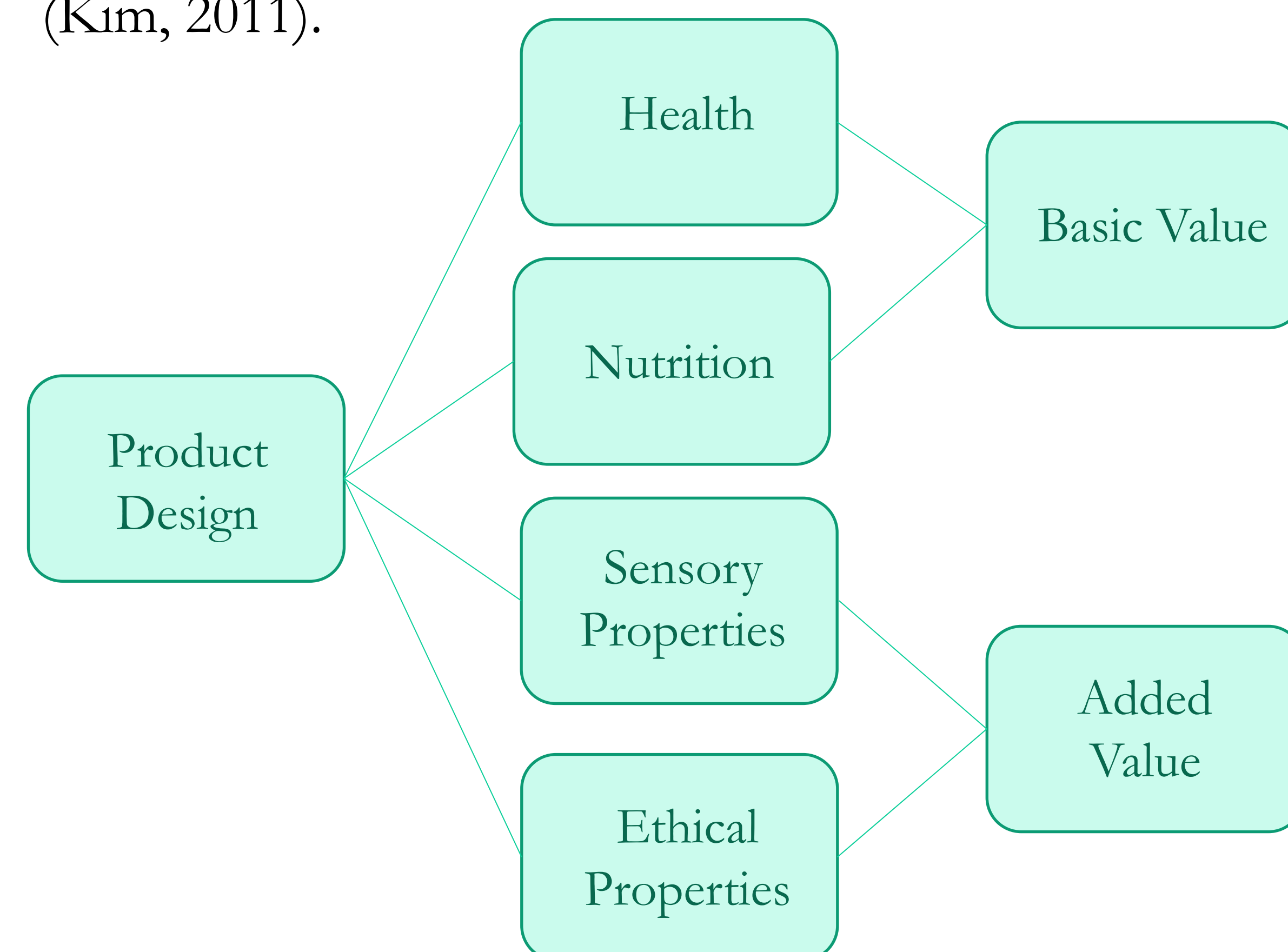


Figure 1. Properties that go into the creation of products (Schleenbecker, 2013)

- The purpose of the current study was to determine the efficiency of physical sunscreen compared to chemical sunscreen using a novel model organism for this type of study, *Escherichia coli* (*E. coli*).

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Materials and Methods



Chemical Physical Chemical Chemical Physical

Figure 2. Different brands of sunscreen used categorized as physical or chemical and their prices per ounce (Torres, 2018).

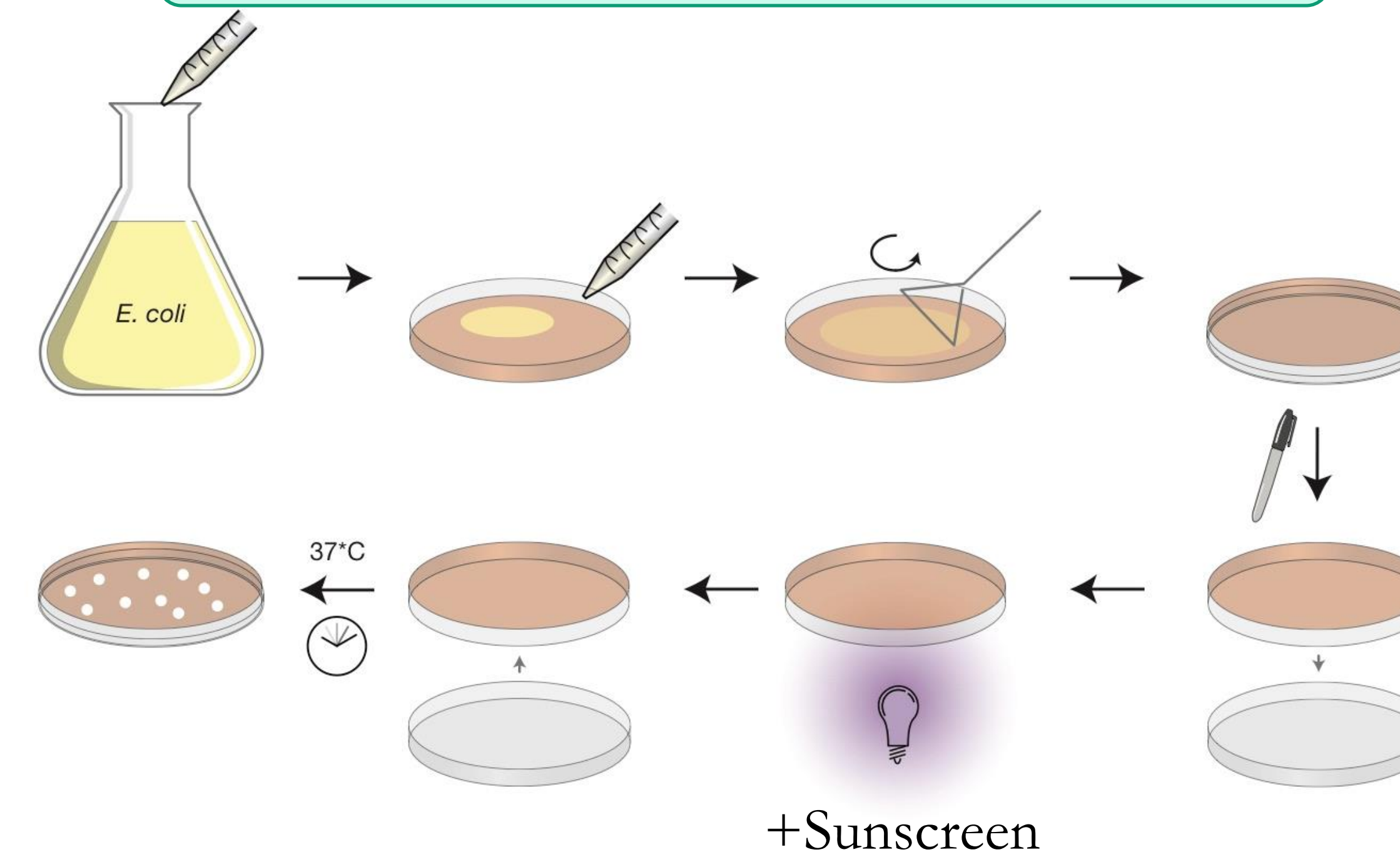


Figure 3. Illustration of the experimental procedure used (Torres, 2018).



Figure 4A. UV lamp off with sunscreen.

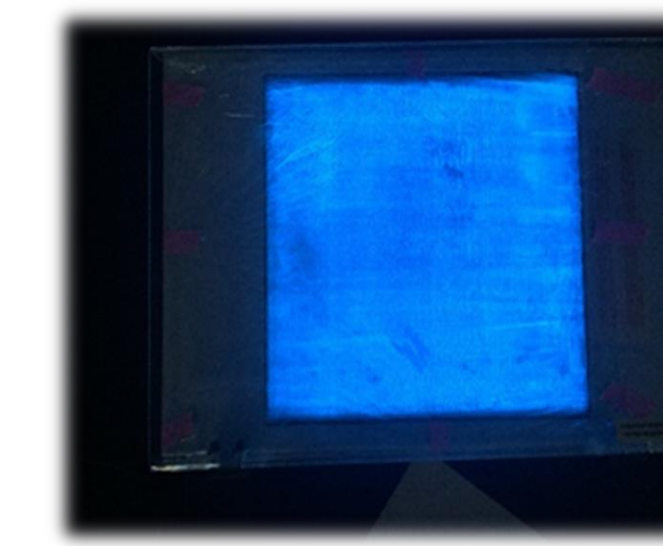


Figure 4B. UV lamp on with sunscreen.

Experimental Methods: Pipetted the *E. coli* that onto a plate that contains nutrient agar. *E. coli* was spread using aseptic technique. Next, saran wrap was taped onto the UV lamp in order to spread the SPF 30 sunscreen. Then the top of the plate was removed, and it was placed face down on the UV lamp.

The UV lamp was closed and turned on for 2 seconds. The petri dish top was put back on and this process was done for all the sunscreens. The plates were left in the incubator overnight at 37°C, and the next day colonies were counted on each plate to see the survival rate.

Statistical Methods: All trials were combined to run the statistical analysis. Using R, an ANOVA, Tukey Kramer Test and descriptive statistic analysis was performed.

References

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Results

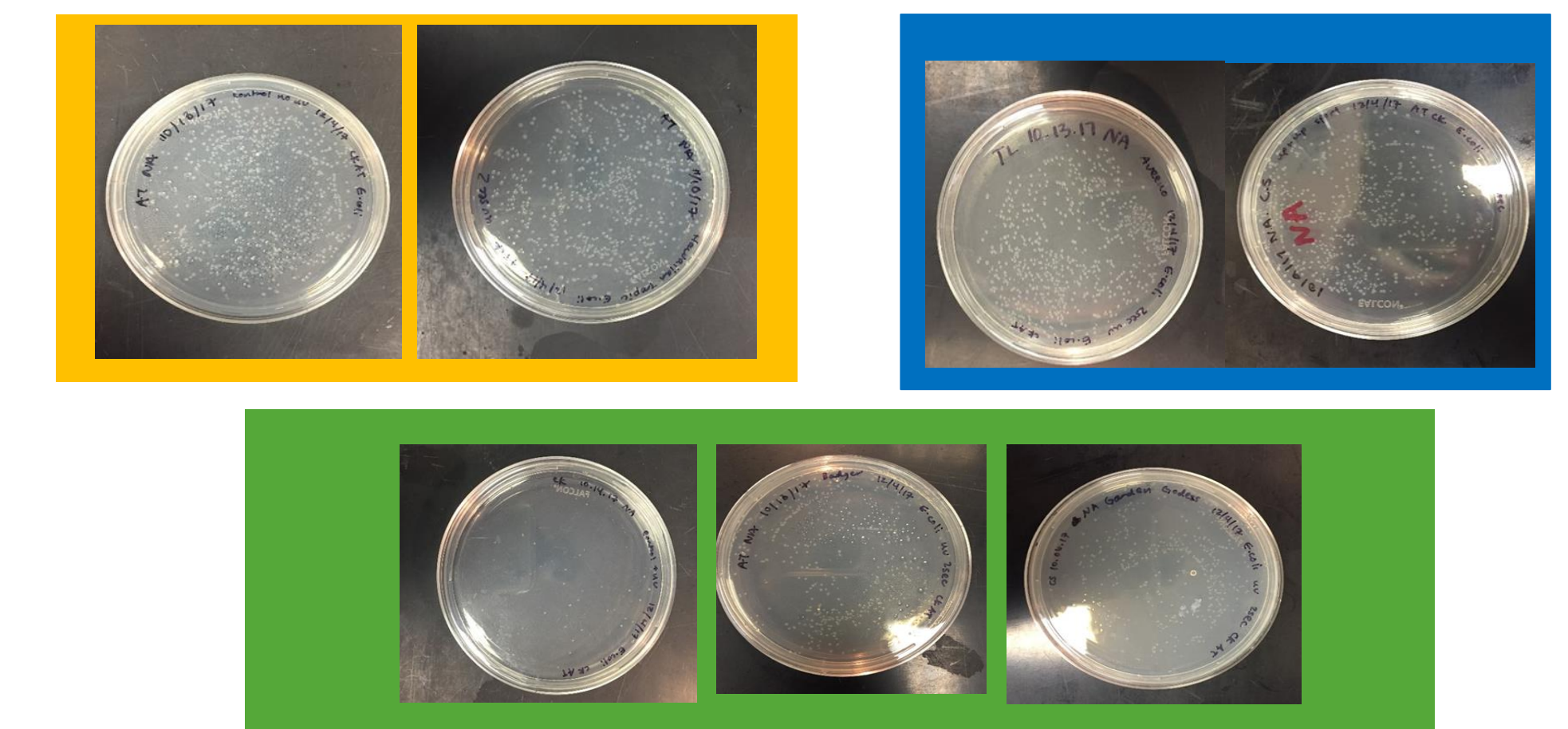
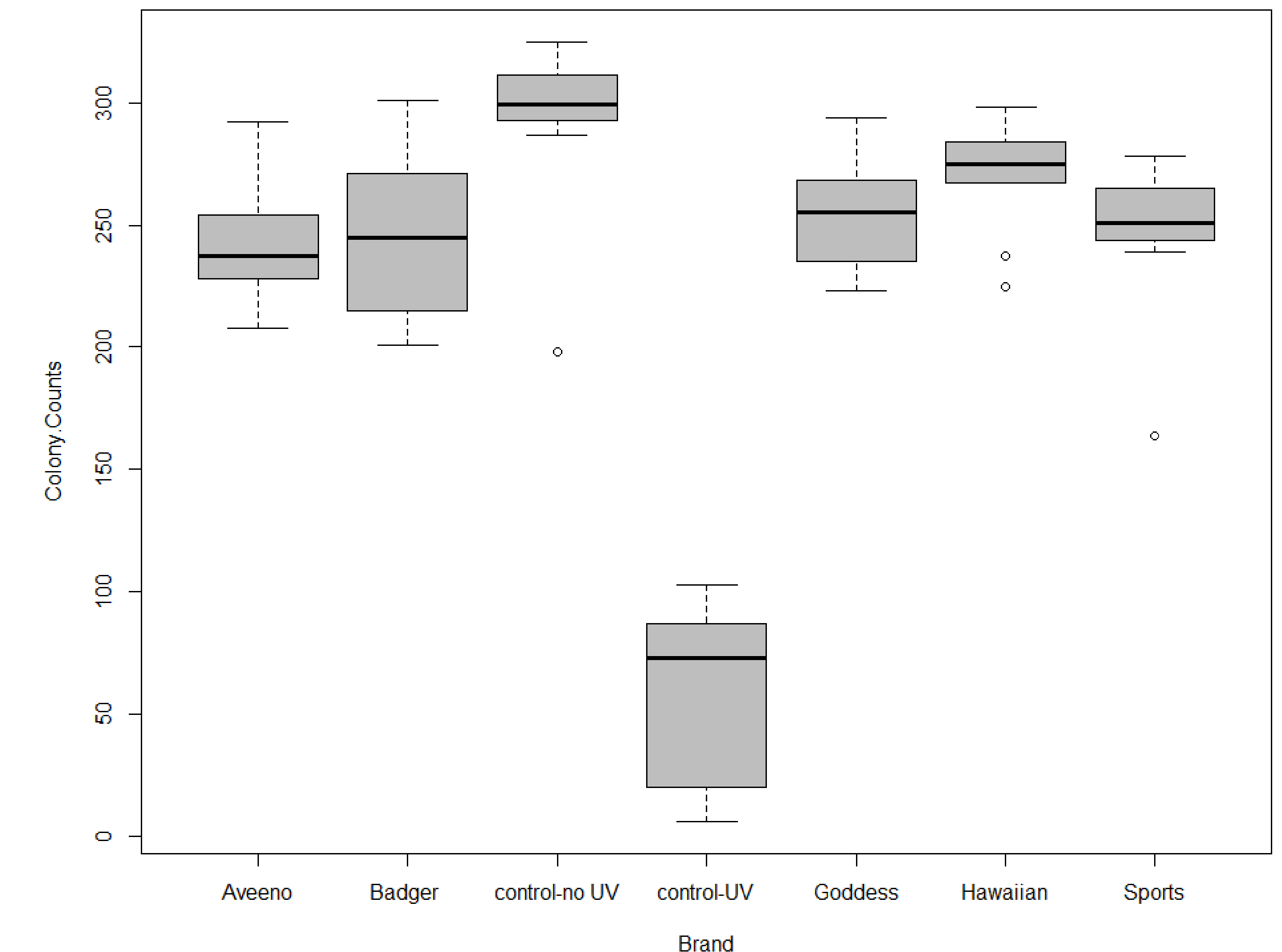


Figure 5. Pictures of experimental results

Sunscreen Brands	Cost of Sunscreen per oz	Hazard Risk Factor
Badger	\$15.99 per 2.9 oz	1
Goddess Garden	\$19.99 per 6 oz	1
Aveeno	\$9.49 3 oz	5
Hawaiian Tropic	\$7.99 6 oz	5
Up and Up Sports	\$6.59 10.4 oz	4

Figure 6. Cost and hazard risk factor of each sunscreen (ewg.org/skindeep)

Discussion

- The results of this experiment did not support our hypothesis. There appeared to be no statistical difference concerning the effectiveness of physical sunscreens over chemical sunscreens.
- Because there was no statistical difference in the effectiveness of the different types of sunscreens, perception that they are better is not accurate in terms of protecting against UV exposure.
- A possible reason behind the higher pricing of physical sunscreens could be due to other elements such as hazard risk factor or reef safety properties.