



# What's the Best Way to Apply Makeup?

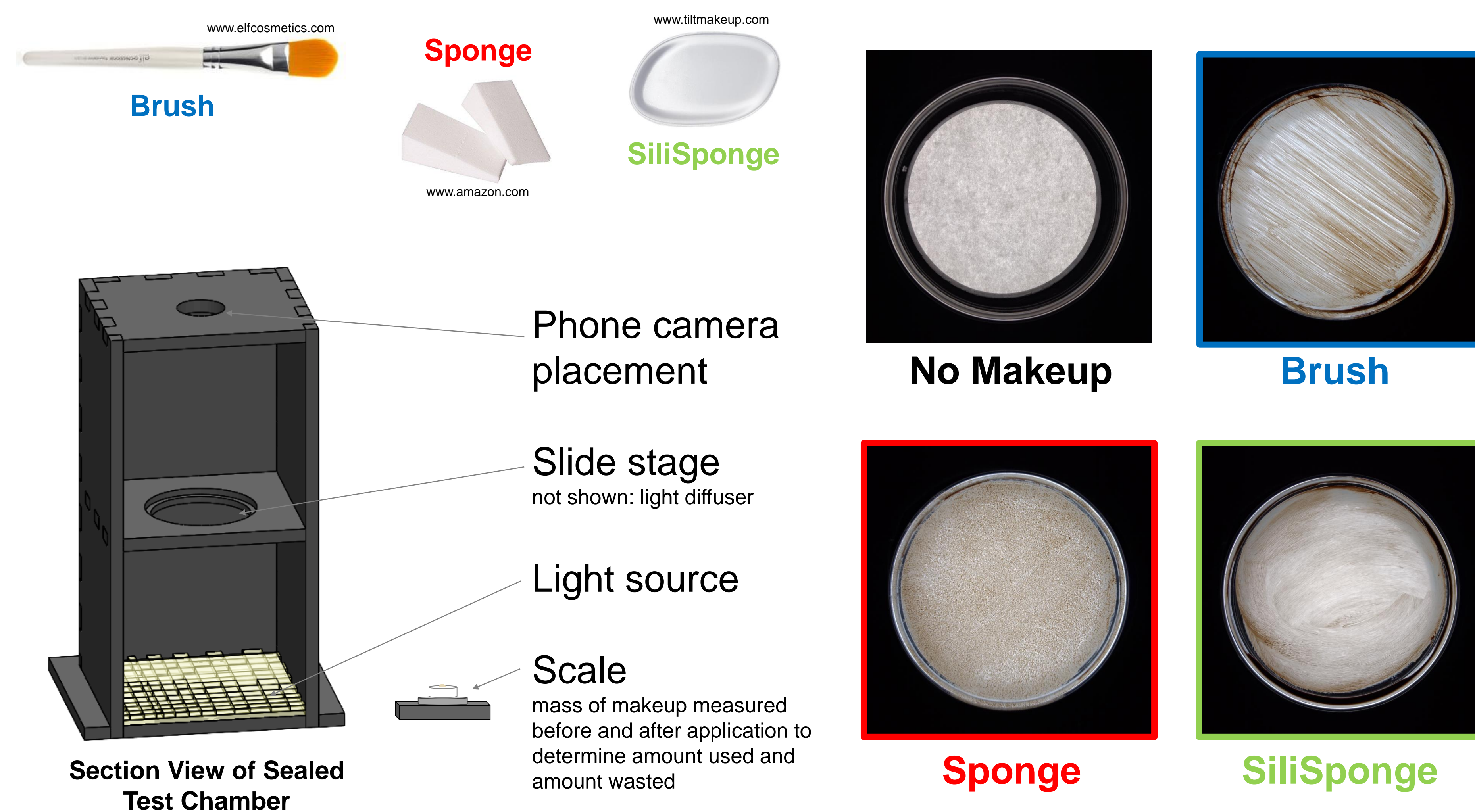
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2.671 Measurement and Instrumentation

## Abstract

When applying foundation makeup, the method that is used can impact coverage, evenness, and product waste. To determine which application method maximizes coverage, minimizes waste, and gives even, uniform results, plastic slides were coated with liquid foundation makeup using a **makeup brush**, a **cosmetic sponge**, and a **SiliSponge** silicone pad. The mass of makeup used was measured with a precision scale before and after using the implement, and images were taken as light was transmitted through the slide. Opacity and homogeneity for each trial were found using computer-aided image processing. The data suggest that **the SiliSponge wastes less product**, while the sponge results in more opaque, heavier coverage.

## Experimental Design

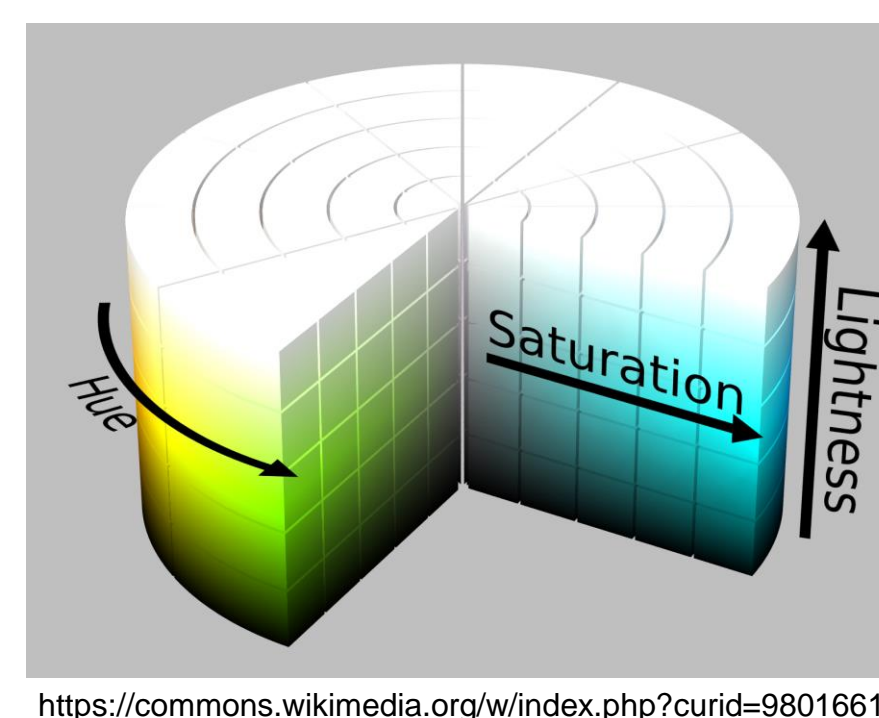


## Data Analysis

image files → MATLAB

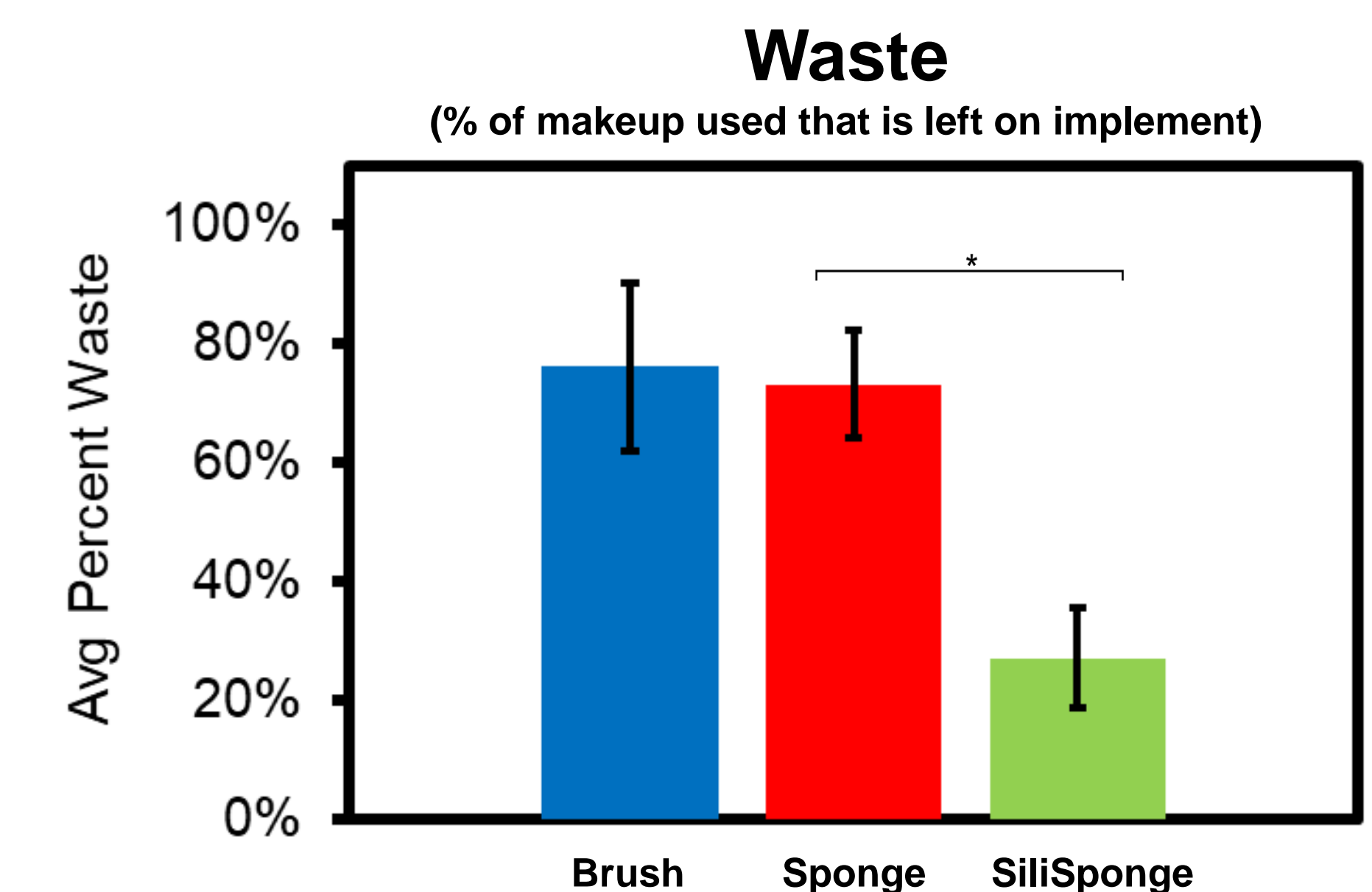
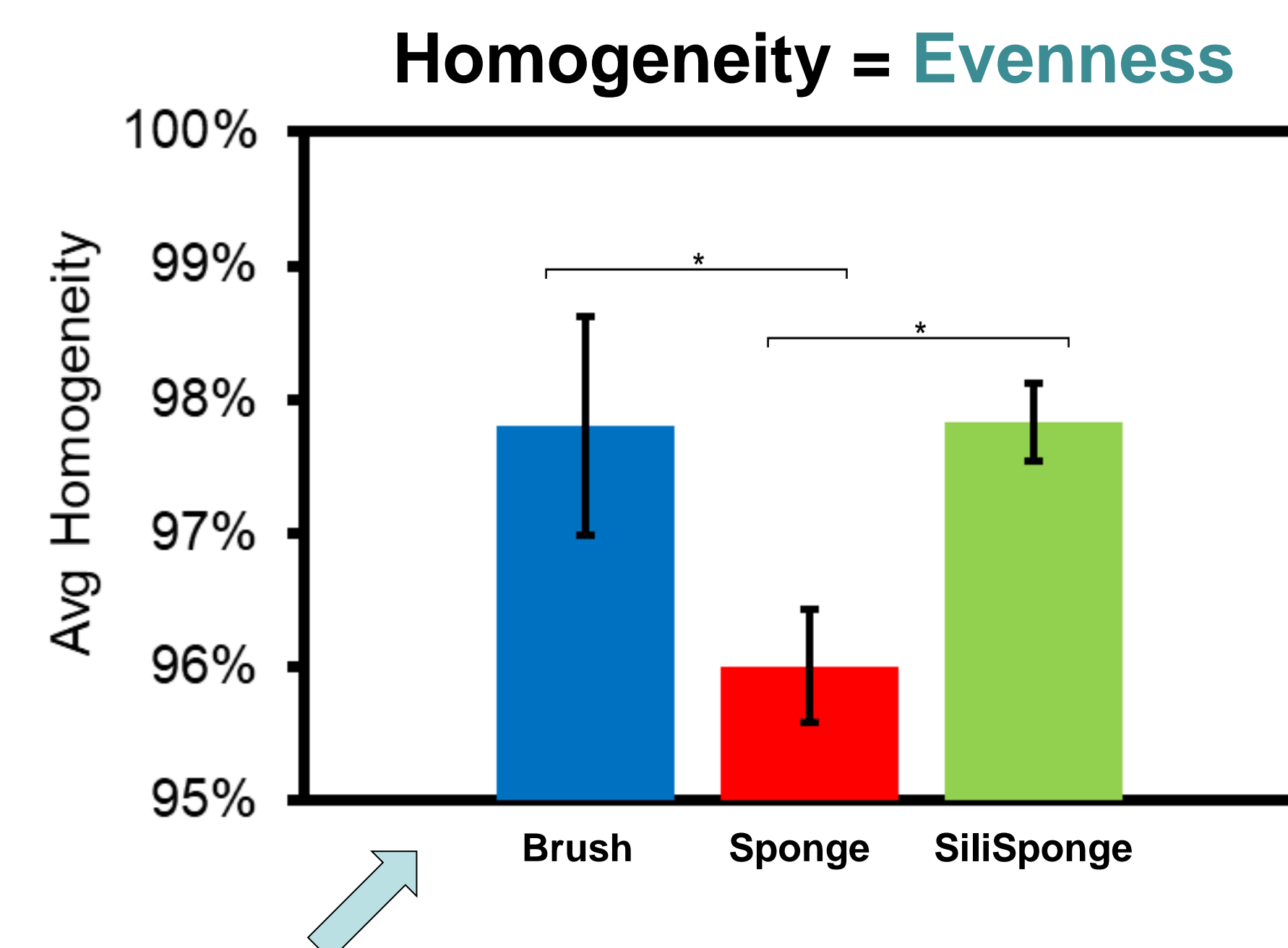
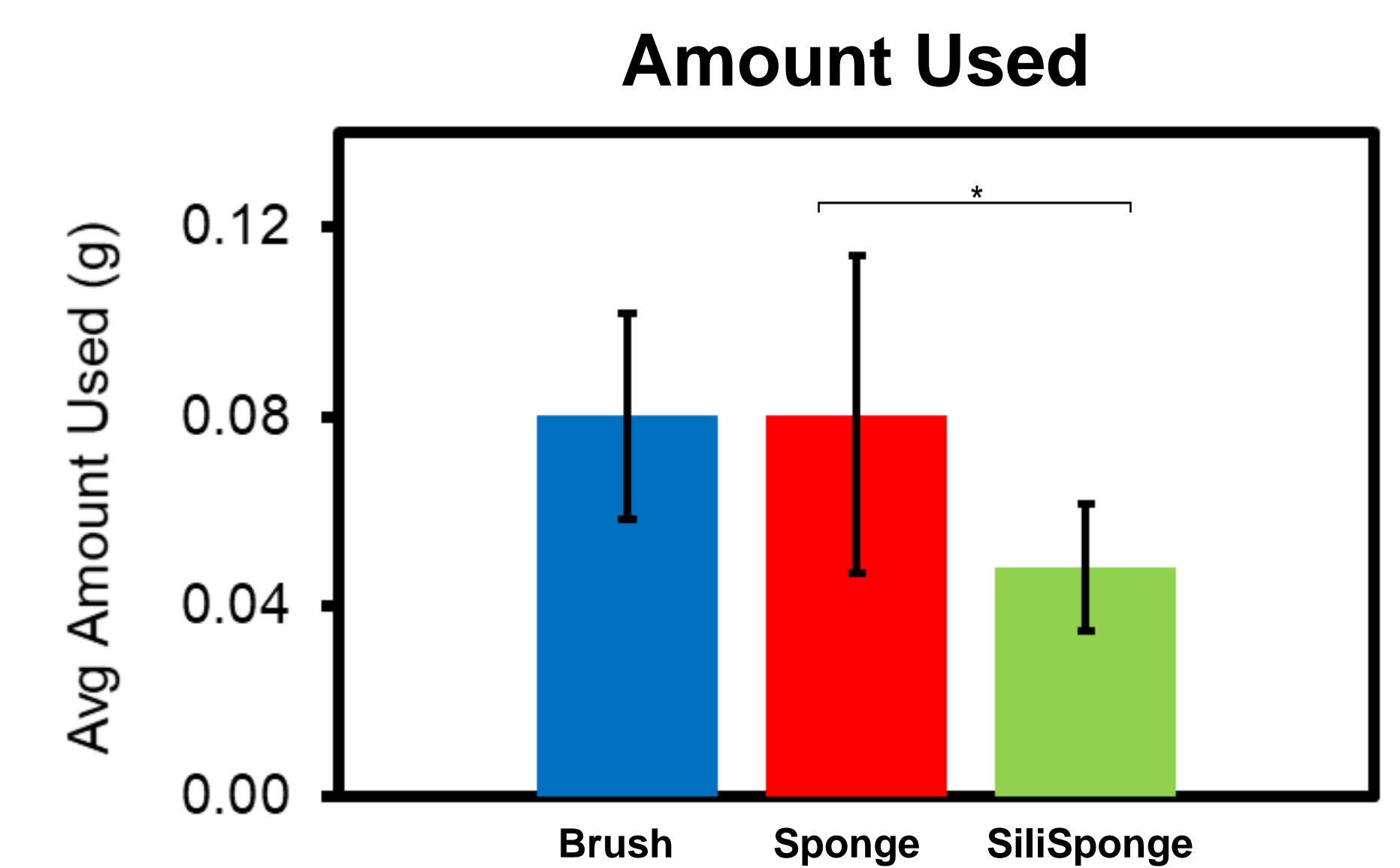
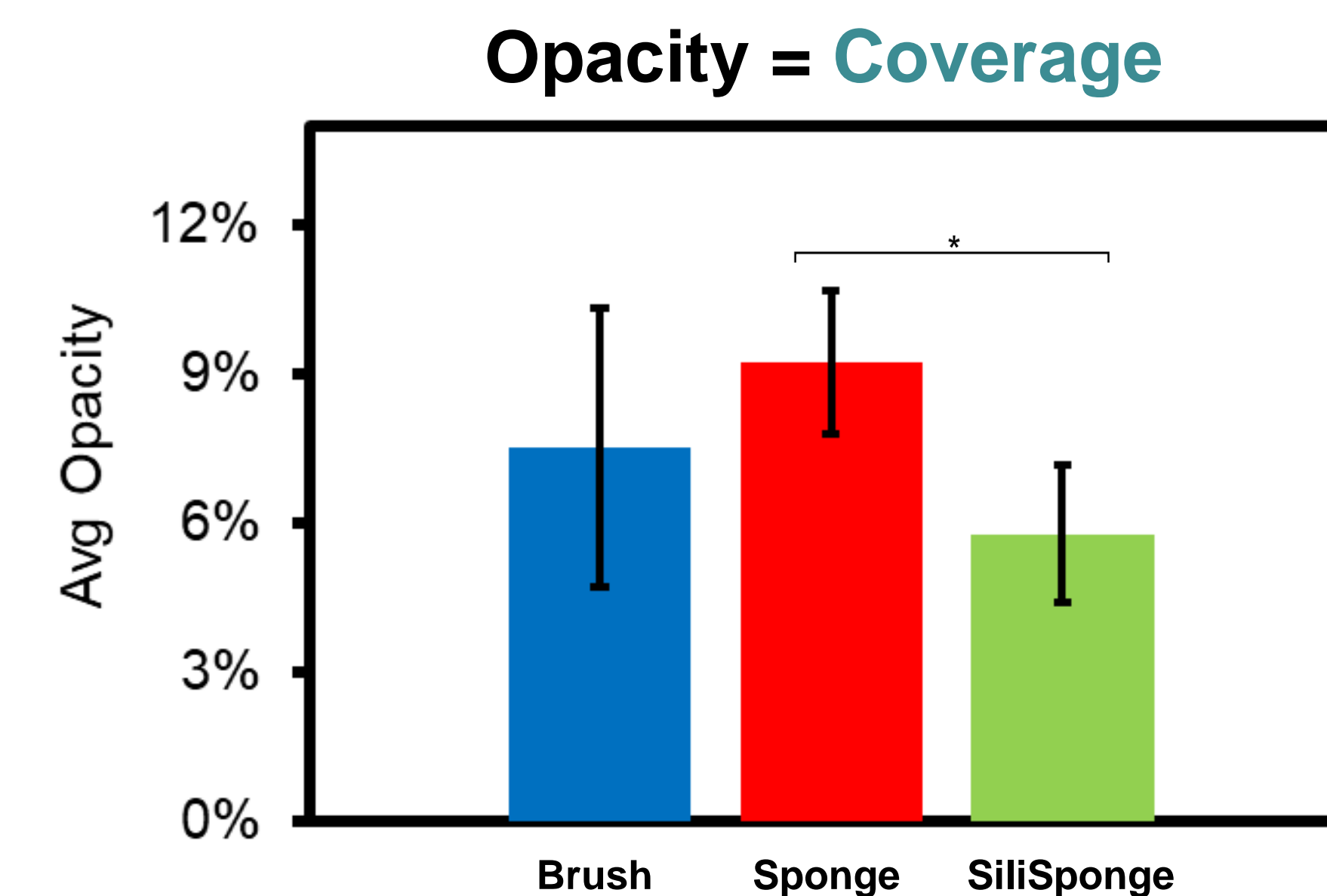
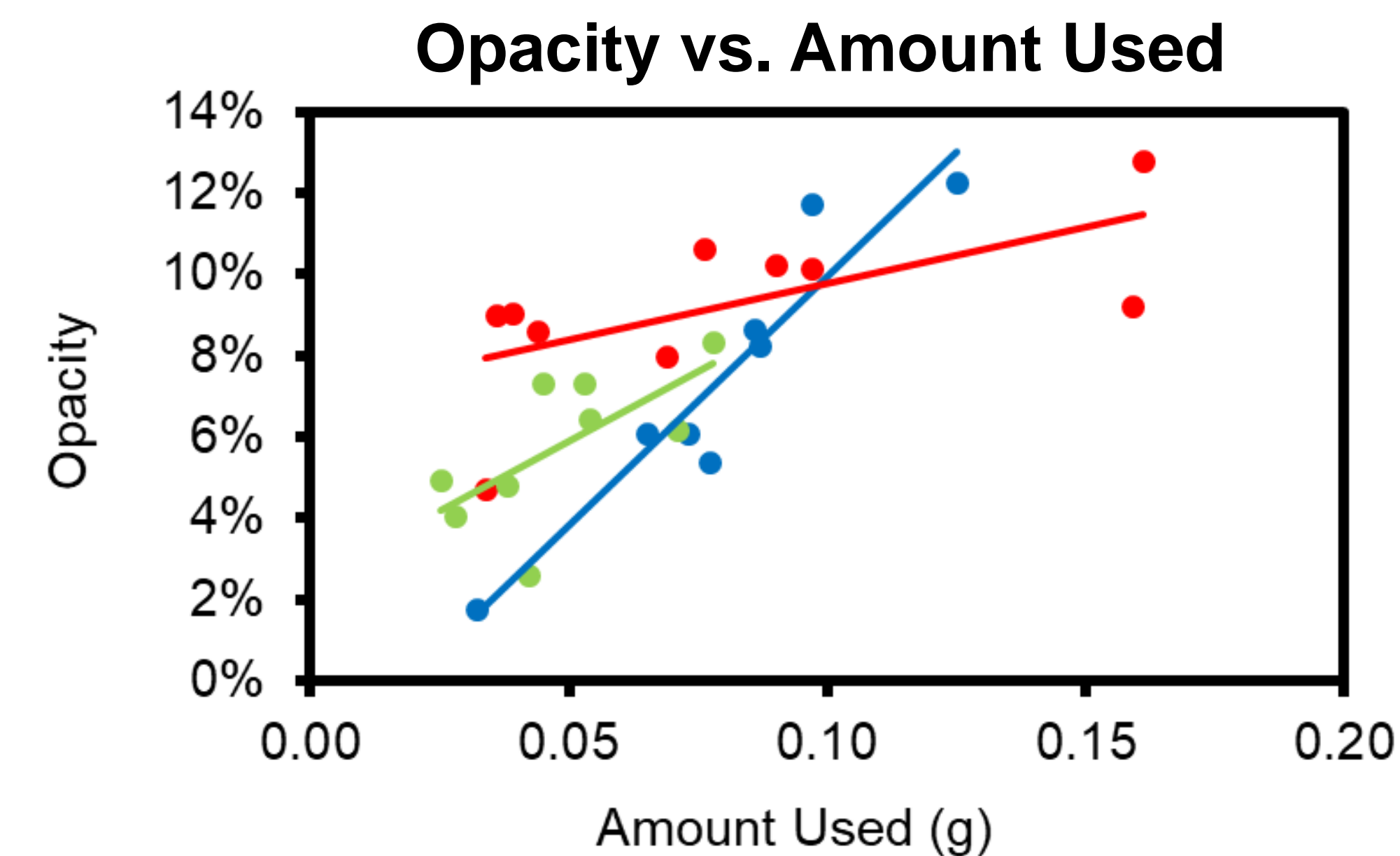
Each pixel in an image has a hue, saturation, and lightness (H,S,L)

Average lightness of all pixels in image  
↓  
Subtract from average lightness of control  
↓  
**Opacity** ↔ **"Coverage"**  
higher opacity = better, heavier coverage



Homogeneity of image, using MATLAB graycoprops and graycomatrix commands  
↓  
**Homogeneity** ↔ **"Evenness"**  
higher homogeneity = better, more even coverage

## Results



Homogeneity data claim that the sponge is uneven compared to the brush and SiliSponge; however, this does not agree with what the human eye sees. Therefore, homogeneity data were considered invalid; a different metric for evenness should be investigated.

## Conclusions

- Data suggest with 95% confidence that the SiliSponge **uses less** and **wastes less** product, while the brush and sponge are identical, providing **heavier coverage** with **more waste**
- A positive correlation between opacity and amount used suggests that heavier coverage could be obtained by increasing the amount of product used

## Acknowledgements

Special thanks to Dr. Kevin Cedrone and Dr. Barbara Hughey for guidance and help with this project.