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## OBJECTIVE

To determine the effectiveness of certain levels of Sun Protection Factor (SPF) at protecting yeast cells (*S. Cerevisiae*) exposed to ultraviolet (UV) radiation.

## BACKGROUND

### What is UV radiation?

- UV radiation from the sun damages DNA, can cause skin cancer, and early aging (Young et al., 2016; D'Orazio et al., 2013)
- Sunscreen formulations contain active chemicals that reflect or absorb UV rays
- SPF value represents how long it takes for UVB radiation to cause skin redness in comparison to when no protection is applied

### Why Yeast?

- *S. Cerevisiae* as a model organism because it has similar DNA and reproduction methods to higher eukaryotes
- Allows us to generalize the results of the experiment to a certain extent (Mohammadi et al., 2015).
- Has fast reproduction rates which allow us to quickly see the effects of the SPF and UV radiation

### Hypothesis

A higher SPF level protects yeast cells more thoroughly from UV radiation allowing them to reproduce.



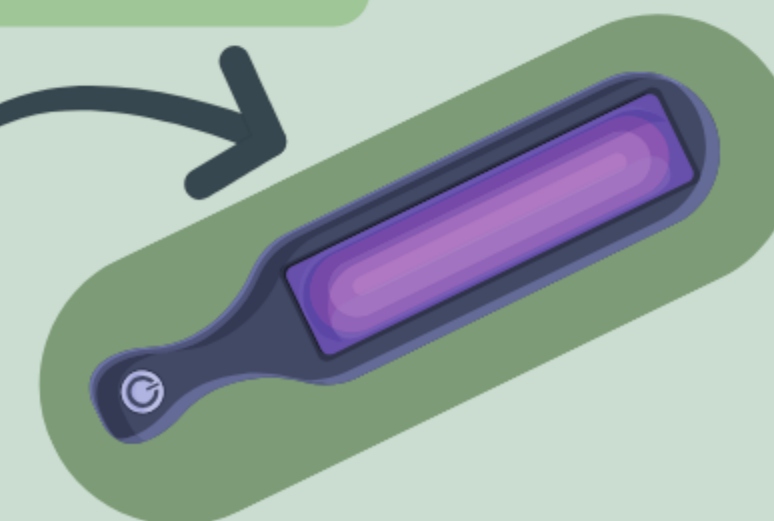
## PROCEDURE

1. 13 test tubes with YEPD are inoculated aseptically with yeast strain HBO
2. The tubes are incubated in a shaking incubator at 30° overnight
3. Each of the 13 tubes containing 15mL of YEPD are labelled (Blank, C, UVC [UV control], 15, 50) and inoculated with 300 µL of cells from the overnight culture
4. 0.5g of the corresponding SPF is rubbed on the outside of each tube
5. 13 cuvettes are labelled and filled (1 mL) corresponding to the tubes
6. Blank with B cuvette and check absorbance of each cuvette on the spectrophotometer
7. Add a small drop of methylene blue to a microscope slide and add 10 µL of each sample to count the dead vs. alive cells out of 100
8. Place all tubes except control on a rack and expose to UV light via UV wand
9. Repeat steps 7-10 in 60-minute intervals for the next 6 hours



spectrophotometer

UV wand



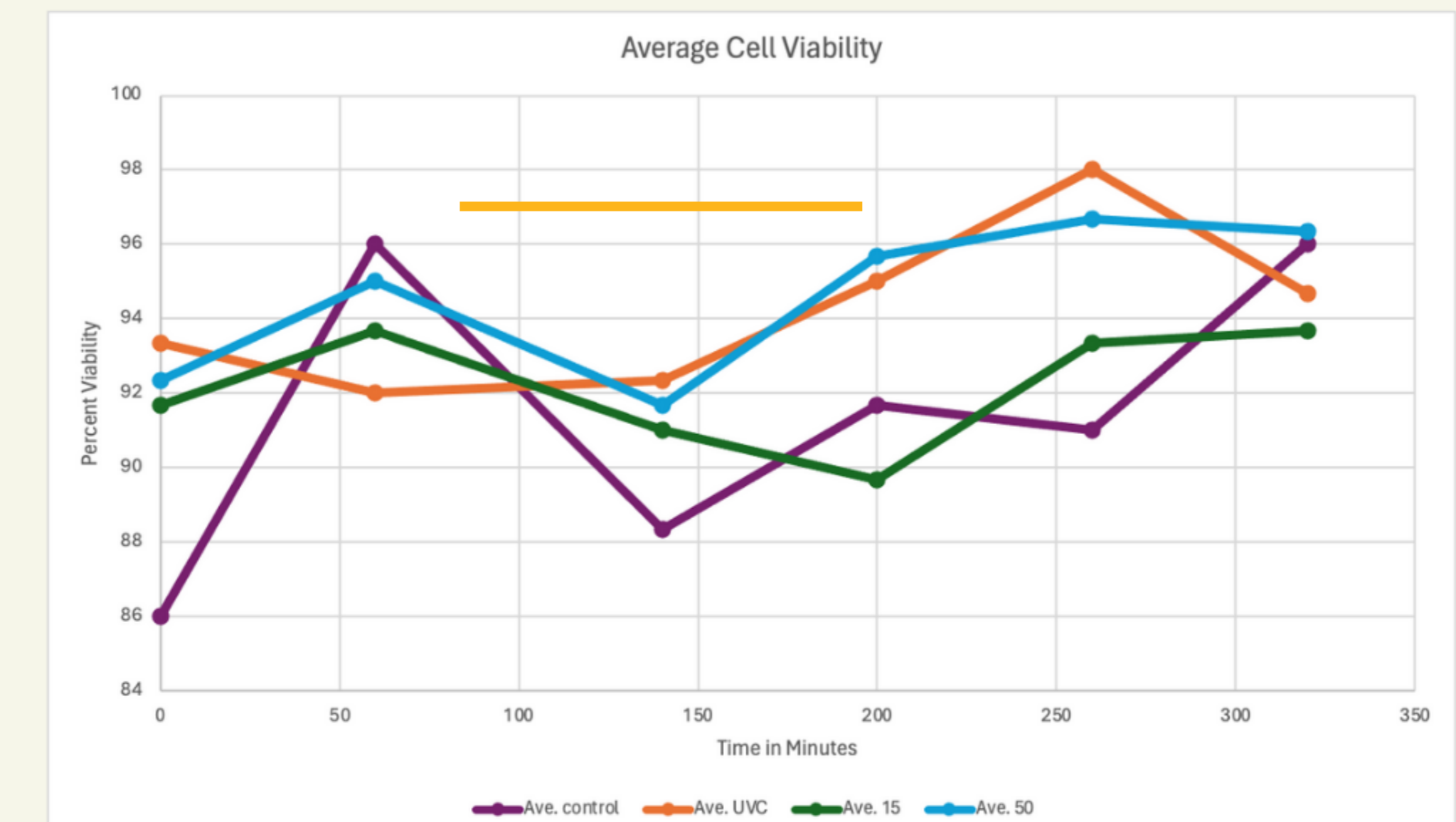
## REFERENCES

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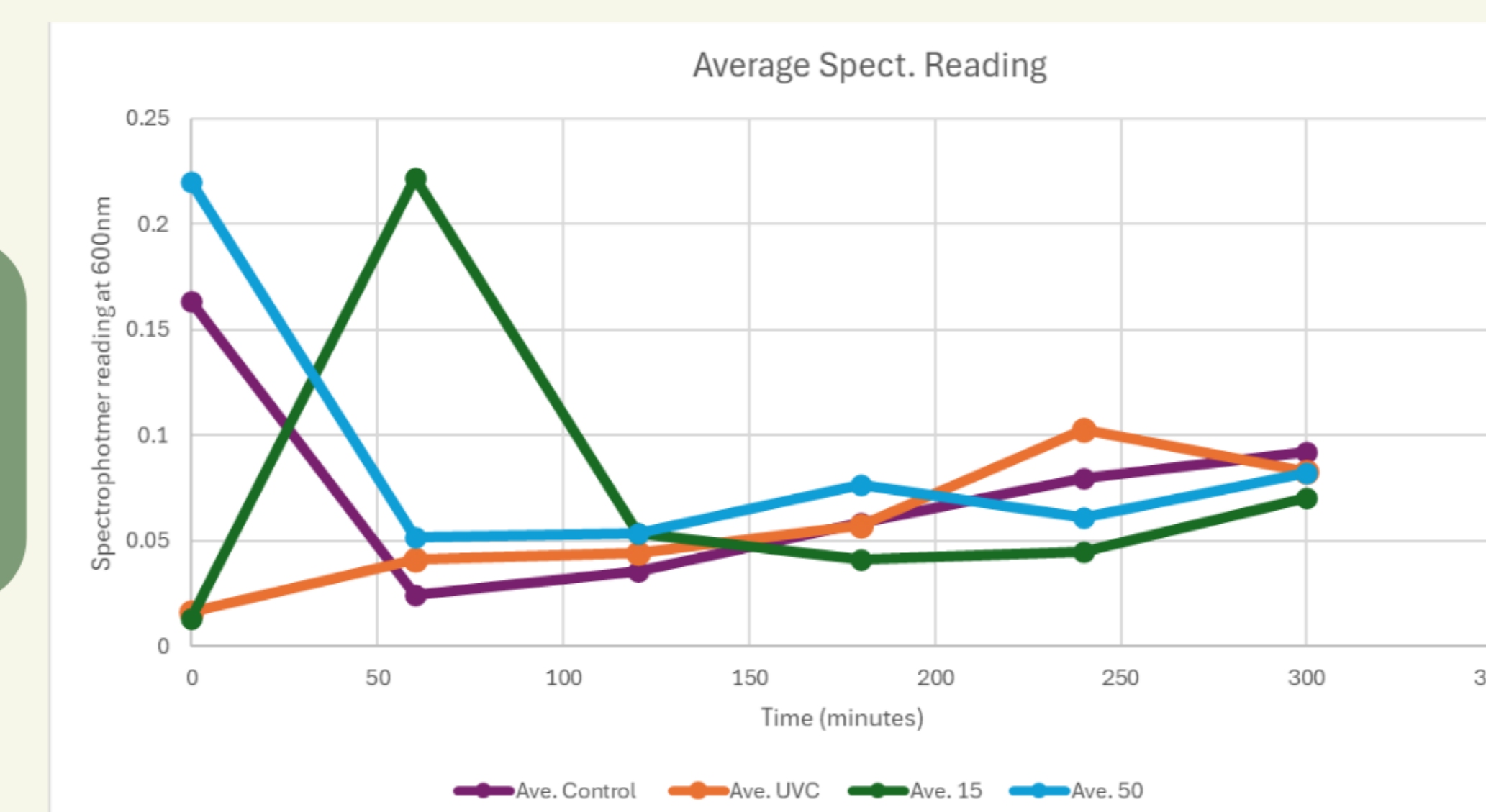
## RESULTS



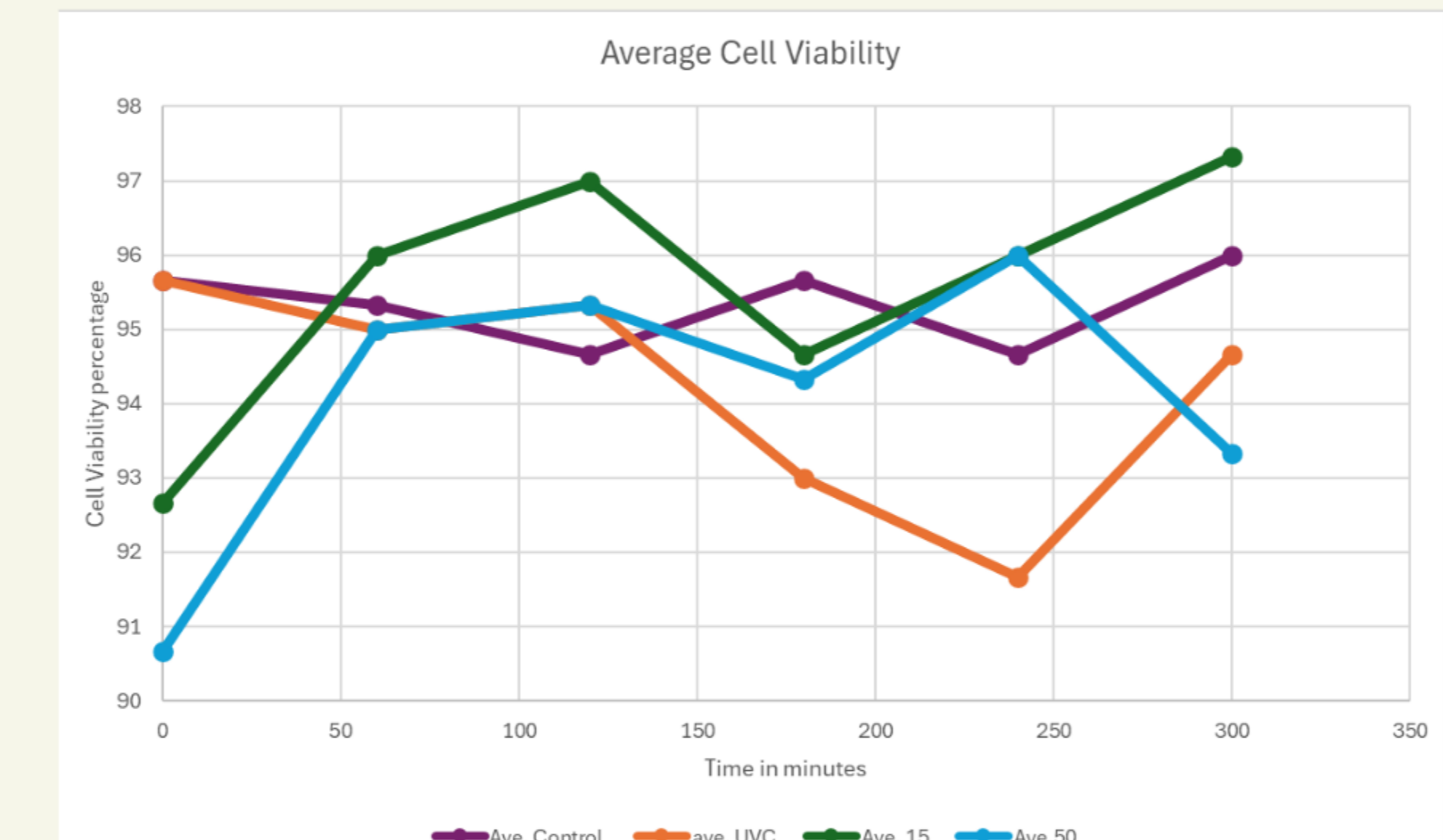
The graph above shows that UV exposure with the variable SPF protection (none, SPF 15, SPF 50) does not significantly alter yeast growth. All of the test samples decreased over time until the last reading. It seems that SPF 50 had the highest readings while UVC and SPF 15 had very similar slightly lower readings.



The graph above shows that yeast cell viability remains mostly unchanged upon UV exposure with the variable SPF protection. Cell viability percentage for all test groups remained in the upper 80s and 90s. It seems that the control group mostly had the lowest viability.



The graph above shows that UV exposure with variable SPF protection (none, SPF 15, SPF 50) doesn't significantly alter yeast growth as can be seen with the high readings of UVC. All of the samples except for SPF 15 went significantly down after the second reading and slowly rose from there.



The graph above shows that overall yeast cell viability remains unchanged upon UV exposure with the variable SPF protection. Cell viability percentage for all test groups remained in the 90s throughout the experiment. Viability was assessed using methylene blue assays.

## CONCLUSIONS

### Trial 1 Analysis

- Our variable SPF did not significantly alter yeast cell growth or cell viability
- Test tubes exposed to UV radiation without SPF had similar readings and viability to those that did have SPF
- Throughout the experiment there was an overall decrease in cell growth

### What we Changed

- Mixing test tubes properly to get an accurate reading of cells
- Move the UV wand further away to allow for more cell growth in our second trial
- Wrap tubes in saran wrap to keep the sunscreen on it

### Trial 2 Analysis

- After initial drop in readings, cell growth slowly increased each reading
- Still no significant effect of UV and SPF on yeast growth and cell viability
- Our hypothesis is incorrect as SPF did not seem to have an effect on cell growth and viability exposed to UV radiation
- Next time, we would do more than a 6 hour growth curve and find a way to incubate the cells during UV exposure