

# Does Water Quality Differ Across CSU's Campus?

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## INTRODUCTION

Many people find themselves constantly filling up their water bottles using filtered fountains, but is there really a difference between that and any other water source on campus? In this experiment, different water sources around Cleveland State University's campus were tested to see if there was a difference between the water consumed in these commonly used areas. Various components were tested including the alkalinity, pH, hardness, iron, copper, lead, nitrate, nitrite, and chlorine. Only 3 categories with substantial data were studied in depth: alkalinity, pH, and hardness

- Alkalinity is the ability of a solution to neutralize an acid. Ideal values between 150 & 200 mg/L<sup>2</sup>
- Hardness is a measure of the amount of impure mineral ions dissolved in a solution. Calcium & magnesium are the most common sources of hard water. Values below 60 mg/L considered soft water<sup>2</sup>
- Water pH is a measure of free hydronium & hydroxyl ions in a solution. Neutral, pure water has a pH of exactly 7 while acidic samples are less than 7 and basic samples are more than 7<sup>2</sup>

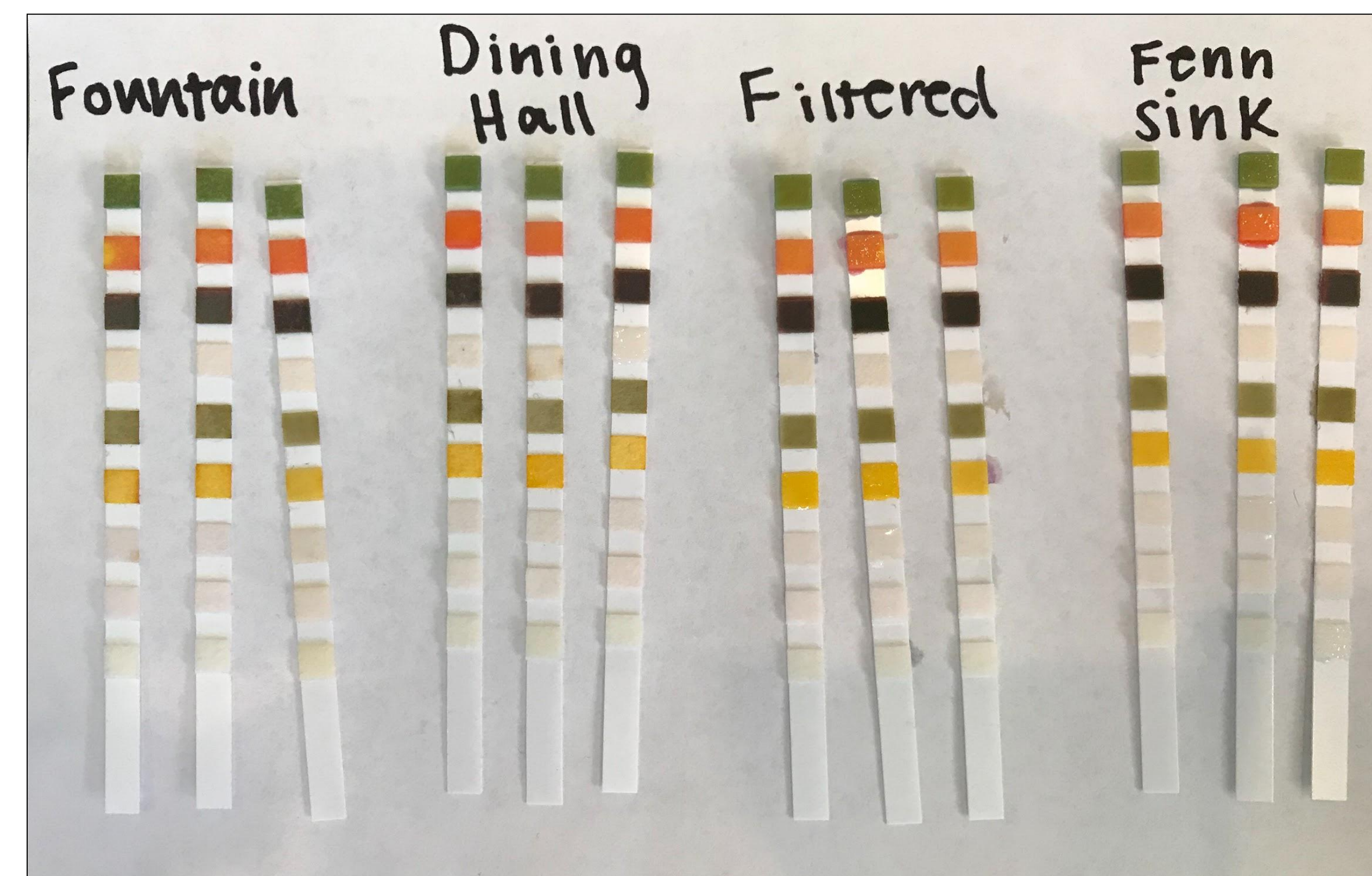


Figure 1. Comparison of Testing Strips

## RESULTS

alkalinity	Sink	Dining Hall	Water Fountain	Fountain Filter
Day to day	X	X	<b>SIGNIFICANT</b> T-Value: -4.43; P-Value: 0.0474	X
Fountain Filter	<b>SIGNIFICANT</b> T-Value: 4.50; P-Value: 0.0020	X	X	
Water Fountain	X	X		
Dining Hall	X			

pH	sink	Dining hall	Water fountain	Fountain filter
Day to day	<b>SIGNIFICANT</b> T-Value: 4.00; P-Value: 0.0280	<b>SIGNIFICANT</b> T-Value: 10.39; P-Value: 0.0091	X	X
Fountain filter	X	X	X	
Water fountain	X	X		
Dining hall	X			

HARDNESS	sink	Dining hall	Water fountain	Fountain filter
Day to day	<b>SIGNIFICANT</b> T-Value: -3.20; P-Value: 0.0493	X	<b>SIGNIFICANT</b> T-Value: 4.59; P-Value: 0.0444	X
Fountain filter	X	X	X	
Water fountain	X	X		
Dining hall	X			

## CONCLUSIONS

- Variation was found in 1 source to source comparison with regards to alkalinity-- Fenn Tower Sink was significantly more alkaline than the Water Fountain Filter
- The remaining source to source comparisons showed no significance in the variables measured
- 5 significant results were observed when tested at various times of day: Fenn Tower Sink-- pH and hardness, Dining Hall pH, and Water Fountain-- alkalinity and hardness
- No water source was more beneficial for one's health than another because levels were all within government regulated standards



Figure 2. Baldwin Meadows Water Testing Kit

## FUTURE WORK

- Expository research to compare water qualities on different campuses across the country
- Expository research to compare different water qualities around the world and analyze why these differences are present
- Research negative effects of drinking water not within government regulated standards

## References

<sup>1</sup> "9-In-1 Drinking Water Test Kit." *Welcome to Baldwin Meadows*, 27 Mar. 2018, baldwin-meadows.com/product/9-in-1-drinking-water-test-kit/.

<sup>2</sup> Mechenich, C., & Andrews, E. (2004). *Home Water Safety: Interpreting Drinking Water Test Results. Board of Regents of the University of Wisconsin System.*

## OBJECTIVES

Determine if water across Cleveland State University's campus differs from source to source to an extent that is unsafe for student and faculty consumption, and evaluate fluctuations in water quality from individual sources on different days and times of the day.

## METHODS

- Collect water from sources in clean containers
- Use the Baldwin Meadows Water Testing Kit<sup>1</sup> to measure alkalinity, pH, and total hardness. 2 to 3 researchers came to a consensus on each data point.
- Compare values from different trails and times in a series of 30, two-sample t-distribution tests at a  $\alpha=0.05$  significance level
- Determine a confidence interval and hypothesis test for each, assuming normal distribution, which is listed under "Results"