

Health and safety of disposable chopsticks | experiment



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Abstract

I heard some stories about disposable chopsticks being dangerous and poisonous. And I wanted to find out myself whether it was true or not. I found out that certain types of disposable chopsticks have greater risks to be acidic and non-disposable chopsticks are much safer. My results were important because I could help raise the awareness of the risk of using disposable chopsticks. This awareness not only saves us from cancer or damage to body, but also helps make the world a greener place to live.

Background Research

This experiment is about “ Are disposable chopsticks safe to use?” My hypothesis is that some disposable chopsticks may not be processed appropriately to be safe to use. I choose this project because many restaurants use disposable chopsticks and to test whether disposable chopsticks are safe or non-disposable chopsticks are safe. I really want to prove if my hypothesis is correct about various of chopsticks. For the safety of many people in the world who use disposable chopsticks, it might be better to use non-disposable chopsticks or the other way around depending on the results.

The normal pH level water is 6.5 to 8.5 and below 6.5 the water is acidic, soft, and corrosive. The pH water level 8.5 and above is hard, but it can cause aesthetic problems. Chopsticks can be made of bamboo, wood, plastic, and stainless steel. Sulfur dioxide and hydrogen peroxide are used to bleach the wooden disposable chopsticks.

Many people use disposable chopsticks all over the world for lunch, dinner, and sometimes breakfast. I hope my experiment will help raise the awareness of using the right kind of the chopsticks and improve the safety for many. Non-disposable chopsticks may be safer than disposable chopsticks, but it will depend on research and test data to prove. I don't want to get sick or get illness by using disposable chopsticks. So there is an importance of this experiment.

Experiment Details

Experiment Question

- What is the effect of production processes on disposable chopsticks?
- How does the improperly processed chopsticks affect our safety?
- What types of chopsticks are better to use?

Experiment Hypothesis

- Are disposable chopsticks safe to use?

My hypothesis is that some disposable chopsticks may not be processed appropriately to be safe to use. I've heard that disposable chopsticks are put into bleach and this was brought to my concern.

Experiment Variables

Independent Variable

The different types of chopsticks, different temperatures of water (hot and cold) and different soaking durations will be changing.

Dependent Variable

I am measuring the pH level of the water after soaking the chopsticks for certain duration for time.

Controlled Variables

The chopsticks will stay in the same glasses and the amount of water will stay the same as well.

Materials and Procedures

Materials Used

- pH Meter
- Disposable chopsticks- 4 kinds
- Stainless steel chopsticks
- Plastic chopsticks
- Hot water boiler
- Tap water
- Bottle drinking water
- Glasses
- Timer
- Computer
- Camera
- Scotch tape

Procedures

STEP 1: First, characterize the pH level of the tap water and bottle drinking water. Record the readings on paper.

STEP2: Next, put hot water into glasses. Then soak four kinds of disposable chopsticks and two kinds of non-disposable chopsticks (stainless steel and plastic) into each designated cups for 30 minutes.

STEP 3: Use the pH meter to measure the pH level of each designated water in the glasses. If below pH6. 5, it could be acidic, soft and corrosive.

STEP 4: Then repeat the above steps with additional designated period of times.

STEP 5: Repeat the same procedures by using cold water in the glasses and record the results.

STEP 6: In the end, we will compare the results of each design of experiments to find out whether the pH level for disposable chopsticks are different from the non-disposable chopsticks with various soaking times and water temperature. We can then conclude if it is safe to use disposable chopsticks or not. Also this will confirm if my hypothesis was correct.

Challenges and Technical Issues

The challenges I had during my experiment are as follows.

1. The electrode tip of the pH meter need to be in the water about 3 cm deep. Dipping too deep or too shallow will affect the readings somewhat. However, with some practices and getting familiar with the depth of the tip, it is not difficult to adjust.

2. The pH meter will take some time to stabilize the reading. Need to make sure the reading does not fluctuate for a few seconds. Then take the reading. The tip is to practice several measurements and take readings patiently.

Experiment Results

A. Baseline Comparison of Different Waters:

1. House tap water is on the hard side, pH level 8.30.
2. The difference of pH level between home tap water and drinking water is 1.21.
3. My experiment is using home tap water. So if using nominal pH level water or lower pH level water, the resulted pH levels would be proportionally lower.

Water Type

(pH)

Home Tap Water

8.30

Bottled Drinking Water

7.09

Difference

-1.21

B. Tested with Hot Water:

<https://assignbuster.com/health-and-safety-of-disposable-chopsticks-experiment/>

1. This experiment is more closely simulating the actual usage of the chopsticks (hot meals & hot soup).
2. Both stainless steel and plastic chopsticks are very stable when soaked in hot water for an hour. So they are safe to use.
3. Plastic chopsticks are performing the best, with least changes in pH level.
4. All four kinds of the disposable chopsticks had pH levels lower by 1. 53 to 2. 15. Bamboo type 3 (PB)) of the chopsticks is the worst, pH level lower by 2. 15. So these chopsticks could pose safety risks by using them with hot meals/ soup.
5. If the baseline water were not pH 8. 30, instead of pH 7. 09, then the pH levels of all four kinds of the chopsticks would be lowered to the even more dangerous acidic levels. So disposable chopsticks are relatively unsafe to use.
6. Bamboo 3 (PB) had the worst yellowish discoloration of water. Bamboo 1 (FL) and Bamoo 2 (GL) also had some yellowish discoloration.

MATERIAL TYPE

BASELINE

30 Min.

Changes from

1 Hour

Changes from

(pH)

(pH)

Baseline (pH)

(pH)

Baseline (pH)

Stainless Steel

8.30

8.95

0.65

8.89

0.59

Plastic

8.30

8.92

0.62

8.64

0. 34

Bamboo 1 (FL)

8. 30

6. 45

-1. 85

6. 77

-1. 53

Bamboo 2 (GL)

8. 30

6. 78

-1. 52

6. 47

-1. 83

Wood

8. 30

7. 35

-0. 95

6. 77

-1. 53

Bamboo 3 (PB)

8. 30

6. 09

-2. 21

6. 15

-2. 15

C. Tested with Cold Water:

1. Both plastic and stainless steel chopsticks were very stable within one hour, while all other 4 kinds of disposable chopsticks were starting to turn acidic in an hour.
2. When chopsticks were soaked in water longer than 1 hr, they all turned more acidic, with disposable chopsticks worse.
3. Soaking in water longer than 1 day, both 2 days and 4 days, the pH levels for most of the chopsticks were stabilized. Most of the changes happened within the first day.
4. Bamboo 3 (PB) had the worst yellowish discoloration of water. Bamboo 1 (FL) and Bamboo 2 (GL) also had some yellowish discoloration.

Data Analysis and Discussion

It was predicted and confirmed that the disposable chopsticks would have lower pH levels, which could be acidic, than the plastic and stainless steel chopsticks after soaking in both hot and tap waters. One possible explanation for low pH readings is that some disposable chopsticks used sulfur dioxide and hydro-peroxide to bleach the chopsticks without appropriate cleaning during the production processes.

In the hot water experiment, the results were more prominent, after 30 minutes to an hour we saw dramatic pH level changes on the disposable chopsticks. At the same time, both plastic and stainless steel chopsticks, the pH levels were very stable after one hour. The two worst Ph level changes were the third bamboo disposable chopsticks (-2. 21 pH level, with the plastic bag wrapping) and the first bamboo disposable chopsticks (-1. 85 pH level, with the Fu-Lu characters). The worst pH level reduction occurred at 30 minutes in hot water, not 1 hour.

For cold water experiment, the pH level changes were at a slower rate than the hot water experiment as expected. Still the worst pH level changes with cold water are still the third bamboo chopsticks (-0. 84 pH at 30 minutes & - 2. 17 pH at 1 day) and the first bamboo disposable chopsticks (-0. 71 pH & - 2. 25 pH at 1 day). The pH level changes were stabilized after 1 day. Plastic and stainless steel chopsticks were also more stable on pH readings.

The worst kind of the disposable bamboo chopsticks- type 3 (PB) also showed the worst kind of discoloration (yellowish) in both hot and cold water experiment. I further noticed both bamboo type 3 (PB) and bamboo type 1

(FL), the worst two disposable chopsticks have less density in the structure. This could confirm that if they are not cleaned well in the production processes, they could contain most unwanted chemicals (bad stuff) and easier to dissolved into hot (especially) and cold waters.

My original question was that “ Are disposable chopsticks safe to use?” My hypothesis was taken in the right direction because after figuring out both the observations of the hot and cold water experiments everything started to fit quite well. This is supporting my hypothesis that disposable chopsticks are not as safe. Moreover, if the baseline water were not pH 8. 30 (tap water), instead of pH 7. 09 (drinking water, difference of Ph1. 21), then the pH levels of all four kinds of the disposable chopsticks after soaking in hot water would be even lower and in the more dangerous acidic levels. I will certainly recommend using either the plastic chopsticks or stainless steel chopsticks for hot meals and hot soups and avoiding using disposable chopsticks.

Conclusion

From my hot and cold waters experiment with both reusable and disposable chopsticks, I can conclude that it's better to use the plastic or stainless steel chopsticks (reusable). The disposable chopsticks are relatively unsafe to use. We should avoid using both Type 3 (PB) and Type 1 (FL) bamboo chopsticks. Also refraining from using the disposable chopsticks will also save the bamboos, trees, forest and earth. It's not only healthy, but also environmental friendly.

Recommendations

This project was done with limited time and resources. The sample size of chopsticks and time interval may not be big enough, the calibration of the pH meter was not done with the sample of pH 7. 01 buffer (lack of test sample sheet) and use home tap water (pH 8. 30). I will recommend to future project leader to use bigger samples size of chopsticks, take more readings in shorter time interval, calibrate the pH meter with the right sample buffer and use bottle drinking water (pH 7. 09, in the middle of the safe drinking water pH range) to perform the experiment.

Work Cited

“ PH Levels.” Freedrinkingwater. com. 29 Sept. 2010 .

“ Scary Disposable chopsticks.” eats-time. blogspot. com. 29 Sept. 2010 .

Experiment Notes:

In a packet.