

Logbook

Title:

- When In Doubt, Brush It Out

Statement of the Problem:

- There are many different types of toothpastes in the market that you can buy at a variety of prices. I wanted to do this experiment because I've been to many dentists and they all recommend different toothpaste and I want to see which toothpaste really helps clean your teeth the best. Or are they all the same. I think people will gain information like which toothpaste can whiten your teeth the best so they know what to buy and so they won't be given false information.

Objective:

- In this experiment we will be determining which toothpaste works best for cleaning and removing stains from teeth.

Hypothesis:

- Which toothpaste works the best for cleaning your teeth ?
 - I hypothesize that the Colgate Optic White Stain Fighter will work the best because in similar research Colgate was the leading toothpaste brand. In addition, Colgate Optic White says that it removes "6x more surface stains". The other brands being tested state they are good for healthy gums, cavity protection, sugar acid protection, sensitive teeth, and that they clean and whiten. However the other brands do not specifically state how much stain removing power they have like the Colgate Optic White Stain Fighter does.

- <https://www.businessinsider.com/best-whitening-toothpaste#how-i-tested-1>

- <https://www.education.com/science-fair/article/smile/>
- <https://ericssondental.com/top-toothpastes-dentists-recommend/>

Materials:

- Science Fair Logbook
- Teeth Whitening Shade Guide
- Computer
- 35 uncooked eggs
- Five identical toothbrushes
- 1 “ 13 x 9 “ glass dish
- Eight tablespoons of coffee
- Twelve cups of bottled water
- Five different toothpastes:
 - 1.Colgate Baking Soda and Peroxide Whitening
 - 2.Colgate Optic White Stain Fighter
 3. Sensodyne Extra Whitening
 4. Crest 3D White Stain Eraser
 5. Aquafresh Cavity Protection
- Teeth Whitening Shade Guide
- 7 sets of plastic gloves
- One roll of paper towels
- Clorox wipes for cleaning test area
- One coffee maker
- Camera for photos
- Paper Plates
- One Black Sharpie Marker
- One coffee bean grinder
- Glass bowl for wetting down toothbrush

Dependent and Independent Variable:

- Independent-My independent variable is toothpaste.
- Dependent-I will be measuring the whiteness of the egg on a tooth whitening scale.
- Constant-My constants will be the toothbrush, egg, pressure, time, and brushing techniques.

Procedure:

1. Sanitize your work area to make sure there are no contaminants that can affect the color of the egg.
2. Brew 12 cups of bottled water and 8 tablespoons of coffee in a thoroughly cleaned coffee maker.
3. Take 5 white eggs and check them for stains, cracks, or any damage.
4. Place a 13 x 9 glass dish on the work area and place the five eggs inside .
5. Once the coffee is finished brewing, let the coffee rest for 15 minutes to cool to room temperature.
6. Pour coffee over the eggs carefully so you do not break the eggs.
7. Let eggs soak for 30 minutes
8. Put on one pair of plastic gloves
9. Carefully remove one egg from the glass dish.
10. Place the egg on a clean and dry paper towel to dry for 5 minutes
11. Repeat steps 8 and 9 with the additional four eggs(use a different pair of gloves for each egg so there is no cross contamination.
12. Prepare one clean paper plate with one clean paper towel per egg
13. Using the sharpie marker, write the name of each toothpaste brand on each plate. There should be one plate for each egg.
14. After the eggs have dried, take 1 clean and unused toothbrush and 1 tube of toothpaste.
15. Dampen 1 clean toothbrush in a bowl of water and add one drop of toothpaste on the toothbrush .
16. Brush the first egg for 2 minutes and 30 seconds with toothpaste indicated on the plate.
17. Brush 8 times clockwise, 8 times counter-clockwise, and 8 times up and down. Repeat these brush combinations until time is complete.
18. Once you are finished brushing the egg, place the egg on the clean paper towel that is on the paper plate with the name of the toothpaste used.
19. Using the tooth whitening scale determine which toothpaste performed the best at removing the stains from the eggs.
20. Repeat steps 14-18 with each of the remaining 4 eggs and their individual toothpastes indicated on the plates.
21. Repeat the tests 7 separate times, with a sum total of 35 eggs, and determine the average best performing toothpaste.

Results:

- The results for this experiment showed a clear leader. After performing 7 trials the results were visibly evident. Sensodyne Extra Whitening toothpaste had the best stain removing and cleansing results. There are many interesting takeaways that were learned from this experiment. For example, many of the more popular drugstore brands advertise their wide array of cleaning and stain fighting benefits. It was unmistakable from as early as trial 4 that Sensodyne was out performing the other brands . Many toothpastes have fancy wording that states that they may be the best. In reality they don't do what is advertised, they have colors that leave tints on your teeth and you can be paying so much for something that could be doing so little. 4 out of the 5 toothpaste had the same active ingredient. Including the highest performing toothpaste and the worst performing toothpaste. So it must be the inactive ingredients that make them perform differently. Just on the first trial, the Sensodyne Extra Whitening toothpaste was already doing the best out of all of the other brands. Sensodynes numbers had already exceeded my expectations as early as trial 3. In the end, the averages for the toothpastes were 5.285 for Colgate Baking Soda & Peroxide Whitening, 4.285 for the Colgate Optic White Stain Fighter, 2.714 for Sensodyne Extra Whitening, 5 for Crest 3D White Stain Eraser, and 6.714 for Aquafresh Cavity Protection.

Toothpaste	T1	T2	T3	T4	T5	T6	T7	AVG
Colgate Baking Soda & Peroxide Whitening	6	9	4	4	4	5	5	5.285
Colgate Optic White Stain Fighter	4	3	5	6	3	5	4	4.285
Sensodyne Extra Whitening	3	2	3	3	3	3	2	2.714
Crest 3D White Stain Eraser	7	5	5	4	4	5	5	5
Aquafresh Cavity Protection	8	7	4	8	6	7	7	6.714



Conclusion:

1. In this experiment my objective was to determine whether or not the Colgate Optic White Stain Fighter will work the best because in similar research Colgate was the leading toothpaste brand. In addition, Colgate Optic White says that it removes “6x more surface stains”. The other brands being tested state they are good for healthy gums, cavity protection, sugar acid protection, sensitive teeth, and that they clean and whiten. However the other brands do not specifically state how much stain removing power they have like the Colgate Optic White Stain Fighter does. In conclusion, my hypothesis was wrong. It is clear that the Sensodyne Extra Whitening toothpaste performed the best.

2. In this experiment I hypothesized that the Colgate Optic White Stain Fighter will work the best because in similar research Colgate was the leading toothpaste brand. In addition, Colgate Optic White says that it removes “ 6x more surface stains”. The other brands being tested state they are good for healthy gums, cavity protection, sugar acid protection, sensitive teeth, and that they clean and whiten. However the other brands do not specifically state how much stain removing power they have like the Colgate Optic White Stain Fighter does. My hypothesis was wrong because the Sensodyne Extra Whitening came out whiter than the Colgate Optic White Stain Fighter.

3. The results for this experiment showed a clear leader. After performing 7 trials the results were visibly evident. Sensodyne Extra Whitening toothpaste had the best stain removing and cleansing results. There are many interesting takeaways that

were learned from this experiment. For example, many of the more popular drugstore brands advertise their wide array of cleaning and stain fighting benefits. It was unmistakable from as early as trial 4 that Sensodyne was out performing the other brands . Many toothpastes have fancy wording that states that they may be the best. In reality they don't do what is advertised, they have colors that leave tints on your teeth and you can be paying so much for something that could be doing so little. 4 out of the 5 toothpaste had the same active ingredient. Including the highest performing toothpaste and the worst performing toothpaste. So it must be the inactive ingredients that make them perform differently.

4. As a person who wanted the best toothpaste for their teeth, I want my teeth to be the whitest they can be, which this experiment showed me. I wanted a toothpaste that I can confidently say that it is one of the best toothpaste for teeth.

5. Something I would change in this experiment is the sample size. The reason I would change the sample size is because if I made the sample size larger, I could execute more toothpastes to get a more precise answer.

Pictures: Additional photographs or drawings



Figure 1: These are the Toothbrushes that were used for this experiment.



Figure 2: These are the toothpastes that were used for this experiment.



Figure 3 : The coffee, Veranda Blonde Roast, was the coffee I used to dye the eggs.



Figure 4: These plates are labeled for individual brushing with each toothpaste and its own egg.



Figure 5: This is a coffee bath that is used to dye the eggs.



Figure 6: Here, I carefully placed the egg on its designated plate along with the other eggs as well on a separate plate .



Figure 7: I am carefully brushing the eggs in an up and down motion making sure not to over brush the egg .



Figure 8: I brushed each egg also with a circular motion 8 times.

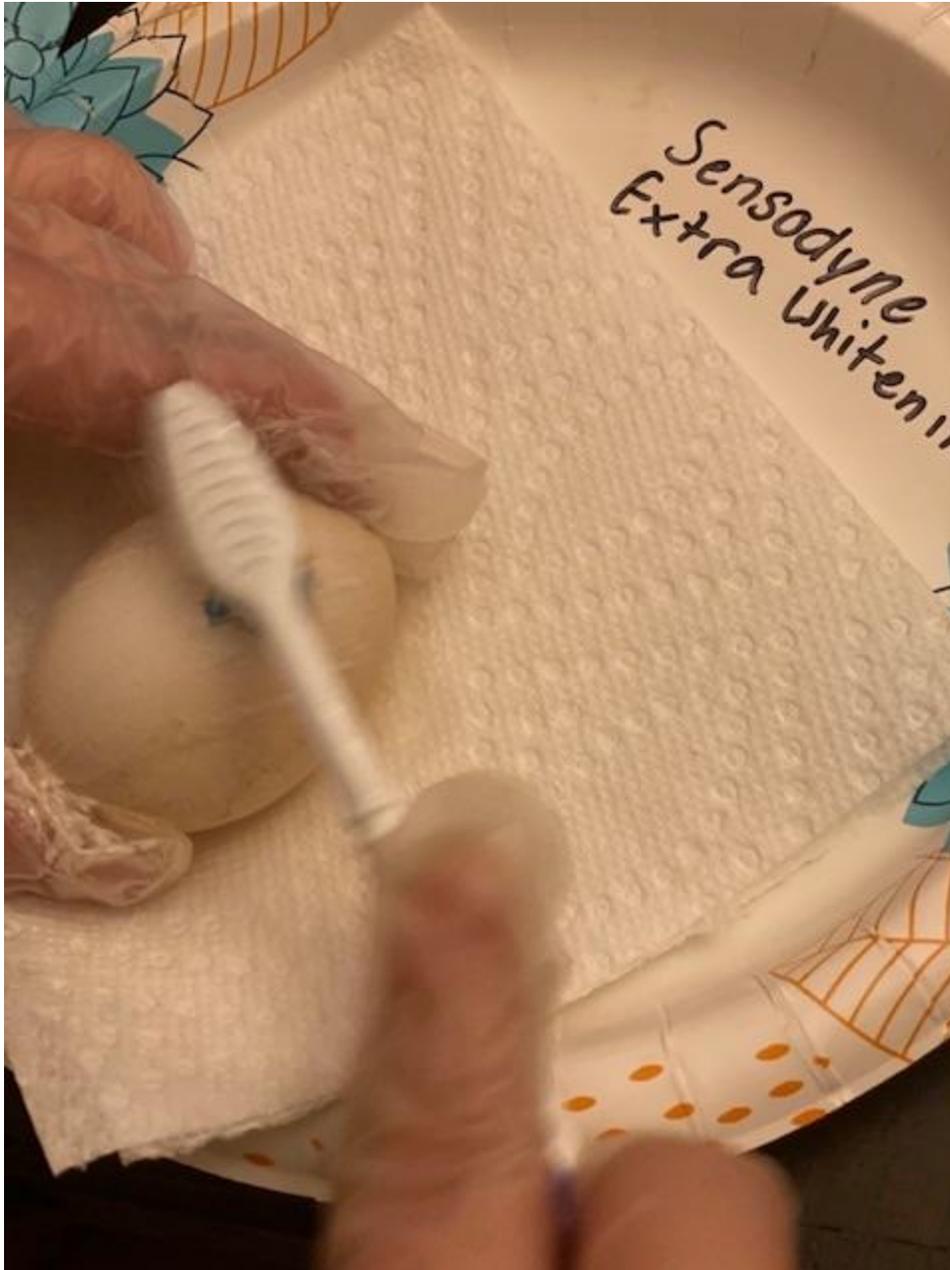


Figure 9: I repeated my brushing techniques for 2 minutes on every single egg.

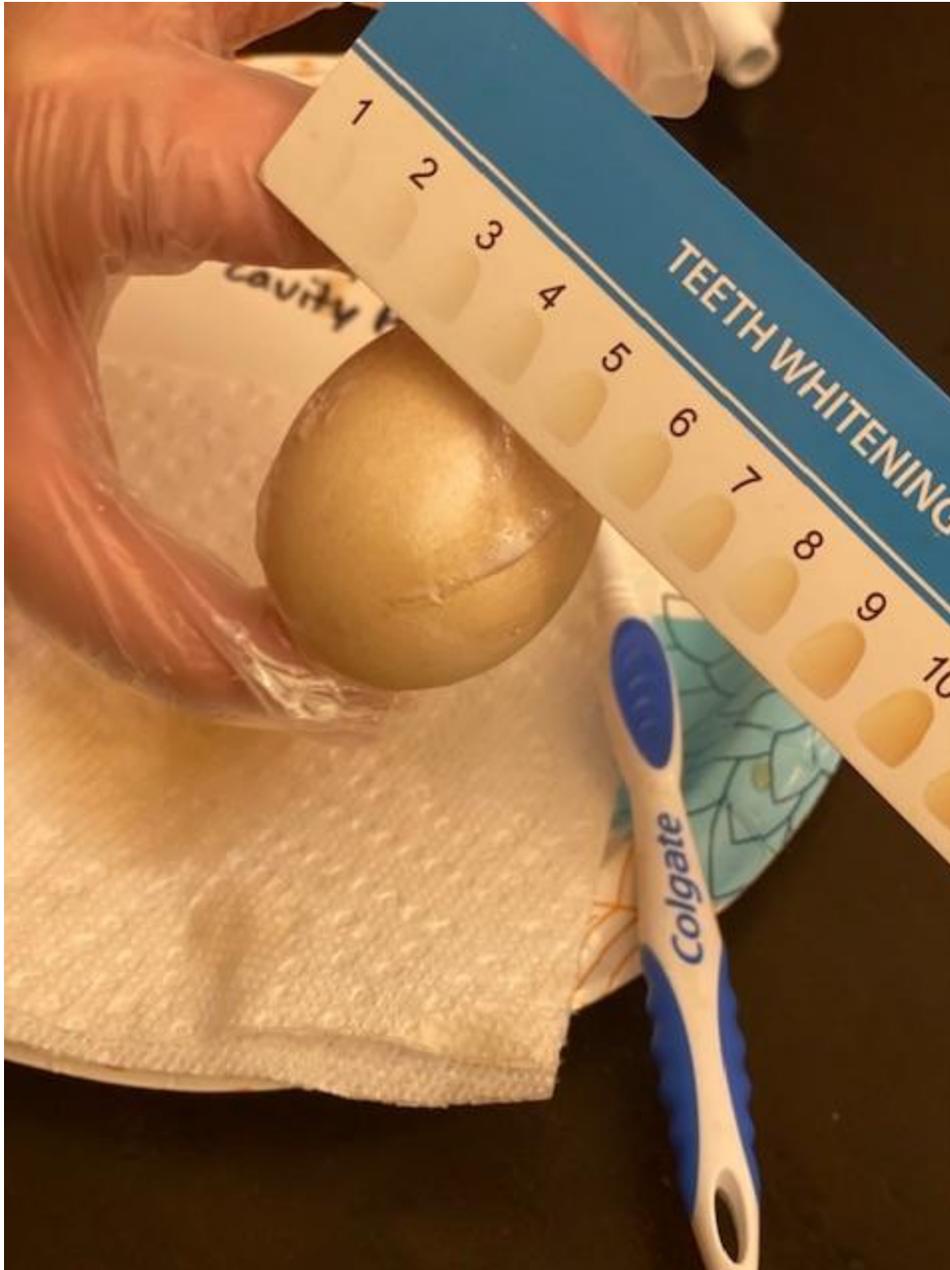


Figure 10: I measured each egg on a tooth whitening scale to determine how white the egg would be.

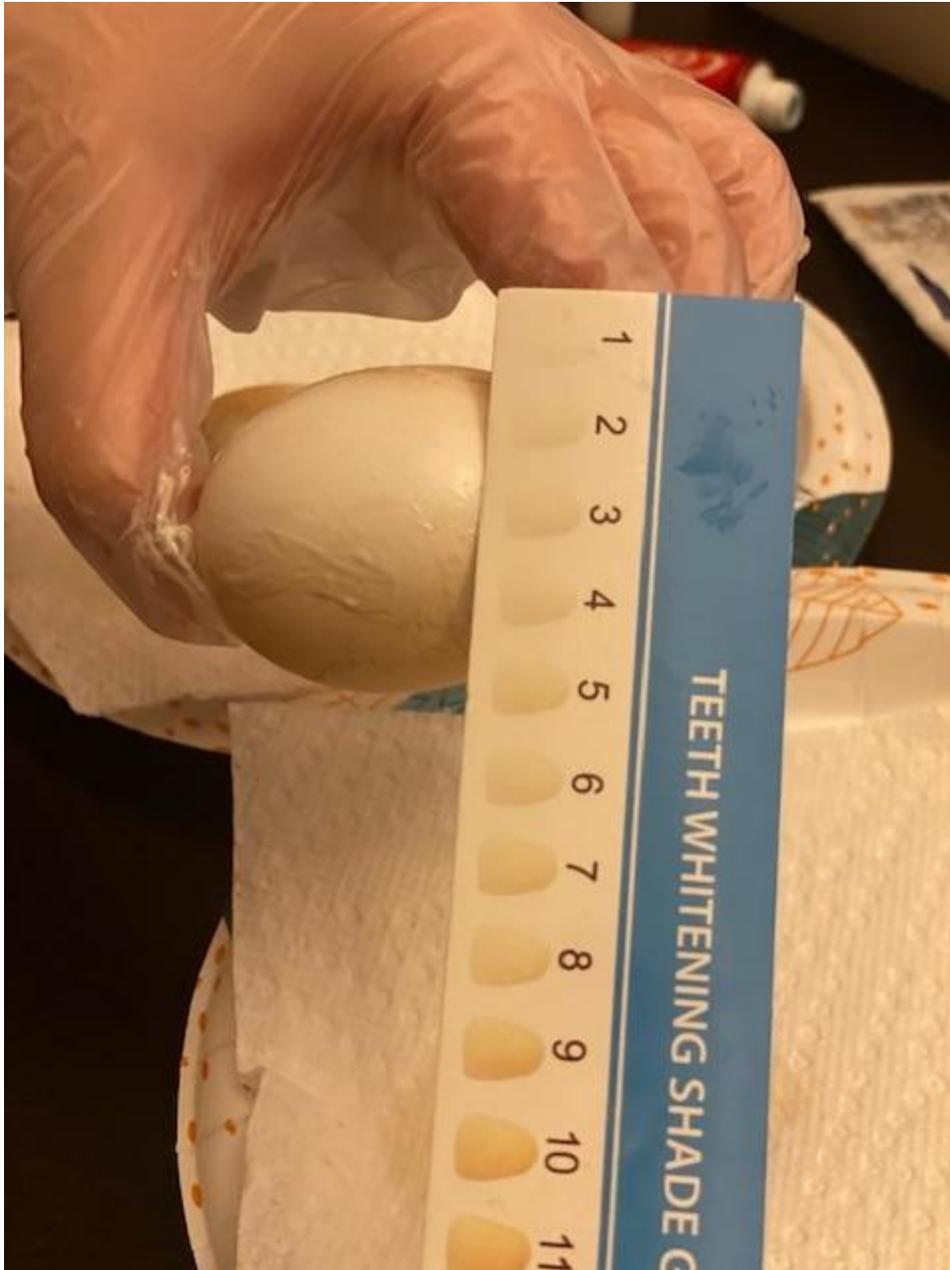


Figure 11: I repeated this step with all of my other eggs to see their whiteness.



Figure 12: I put 1 dollop of toothpaste on each clean brush making sure not to overuse the toothpaste.



Figure 13: I repeated this step with all remaining eggs making sure to be as precise as possible.

Which toothpaste works the best at whitening your teeth?

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When In Doubt, Brush It Out

The focus of this experiment is on toothpaste. The problem that was investigated was: what is the best toothpaste for helping to whiten your teeth. For this project, I hypothesized that the Colgate Optic White Stain Fighter will work the best because in similar research Colgate was the leading toothpaste brand. In addition, Colgate Optic White says that it removes “ 6x more surface stains”. The other brands being tested state they are good for healthy gums, cavity protection, sugar acid protection, sensitive teeth, and that they clean and whiten. However the other brands do not specifically state how much stain removing power they have like the Colgate Optic White Stain Fighter does. This topic is important because many toothpastes work efficiently but not many people know which one is the best. People need to know this because we want to be brushing our teeth with the best possible toothpaste so we can have good breath, nice and clean teeth, and so we don't have bad and deteriorating teeth. Toothpaste is very important because without it, we would have plaque, tartar, and stains along with many cavities. This minty goo that we put in our mouths twice a day can help fight off things like cavities and can help our teeth so we don't get dentures at a young age. I believe that toothpaste is one of the most important things in basic human hygiene.

Method

The scientific method was used to conduct this experiment. The question that was asked for this science project was: Which toothpaste works the best for whitening your teeth. I hypothesized that the Colgate Optic White Stain Fighter will work the best because in similar research Colgate was the leading toothpaste brand. In addition, Colgate Optic White says that it removes “ 6x more surface stains”. The other brands being tested state they are good for healthy gums, cavity protection, sugar acid protection, sensitive teeth, and that they clean and whiten.

However the other brands do not specifically state how much stain removing power they have like the Colgate Optic White Stain Fighter does.

Materials

There were few materials used to conduct this experiment Science Fair Logbook, computer, 35 uncooked eggs, five identical toothbrushes, one “ 13 x 9 “ glass dish, eight tablespoons of coffee, 12 cups of bottled water, five different toothpastes: Colgate Baking Soda and Peroxide Whitening, Colgate Optic White Stain Fighter, Sensodyne Extra Whitening, Crest 3D White Stain Eraser, Aquafresh Cavity Protection, teeth whitening shade guide, seven sets of plastic gloves, one roll of paper towels, Clorox wipes for cleaning test area, one coffee maker, camera for photos, paper plates, one black sharpie marker, one coffee bean grinder, glass bowl for wetting down toothbrush.

Procedures

The scientific method was followed while conducting this experiment. To begin, all materials needed were gathered. Sanitize your work area to make sure there are no contaminants that can affect the color of the egg. Brew 12 cups of bottled water and 8 tablespoons of coffee in a thoroughly cleaned coffee maker. Take five white eggs and check them for stains, cracks, or any damage. Place a “13 x 9” glass dish on the work area and place the five eggs inside. Once the coffee is finished brewing, allow the coffee to rest for 15 minutes to cool to room temperature. Pour the room temperature coffee over the eggs soak for 30 minutes. Put on one pair of plastic gloves. Carefully remove one egg from the glass dish. Place the egg on a clean and dry paper towel to dry for five minutes. Repeat steps eight and nine with the additional four eggs.

Use a different pair of gloves for each egg so there is no cross contamination. Prepare one clean paper plate with one clean paper towel per egg. Using the sharpie marker, write the name of each toothpaste brand on each plate. There should be one plate for each egg. After the eggs have dried, take one clean and unused toothbrush and 1 tube of toothpaste. Dampen one clean toothbrush in a bowl of water. Brush the first egg for two minutes and 30 seconds with toothpaste indicated on the plate. Brush eight times clockwise, eight times counter-clockwise, and eight times up and down. Repeat these brush combinations until time is complete. Once finished brushing the egg place the egg on the clean paper towel that is on the paper plate with the name of the toothpaste used. Using the tooth whitening scale determine which toothpaste performed the best at removing the stains from the eggs. Repeat steps with each of the remaining four eggs and their individual toothpastes indicated on the plates. Repeat the test seven separate times, with a sum total of 35 eggs, and determine the average best performing toothpaste.

The results of this experiment showed that the Sensodyne Extra Whitening Toothpaste out-whitened the other toothpastes and performed the best out of all of them.

Results

The experiment produced results. They are as follows. The results for this experiment showed a clear leader. After performing seven trials the results were visibly evident. Sensodyne Extra Whitening toothpaste had the best stain removing and cleansing results. There are many interesting takeaways that were learned from this experiment. For example, many of the more popular drugstore brands advertise their wide array of cleaning and stain fighting benefits. It was unmistakable from as early as trial seven that Sensodyne was out performing the other brands . Many toothpastes have fancy wording that states that they may be the best. In reality they don't do what is advertised, they have colors that leave tints on your teeth and you can be paying so

much for something that could be doing so little. Four out of the five toothpaste had the same active ingredient. Including the highest performing toothpaste and the worst performing toothpaste. So it must be the inactive ingredients that make them perform differently. Just on the first trial, the Sensodyne Extra Whitening toothpaste was already doing the best out of all of the other brands. Sensodynes numbers had already exceeded my expectations as early as trial three. In the end, the tooth whitening averages for the toothpastes were 5.285 for Colgate Baking Soda & Peroxide Whitening, 4.285 for the Colgate Optic White Stain Fighter, 2.714 for Sensodyne Extra Whitening, 5 for Crest 3D White Stain Eraser, and 6.714 for Aquafresh Cavity Protection. The lower the average the better the toothpaste performed.

Discussion

There is much information to be found on the topic of different toothpastes. This SMILE experiment, like me, evaluated which toothpaste was best for whitening. They used similar brushing techniques, only had five toothpastes and five toothbrushes, and brushed on a ceramic tile for two minutes to simulate brushing your teeth. They brushed 27 times to stimulate brushing for two weeks to see what the results would be. (<https://www.education.com>)

In this experiment, these people took four brands of toothpaste and determined which one looked better. They took ceramic tiles and soaked them in coffee for 24 hours. After this, they brushed the whole tile for two minutes in circular motions and washed it off. They repeated their steps 14 times to stimulate brushing for two weeks. (<https://www.education.com>)

According to (<https://www.mouthhealthy.org>) “Teeth can change color due to age, trauma, medications,...”. According to (<https://fortsondentistry.com>), “If you don't brush you can get plaque which breaks down your tooth enamel.”

Conclusions and Future Study

For this experiment, my hypothesis was contradicted. This experiment worked because I followed all of my instructions very carefully and I made sure that there was nothing that could make my experiment go wrong or there was nothing that could make my outcome false. This was successful because I made sure that I had no variables that could affect my experiment or anything that could make my experiment go wrong. The results told me that the Sensodyne Extra Whitening Toothpaste was the best overall toothpaste to use to whiten your teeth. I proved that the Colgate Optic White Stain Fighter might not work as well as you think. Something I would change in this experiment is the type of toothpaste. I would change the type of toothpaste to whitening toothpaste. If I do that I could see if whitening toothpastes work the same as regular toothpaste or if they have a different impact.

References

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Harris. E. (2022). *Does Whitening Toothpaste Work?*. Education.com.

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Appendix

Table A1

Toothpaste	T1	T2	T3	T4	T5	T6	T7	AVG
Colgate Baking Soda & Peroxide Whitening	6	9	4	4	4	5	5	5.285
Colgate Optic White Stain Fighter	4	3	5	6	3	5	4	4.285
Sensodyne Extra Whitening	3	2	3	3	3	3	2	2.714
Crest 3D White Stain Eraser	7	5	5	4	4	5	5	5
Aquafresh Cavity Protection	8	7	4	8	6	7	7	6.714

Figure A1

