Effect of Different brands of Hair dye on Hair strength

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Abstract:

Our purpose was to find out the effect of different brands of hair dye on the strength of hair from four 14 year old girls. We hypothesise that brand B would cause the most amount of damage as it has the most number of harmful chemicals in the hair dye as compared to brands A and C. Our method was to test the strength of each person's hair by hanging weights on the hair before dying them as a control. Afterwards, we dyed a set of hair from each student with brand A and repeated the process with brands B and C and hung weights on all of them. The strength would be determined by the amount of weight the hair could carry without breaking.

Introduction:

We investigated how the different chemicals in hair dye affected the strength of various hair types. Hair dyes from three different brands were tested on four different hair samples from 4 girls aged 14. It is commonly believed that chemicals found in hair dye can damage the hair. One example is hydrogen peroxide, which is said to modify the hair structure and make the hair brittle. Hence we expected the chemicals in hair dyes to cause the dyed hair to decrease in strength. Therefore, we predict that brand B will cause the most amount of damage to the hair strength as it has the most number of harmful chemicals. Hair strength will be determined by the amount of weights the dyed hair strands can hold before breaking, and hair dyed with brand B will hold the least amount of weights. However, we also found that there are chemicals in dyes that reduce damage, such as glycerin, which help strengthen hair. This experiment may greatly assist those looking for a brand of hair dye that will cause the least amount of damage to their hair.

Theoretical background:

Hydrogen peroxide is a common chemical found in dyes. It is said to modify the hair structure and make the hair brittle. Hydrogen peroxide in the hair dye is also a bleaching agent and an oxidising agent which breaks bonds in the hair and oxidises the melanin. The oxidised molecules are colourless. This process results in free radicals produced. Free radicals, which are unstable atoms, can damage cells and cause aging and illnesses. Antioxidants in the hair dyes neutralise the free radicals and reduce or prevent the effect of them. Ammonia is the alkaline chemical that opens the cuticle and allows the hair color to penetrate the cortex of the hair. However, there are also chemicals found in dyes to reduce damage such as glycerin, which help strengthen hair. There are ingredients in the hair dye that strengthen hair such as silk amino acids and keratin amino acids in brand A, glycerin in brands A and B, and malic acid and Butyrospermum parkii in brand C. There are also antioxidants in the hair dyes like erythorbic acid in brand A, ascorbic acid in brands A and B, threonine in brand B.

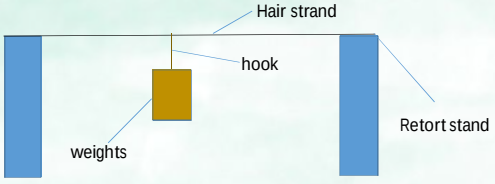

Fig. 1: Experiment Set up Diagram

Table 1: Number of harmful and strengthening chemicals

Brand of hair dye	No. of Harmful Chemicals	No. of Strengthening Chemicals
A	4	3
B	5	1
C	4	2

Procedure:

1. Dye the students' hair sample with Brand A, B and C by coating it with the hair dye and covering it in a piece of aluminum foil for the required time stated on the instructions of the respective dyes. Follow other instructions on the box.
2. Rinse and dry the dyed hair samples.
3. Repeat for the other 2 brands of hair dye on two more hair samples A.
4. Tape both sides of one strand of student 1's hair(non-dyed) to the retort stands. Hang weights on 1 strand of Student 1's hair(non-dyed) until it breaks. (Fig. 1)
5. Take 1 strand of Student 1's hair dyed with the Brand A and hang weights on it until it breaks. Repeat this step for Student 1's hair dyed with brands B and C.
6. Record the mass required to break the single strand of hair.
7. Repeat steps 4-6 for hair samples of student 2, 3 and 4.

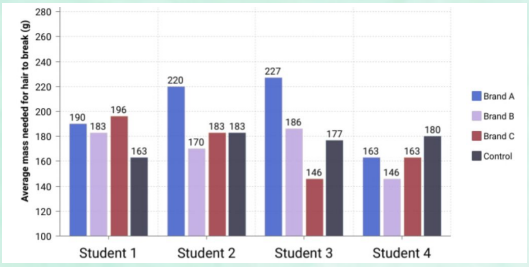

Fig. 2: The average mass needed to break each hair sample for every brand.

Results and discussion:

From Table 1, brand A has the least number of harmful chemicals (tied with Brand C) and the most number of strengthening chemicals. Whereas brand B had the most number of harmful chemicals and the least number of strengthening chemicals so we predict that Brand B is the most damaging hair dye brand and brand A, the least damaging.

In our analysis (Fig. 2), all of student 1's hair samples increased in strength after being dyed. This anomaly might be due to the student's unique genetics, hair type or diet. For example, her hair might possibly be oily, so only oil-soluble chemicals can pass through. She might have the ability to absorb more amino acids from proteins than the average person and thus her hair is already naturally strong and resistant to damaging chemicals. These factors might have prevented the harmful chemicals from damaging her hair. As for Brand B, student 2 and 4 had a decrease in strength while student 3 had a slight increase. However, student 2 and 4's decreases are more significant compared to student 3's slight increase and student 3's slight increase might also be an experimental error. The experimental errors in this experiment could have arisen because the method of obtaining hair samples was inconsistent, and the hair sample may weak to begin with. Hence, based on results from student 2 and 4, we conclude with some confidence that brand B is indeed more damaging than the other brands.

Conclusion:

Through this experiment, whilst we recognize that hair dyes have harmful chemicals in them, hair dye manufactures have now added many strengthening chemicals. However, we are unable to know the exact quantities of the strengthening and harmful chemicals. Hence, even if a brand of hair dye has a higher absolute number of harmful chemicals compared to another brand, it may still be less harmful as the total quantity of the harmful chemicals may be less. Because of the strengthening chemicals, it also might mean that hair can be stronger and nourished even after it is dyed. The determination of hair strength is a complex concept and is dependent of multiple factors like hair type and diet. Hence, with more time and resources, we can possibly refine and optimize our data collection and analysis methods to achieve more accurate and reliable results.

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