

Effectiveness of Detergents With and Without Enzymes

Introduction

The simplicity of washing clothes with soap and water has been advanced in recent years with the addition of enzymes in laundry detergents. Enzymes have been used in detergents since the 1960s and now the majority of detergent companies are using enzymes in their products (Soaps and Detergents). The enzymes that are used in detergents are amylase, lipase, cellulose and protease (Enzymes in Laundry Detergents). This experiment investigates and compares the overall effectiveness of different detergents and tests the limits of the enzymes function in varying levels of pH.

Materials

- 6 Blood Stained pieces of cloth
- 2 beakers
- 2 Detergent brands.
- PH strips
- Droppers WI 0.1 Hydrochloric Acid and 0.1 Sodium Hydroxide
- Stirring rod
- Water
- Sharpie Marker

Methods

The study site was in a controlled lab environment on the campus of XXX College. The detergents being tested were Wisk and Dynamo 2x Ultra. The effectiveness of the detergents on blood stained clothing was being tested to determine if a detergent with enzymes (Wisk) was more efficient than a detergent without enzymes (Dynamo 2x Ultra). After determining which was more effective, the pH limit of the enzyme would be tested to see at what pH level the enzyme would no longer function.

To start the test, we began dividing up the blood stains and putting them in groups for

1 each detergent. The first two were used to compare the Wisk and Dynamo directly using water
 2 with a normal pH level of 7. The second group of two tested the Wisk with water at a pH level
 3 of 8 and 9. The third pair was used to test the Wisk with water at a pH level of 5 and 6. After
 4 dividing up the samples, the detergents were diluted to form a solution of 1% Wisk and 1%
 5 Dynamo 2x Ultra in separate containers. 6 drops of the Wisk solution was then placed on the first
 6 stain. This step was repeated using the Dynamo solution on stain 2. Both stains were set in
 7 different beakers of water with a pH level of 7 for 3 minutes each. For stains 3 and 4 only the
 8 Wisk solution was used and 6 drops were placed on each stain. 0.1 Sodium Hydroxide was used
 9 to rise the pH Level of the water. Three drops were used to raise pH to 8 then five drops to raise
 10 it to 9. Stain 3 was placed in water with a pH level of 8 while stain 4 was left in water with a pH
 11 of 9, both stains were left in the water for 3 minutes then set aside to dry. Blood stains 5 and 6
 12 were also used for only the Wisk solution and 6 drops were used on each stain. 0.1 Hydrochloric
 13 Acid was used to lower the pH level of regular water. Thirteen drops were used to lower the
 14 water pH to 5 and six to lower the pH to 6. Stain 5 was left in water with a pH level of 5 while
 15 stain 6 was left in water with a pH of 6. Both stains were left in the water for 3 minutes then set
 16 aside to dry.

17 **Results**

18 Table 1.0

| Detergent/Stain Number | PH Level | Appearance |
|--------------------------|----------|--|
| Wisk, Stain 1 | 7 | Slight dark white color where drops were placed. |
| Dynamo 2x Ultra, Stain 2 | 7 | Slightly less brown, Little to no change in color. |
| Wisk, Stain 3 | 8 | Slight dark white color where drops were placed. |
| Wisk, Stain 4 | 9 | Light brown color where drops were placed. |
| Wisk, Stain 5 | 5 | Tan tint where the drops had been placed. |
| Wisk, Stain 6 | 6 | Tan tint where the drops were placed. |

1 Blood stains 1 and 2 were observed after they had dried and it was clear that out of the two
2 detergents, the detergent that contained enzymes was far more effective than the detergent without
3 them. Stain 1 was far less brown where the drops had been placed while stain 2 had only slight color
4 changes.

5 The enzyme detergent had continued to work effectively against the blood stains in group
6 two despite the rise in pH level. Blood stains 3 and 4 both had color changes that were observed;
7 however, Stain 3 was slightly less brown than stain 4. The enzyme detergent continued to work
8 despite the drop in pH level. Stains 5 and 6 both had color change and became less brown but, there
9 was little to no change of color between the two stains.

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11 **Discussion**

12 The Data that was recorded was Qualitative; our findings were determined through visual
13 comparisons between the blood stains. The results show that the detergent with enzymes does work
14 more effectively than the detergent without enzymes. It also shows that the pH level affects the
15 function of enzymes at certain levels. Due to time constraints there was not enough time to test a
16 wider range of pH levels to determine the actual peak and trough of enzyme function. Another
17 way the experiment could have been changed is by letting each sample sit in the water longer
18 than three minutes in order to see if there would be any further change in the stain. The data
19 shows that the enzyme detergent is more efficient, because the enzymes break down the proteins
20 and lipids in the stain when they are in the water through hydrolysis. This makes the cleaning of
21 the cloth much easier. In conclusion the hypothesis being tested was not completely supported.
22 The Enzyme detergent was more effective, but the pH level did not change the outcome as
23 drastically as first predicted.

1 **References:**

2 "Soaps and Detergents: Chemistry". *Cleaning Institute*. American Cleaning Institute, n. d.
3 Web. September 20 2014.

4 "Enzymes In Laundry Detergents". *Science in the box*. Proctor and Gamble, n. d.
5 Web. September 20 2014.

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