Biological Machines - Enzymes

Experiment: With or Without Enzymes?

Agar Plates

**Background Information**

Many advertisements on television are about cleaning products. These cleaning products claim to take out stains faster, easier, at any temperature with minimal water. What is a detergent and how is it able to take out the dirt? What makes a ‘great detergent’?

Detergents contain synthetic, organic surface-active agents called surfactants, which lower the surface tension of water and allow dirt and grease on clothing to be removed. An enzyme known as protease is sometimes added to the detergent because it is believed that most of the dirt on clothing is protein-based and this enzyme added could breakdown the protein stains, leaving clothes cleaner after washing. Many of the enzymes used in washing powders today are proteases to remove protein stain.

**Aim:** To determine if detergents with protease enzymes are more effective at breaking down protein than detergents without enzymes.

**Materials:**

|  |  |
| --- | --- |
| * 4 different laundry detergents – 2 organic (no enzymes), 2 non-organic (containing enzymes) made into solutions
* 4 Petri dishes – filled with agar mixture containing milk protein
 | * (Cork borer) corer
* marker pen
* pipette
* labels
* 4 x beakers
 |

**Method**

*Note*: Two controls set-up per class- 1. Use water with no detergent. 2. Detergents with coloured dye. Teacher to do set-up controls for their class:

* 1. Use the solutions provided of each detergent to carry out this experiment
	2. Take the agar plates and divide each plate into thirds by drawing on the plastic bottom with the marker pen (See diagram below).
	3. Using the corer place a hole in each third of the plate so that it looks like the plate below:
	4. Use the pipette and place 80µL (2 drops) of one of the detergents in each hole of plate 1. You want to place enough to fill the wells but not overflow onto the surface of the plate.
	5. Repeat this for each plate using a different detergent for each plate.

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Repeat this for each plate using a different detergent for each plate.

Experiments

Lines on bottom of plate

‘corer’ holes

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**Method:**

* 1. Ensure you label the lid of each plate so you know which detergent is tested in each.
	2. Leave the agar plates for 24hours in a safe location ensuring that they do NOT get tipped upside down.
	3. After 24hours, check the agar plates for signs of the proteases breaking down the protein. You should be able to see a clear colourless ring surrounding each hole if the enzyme has broken down the protein. You need to measure the radius and record this in the results table below:

**Results:**

|  |  |  |
| --- | --- | --- |
| **Laundry Detergent** | **Observations and Measurements** | **Average** |
| **Test 1** | **Test 2** | **Test 3** |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

**Questions (Complete these in your notebook):**

1. **Did you achieve the aim of this experiment?**
2. **Was your hypothesis correct? Why or why not?**
3. **Which laundry detergent provided the greatest breakdown of proteins?**
4. **How did you determine your answer from question 1?**
5. **Why did one laundry detergent perform better than the others? (ie What was the active ingredient/s that made it more effective?)**
6. **Why did you carry out each test 3 times?**
7. **What was the control in this experiment?**
8. **What further tests would be necessary to determine which laundry powder is the most effective in the widest range of conditions (eg temperature, concentration etc)?**

Experiments