How effective are digestive enzymes supplements?

**Enzyme practical design (formative)**

*There are different possible hypothesis to test* ***but*** *you can only test one and it must be testable. Write as an IF and THEN statement. The practical design will be developed to test the hypotheses you have constructed.*

**Hypothesis**

**If** amylase as a digestive supplement is used **then** the breakdown of starch will increase

**If** protease as a digestive supplement is used **then** the breakdown of proteins will increase

**If** bromelain as a digestive supplement is used **then** the breakdown of proteins will increase

**If** a plant enzyme digestive supplement is used **then** the rate of substrate breakdown will be increased

***If*** *a liquid form of digestive enzyme supplement is used* ***then*** *the rate of substrate breakdown will increase*

**Materials**

Digestive supplement enzyme source (protease for protein)

Egg white or milk for protein substrate

Water bath

Thermometer

*There is not justification of sections in the method designed.*

25mL test tubes

Test tube rack

Reagent strips to test for presence of amino acid in solution

**Method**

1. Collect equipment
2. Make up 10% solution of protease digestive supplement by mixing 1mL of digestive liquid with 10mL of distilled water
3. Make up 10% solution of protease digestive supplement by mixing 1g of digestive powder with 10mL of distilled water
4. Measure out 20mLs of milk and place in 25mL test tube
5. Test milk for presence and amount of amino acids present and record in table (using units present on bottle)
6. Add 2mL of 10% solution of protease digestive supplement (liquid source) to the test tube
7. Place test tube in a water bath set at 37 degrees
8. Record for the presence of amino acids by using reagent strips every 5 minutes for 30 minutes
9. Repeat steps 4 to 8 once more
10. Repeat steps 4 to 9 but this time use 2 mL of 10% solution of protease digestive supplement (powder source) to the test tube
11. Dispose of solution safely and clean up area once completed

*Consider: Controlled variables*

 *Sample size (2)*

 *Reliability of data (reagent test strip, sample size, resolution)*

 *Limitations such as enzyme source*

**Results**

**Table 1**: The breakdown protein of using a liquid digestive supplement compared to a powdered digestive supplement

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Time (minutes)** | **Temperature of solution (0C)** | **Volume of solution** | **Reagent strip record** | **Average****(2 trials/2)** |
| **Treatment** | **Liquid** | **Powder** |
| **Liquid supplement** | **Powdered supplement**  |
| **Trial 1** | **Trial 2** | **Trial 1** | **Trial 2** |
| 0 | 37 | 50mLs |  |  |  |  |  |  |
| 5 | 37 | 50mLs |  |  |  |  |  |  |
| 10 | 37 | 50mLs |  |  |  |  |  |  |
| 15 | 37 | 50mLs |  |  |  |  |  |  |
| 20 | 37 | 50mLs |  |  |  |  |  |  |
| 25 | 37 | 50mLs |  |  |  |  |  |  |
| 30 | 37 | 50mLs |  |  |  |  |  |  |

*Limitations: Volume of enzymes present*

 *Will other enzymes in body digest the enzyme digestive supplement?*

 *Effects of Hydrochloric acid in stomach not accounted for in design*