Investigate the amount of protein essay sample

1. Aim

To investigate the amount of protein present in different types of milk by measuring

the mass of protein in each types of milk.

2. Introduction

Casein is a protein which is found in milk. This is a conjugated protein that has prosthetic groups that is called phosphoric acid, covalently bonded to the R-groups of some amino acid residues. Thus casein is also called phosphoprotein. Casein is insoluble in water. The addition of dilute acid to milk – the precipitate is known as acid casein. In order to estimate the amount of protein present in each type of milk, we can measure the mass of its coagulation in acid.

Hypothesis

-The mass of protein in full cream milk is highest while the mass of protein in soya milk is lowest.

Independent variable

Four different types of milk, namely full cream milk, skimmed milk, goat’s milk and soya milk.

Dependent variable

Amount of protein present in each type of milk, measured in terms of average mass of protein.

Controlled variable

Variable

How it is controlled

Volume of HCl used

10ml of each dilute HCl is used for the first three types of milk

Volume of milk used

20ml of each types of milk is used

Duration in which the milk is settled and let the casein precipitate out of the milk

All types of milk are settled for 5 minutes

Duration for stirring the solution

All types of milk are stirred for 90s

Rinse the acid

Run distilled water through the precipitate to rinse off the acid

3. Apparatus and Materials

Apparatus

2 50ml measuring cylinder

2 100ml beaker

1 syringe

1 funnel

1 stopwatch

1 petri dish

1 electron balance weighing up to 0. 1g

1 busen

1 glass rod

Materials

20ml dilute HCl

40ml full cream milk

40ml skimmed milk

40ml goat’s milk

40ml soya milk

2g MgSO4

4 filter paper

4 cheese cloth

Distill water

4. Procedure

Refer to worksheet titled ‘ determining protein content in milk

Calculation:

– Start by keying in the data into a column

Ex: skimmed milk: B5 to H5

– The mean is calculated with the AVERAGE function

Ex: Calculate the mean of the values in skimmed milk B5 to H5

fx = AVERAGE (B5: H5)

– For standard deviation use the STDEVA function

Ex: Calculate the standard deviation of the values in skimmed milk B5 to H5

fx = STDEVA (B5: H5)

Table 3: showing the nutrition panel in different types of milk per 100ml and per 20ml

Types of milk

Mass of protein(g) per 100ml

Mass of protein(g) per 20ml

Full cream milk

3. 4

0. 68

Skimmed milk

3. 4

0. 68

Goat milk

2. 9

0. 58

Soya milk

1. 2

0. 24

Calculation:

-Mass of protein per 20ml of skimmed milk = (20 x 3. 4)/100 = 0. 68g

6. Graph:

7. Discussion of results

Anomalous results

There were 2 anomalous readings in the data collected. There were in reading 2 of full cream milk and in reading 4 of soya milk. They were highlighted in table 1. It is because the precipitates are not enough time to

settle; thus the precipitates are not completed out of the milk. The liquid is not removed as much as possible or squeezing the solid too much out of the cheese cloth. This makes the mass of protein inaccurate in reading 2 because of the amount of liquid. Or the precipitates are not filtered enough; still remain the liquid on the filter paper. The mass of protein in reading 4 is anomaly. Therefore, their values differ greatly from those of other readings. As a result, they have been excluded when calculating the average mass of protein and standard deviation.

Results of investigation

According to my result in table 3, the mass of protein in full cream milk is highest while the mass of protein in goat milk is lowest. However, according to the value of nutrition panels in 20ml, the mass of protein in full cream milk is highest (0. 68g) while the mass of protein in soya milk is lowest (0. 24g).

Compare to my result, the protein yield in nutrition panel differ the protein yields in my experiment. For the protein yield in nutrition panels, the mass of protein in goat milk is greater than the mass of protein in soya milk whereas the mass of protein in goat milk is smaller than the mass of protein in soya milk in my result. Almost milk contain casein, but the soya milk is a special kind of milk. This is formed from soy bean. Almost protein present in soy milk is soy protein, thus the soya milk contain very little casein or has lack of casein. Leading the procedure determine the protein in soya milk differ that of remaining milk. That’s why the protein present in soya milk is lowest in four types of milk.

The mass of protein present in soya milk is greater than that of goat milk in my experiment. It is because the precipitates are not enough time out of the milk. When adding the solution that contains goat's milk through the cheese cloth. It is filtered very quickly, leading the precipitates did not present in cheese cloth. The soya milk is filtered by filter paper and is left in one day, however, some filter papers contain precipitate and little amount of liquid. This makes the result inaccurate and lead the amount of protein present in soya milk is greater than the amount of protein present in goat's milk. Furthermore, the raw data is not collected equally. It is because some data minus the cheese cloth or filter paper, or some data did not.

Casein exists as calcium salt, calcium caseinate. The isoelectric point of calcium caseinate is a pH 4. 6. It is insoluble in solution that has pH less than 4. 6. The pH of milk is 6. 6; therefore, casein has a negative charge at this pH and is solubilized as a salt. If it has an addition of acid in milk, the negative charges of casein are neutralized or increased, the solubility of casein decrease, thus the protein precipitates and calcium ions present. For soya milk, it contains very little casein or lack of casein, main protein is soy protein. It cannot be determined by adding dilute HCl. Because casein is a group of soluble protein, heating soya milk, the protein will be denatured, loses their three dimensional shape. Protein's solubility decreases in milk and precipitates present in the solution. Additionally, it is left in one day, it allows the milk to sour, thus the lactic acid produced precipitates the casein.

8. Conclusion

-The mass of protein in full cream milk is highest while the mass of protein in soya milk is lowest. This agrees with the hypothesis proposed for the investigation. However, my results do not support the hypothesis because of some limitation or weakness.

9. Evaluation

Limitation/weakness

Evaluation of limitation/weakness

Suggestion for improvement

Instrument used in measuring the mass of casein

Limited precise of balance (only 0. 1g). Smaller change in the mass cannot find out

Use a balance that has a greater precise – up to 0. 001g

Short of duration to allow the precipitate out of the milk (5 minutes)

5 minutes may not be long enough for precipitate out of the milk.

Increase the duration for allowing the precipitate out of each type of milk to 15 to 25 minutes

Using different types of filter (cheese cloth and filter paper)

Using different filter, causing the significant change between the mass of protein present in 4 types of milk

Using one type of filter

(cheese cloth or filter paper)

Data comes from different results

Some of readings minus the cheese cloth or filter paper, or some of readings did not

Must use the identical result, ex: all the data minus the cheese cloth or all the data did not minus.

10. References:

-Option C. Cells and energy – C. 1 Proteins

-Internal Assessment – Core 1. 1 Statistical Analysis

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