International Journal of Latest Engineering and Management Research (IJLEMR)
ISSN: 2455-4847
www.ijlemr.com || Volume 02 - Issue 02 || February 2017 || PP. 50-53

Comparative Study of Lactose and Casein in Different Types of Milks

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Abstract: In this work" comparative study of Casein and Lactose present in different types of milk " cow, goat ,buffalo and camel's milks were considered. These milks were collected from different places in Bangalore. From experimental results amount of casein found in following order. Goat milk>cow milk>camel milk>buffalo milk. Similarly amount of Lactose were found pressure were followed in all cases. Casein phosphate and calcium present in the fodder may be the major factor for the variation of casein in the different types of milk and carbohydrate present in the food materials may be main reason for variation of lactose in different types of milk .

Index Terms: Casein, Lactose, Calcium Caseinate, Phosphoprotein, Carbohydrate

1. Introduction

Casein well defined group of proteins found in milk, constituting about 80% of the proteins in cow's milk, but only 40% in human milk. Casein is a remarkably efficient nutrient, supplying not only essential amino acids, but also some carbohydrate and the inorganic elements calcium phosphorus.

Casein, the main protein in milk, is a phosphoprotein, meaning that phosphate groups are attached to the hydroxyl groups of some of the amino acid side-chains. Casein exists in milk as the calcium salt calcium caseinate. It is actually a mixture of at least three similar proteins which differ primarily in molecular weight and the amount of phosphorus groups they contain.

Casein is isolated from milk commercially and is industrially important because after dissolving in alkaline solution and drying,it becomes sticky substance that can be used in glues,the coating of paper,and binding of colours in paints and wallpaper.It is also used as coating for fine leather,and is cured with rennet to produce a plastic material used for buttons,When isolated under sanitary conditions and dissolved in alkaline solutions,casein is also employed in the manufacture of pharmaceutical and nutritional products.

Lactrose is a disaccharide(2sugars) made up of glucose and galactose(both are monosaccharides). It comparises 4.8 to 5.2% of milk ,52% of SNF,and 70% of whey solids.It is not as sweet as sucrose.When lactose is hydrolysed by B-D-galactosidase(lactase),an enzymes that splits these monosaccharides,the result is increased switness and depresssed freezing point.

2. METHODOLOGY

PRECIPITATION METHOD

Precipitation a solid from a solution. When the reaction occurs in a liquid solution, the solid formed is called the 'precipitate'. The chemical that causes the solid to form is called the 'precipitant'. Without sufficient force of gravity (settling) to bring the solid particles together, the precipitate remains in suspension. After sedimentation, especially when using a centrifuge to press it into a compact mass, the precipitate may be referred to as a 'pellet'. The precipitate-free liquid remaining above the solid is called the 'supernate' or 'supernatant'. Powders derived from precipitation have also historically been known as 'flowers'.

Sometimes the formation of a precipitate indicates the occurrence of a chemical reaction. If silver nitrate solution is poured into a solution of sodium chloride, a chemical reaction occurs forming a white precipitate of silver chloride. When potassium iodide solution reacts with lead nitrate solution, a yellow precipitate of lead iodide is formed.

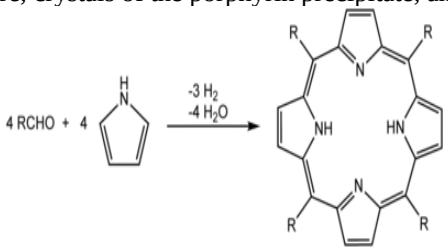
Precipitation may occur if the concentration of a compound exceeds its solubility (such as when mixing solvents or changing their temperature). Precipitation may occur rapidly from a supersaturated solution.

In solids, precipitation occurs if the concentration of one solid is above the solubility limit in the host solid, due to e.g. rapid quenching or ion implantation, and the temperature is high enough that diffusion can lead to segregation into precipitates. Precipitation in solids is routinely used to synthesize nanoclusters. An important stage of the precipitation process is the onset of nucleation. The creation of a hypothetical solid particle includes the formation of an interface, which requires some energy based on the relative surface energy of the solid and the solution. If this energy is not available, and no suitable nucleation surface is available, supersaturation occurs.

2.1. Applications

Precipitation reactions can be used for making pigments, removing salts from water in water treatment, and inclassical qualitative inorganic analysis.

Precipitation is also useful to isolate the products of a reaction during workup. Ideally, the product of the reaction is insoluble in the reaction solvent. Thus, it precipitates as it is formed, preferably forming pure crystals. An example of this would be the synthesis of porphyrins in refluxing propionic acid. By cooling the reaction mixture to room temperature, crystals of the porphyrin precipitate, and are collected by filtration:[2]



Precipitation may also occur when an antisolvent (a solvent in which the product is insoluble) is added, drastically reducing the solubility of the desired product. Thereafter, the precipitate may easily be separated by filtration,decanting, or centrifugation). An example would be the synthesis of chromic tetraphenylporphyrin chloride: water is added to the DMF reaction solution, and the product precipitates.[3] Precipitation is also useful in purifying products: crude bmim-Cl is taken up in acetonitrile, and dropped into ethyl acetate, where it precipitates.[4] Another important application of an antisolvent is in ethanol precipitation of DNA.

In metallurgy, precipitation from a solid solution is also a useful way to strengthen alloys; this process is known assolid solution strengthening.

2.2. Representation using chemical equations

An example of a precipitation reaction: Aqueous silver nitrate ($AgNO_3$) is added to a solution containing potassium chloride (KCl), the precipitation of a white solid, silver chloride (AgCl), is observed.

$$AgNO_3\ (aq) + KCl\ (aq) \rightarrow AgCl\ (s) + KNO_3\ (aq)$$

The silver chloride (AgCl) has formed a solid, which is observed as a precipitate. This reaction can be written emphasizing the dissociated ions in a combined solution. This is known as the ionic equation.

$$Ag^+\ (aq) + NO_3^-\ (aq) + K^+\ (aq) + Cl^-\ (aq) \rightarrow AgCl\ (s) + K^+\ (aq) + NO_3^-\ (aq)$$

A final way to represent a precipitate reaction is known as a *net ionic reaction*. In this case, any spectator ions (those that do not contribute to the reaction) are left out of the formula completely. This simplifies the above equations to the following:

$$Ag^+\ (aq) + Cl^-\ (aq) \rightarrow AgCl\ (s)$$

2.3. Precipitate colors

Many compounds containing metal ions produce precipitates with distinctive colors. The following are typical colors for various metals. However, many of these compounds

Gold	Orange
Chromium	Deep green, murky green, orange, purple, yellow, brown
Cobalt	Pink
Copper	Blue
Iron (II)	Green
Iron (III)	Reddish brown
Manganese	Pale pink
Nickel	Green

can produce colors very different from those listed.
Other compounds generally form white precipitates.

3. EXPERIMENTAL

All the glasswares required for experiment were of Borosil and Chemicals (calcium carbonate, Acetic acid,Acetone) were of Merck company... All glass wares were cleaned properly by.using chromic acid.Apparatus were checked properly before use.Thermometer was also checked whether it was showing temperature correctly.In a 500ml beaker 300ml milk of cow was added and heated on waterbath at 60 degree centigrade. To this 10% acetic acid solution was added.

Flocculent precipitate formed.(casein precipitated at a point slightly higher than its isoelectric point at PH 4.4). The precipitate was filtered and dried and weighed and labeled as casein.Filtered kept separately.

Approximately 6 gm of calcium carbonate was weighed and added to the filterare. The filterate was concenterated up to 50 ml and added 300ml of acetone and filtered. Finally it was cooled.Crystal of lactose was collected and driwd and weighed. All experiments were repeated four times and finally average values calculated.

Same processes were followed for other milks and values were recorded and tabulated in Table No 1, Table No 2,Table No 3, and Table No 4

Melting point of lactose was determined carefully and was found 203 degree centigrade.Melting point of casein was also determined and was found 280 degree centigrade.

Table 1.
Sl. Lactose in gram /300ml

1	Cow	2.13g
2	Goat	3.00
3	Buffalo	1.903
4	Camel	2.35

Table 2
Sl. Lactose in gram /1000ml

1	Cow	7.101
2	Goat	10.00
3	Buffalo	6.34
4	Camel	7.83

Table 3
Sl. Casein in gram /300ml

1	Cow	25.2368g
2	Goat	26.1661
3	Buffalo	15.6935
4	Camel	21.6935

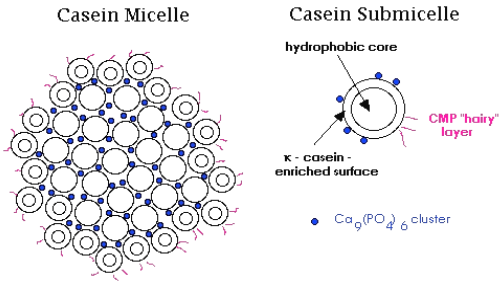
Table 4
Sl.Casein in gram /1000ml

1	Cow	84.12g
2	Goat	87.22
3	Buffalo	52.31
4	Camel	72.31

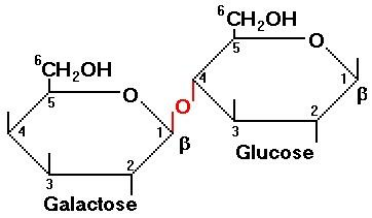
4. RESULT AND DISCUSSION

Results of experiments of Casein may be arranged in the following order:
Casein in goat milk >cow milk >camel milk>buffalo milk .

Casein



Lactose



According to the chemical composition of casein phosphate and calcium present in the fodder for animals may be the major factor for the variation of casein in the different types of milk.
Lactose content in different types of milks may be arranged as follows:
Goat milk>camel milk>cow milk>buffalow milk. :
According to the structure; carbohydrate present in the food materials for animals may be main reason for variation of lactose in the different types of milk .

CONCLUSION

Casein and Lactose are found more in goat milk and less in buffalo.milk

ACKNOWLEGEMENT

I thank to Mrs, Amita Gupta H.O.D Chemistry AMC College Bangalore for her full support during Research period.

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