Casein

Casein is a family of related phosphoproteins. These proteins are commonly found in mammalian milk, comprising about 80% of the proteins in cow's milk and between 20% and 60% of the proteins in human milk.

TYPES OF CASEIN

Casein is usually divided into the following types:

- Rennet casein, obtained by enzymatic precipitation
- Acid casein, obtained by acidifying skim milk to the isoelectric point (pH 4.6 – 4.7)

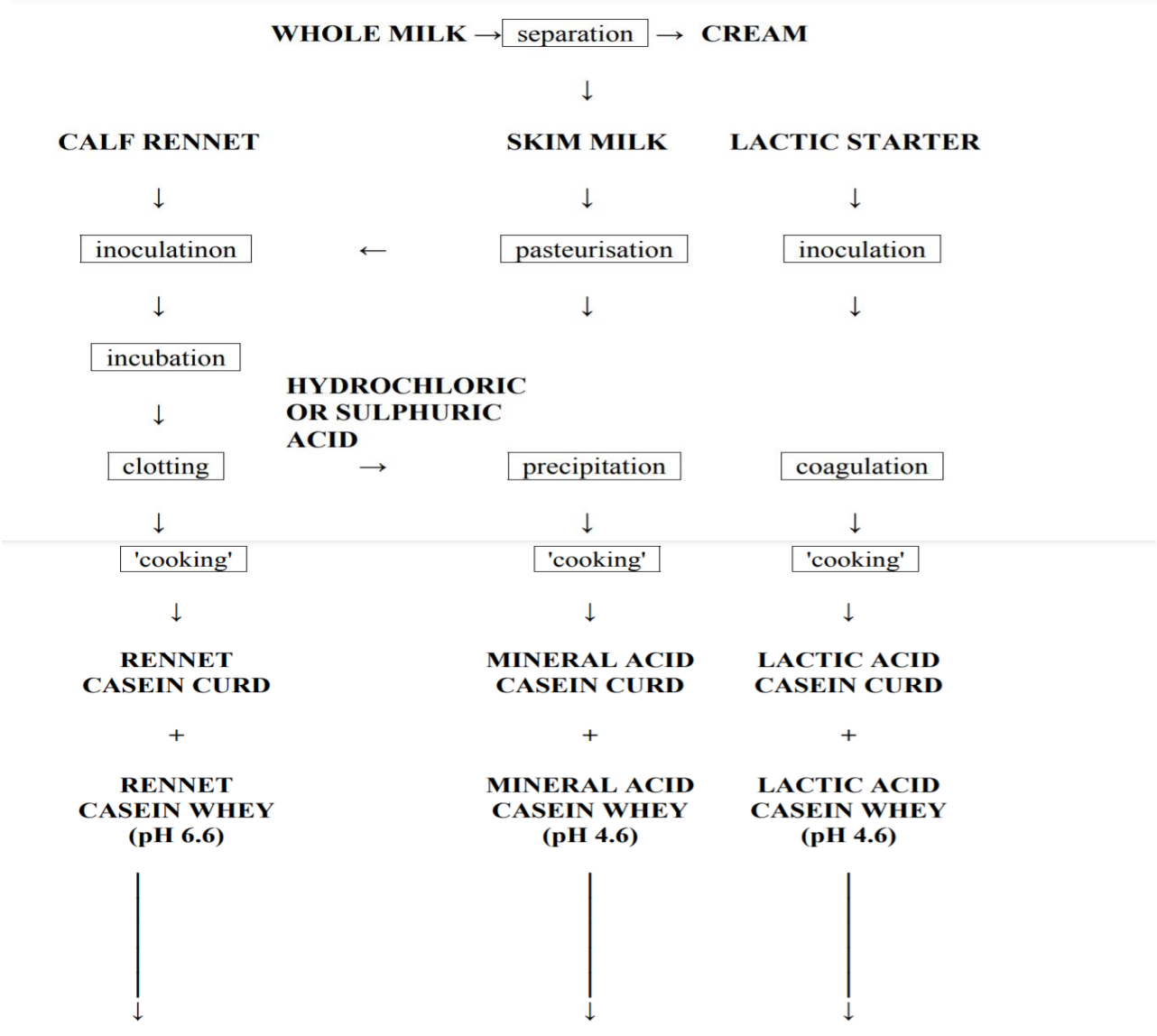


Figure 1 - Processing steps involved in the precipitation of acid and rennet caseins from milk.

Table 1 - Composition of casein

Component	Acid casein	Rennet casein
Moisture (%)	11.4	11.4
Protein (%)	85.4	79.9
Ash (%)	1.8	7.8
Lactose (%)	0.1	0.1
Fat (%)	1.3	0.8
Sodium (%)	< 0.1	< 0.1
Calcium (%)	0.1	2.6-3.0
pH	4.6-5.4	7.3-7.7
Solubility in water (%)	0	0

Uses of Casein:

Acid casein	Rennet casein
Adhesive for wood, *e.g.* plywood; adhesive for foil laminates and paper	Plastics in the form of buttons, buckles, imitation tortoiseshell (combs and hairclips), imitation ivory (knife handles and piano keys), fountain pen barrels, shoehorns, dominoes, novelties
Coatings for paper and cardboard	
Horticultural spreaders	
Joint cements in wallboard	
Leather tanning	
Paints	
Photo-resist	
Stock foods	
Synthetic fibres	
Textile sizing	

Difference between casein and serum protein

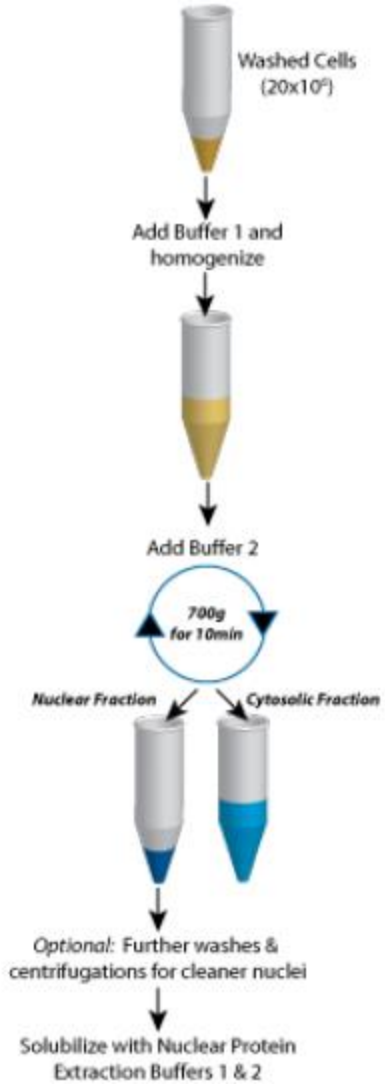
Milk proteins are divided into **two classes**: **serum proteins** also referred to as**seric proteins**, solubles (found in whey) and **casein, which is** coagulable. This last category represents more than 80% of milk protein.

Caseins consist of three subcategories (alpha α, beta β and kappa κ) and exist in the form of a colloidal suspension (micelle).

Serum proteins, unlike casein, are soluble molecules in the aqueous phase of milk. They consist of four main subcategories: α-lactalbumin, β-lactoglobulin, bovine albumin serum and proteosis-peptones.

Common techniques used in protein fractionation.

Protein fractionation generally refers to the process of isolating, identifying and characterizing various proteins present in a sample. However, the analysis of proteomes is usually hindered by the vast amounts of proteins, especially since the larger, more abundant proteins tend to inhibit the signal of lower abundance proteins. Incidentally, the lower abundance proteins are usually the more interesting proteins in the group.



To address this problem, you need to identify the properties that separate them from the rest of the unwanted proteins and then use the appropriate protein fractionation technique(s) to isolate them from the rest of the unwanted proteins. You can use various general properties such as size, shape, solubility, stability and sedimentation velocity, ability to bind with various ionic groups, and affinity for substrates as a basis for isolating your protein of interest from complex biological samples. You can likewise separate proteins based on their cellular location, thereby allowing you to extract cytoplasmic, nuclear and membrane proteins.

Fractionation of proteins in solutions can usually be carried out through precipitation and/or chromatographic and electrophoretic procedures. Fractionation through precipitation can be achieved by "salting out" with ammonium sulfate, isoelectric precipitation (adjusting the pH to precipitate the unwanted proteins), or by using solvents such as alcohol or acetone.

By "salting out" or increasing the ionic strength of the solution, proteins that have more hydrophobic regions will aggregate and precipitate faster than those with less hydrophobic regions. Adjusting the pH, on the other hand, cause some of the proteins to reach their isoelectric point. At this point, some of the proteins begin to precipitate. It is interesting to note that this technique is mostly used to precipitate the unwanted proteins, leaving the protein of interest in the solution.

Proteins can also be fractionated by using chromatographic and electrophoretic procedures. Different proteins can be separated by employing gel filtration which separates proteins based on their size and shape and/or adsorption chromatography.

Keep in mind that there is no single way by which you can separate proteins so you need to establish what your final goals are before using a particular protein fractionation method. In addition, since there would rarely be a single fractionation technique that is suitable for most cases, you may require multiple, systematic techniques to complete your research.