<b>PROTEIN GLUE</b>	
Experimental protocol	
<b><u><b>A</b></u> <b>A</b> Families</b>	
Chemistry	
60 minutes	

Milk is characterized by a creamy emulsion composed of fat globules in aqueous phase, so that its ingredients, such as casein globules, other proteins, lactose and salts, are suspended and dissolved.

Casein is the main protein in milk, representing approximately 80% of the total protein.

Milk Vinegar Baking soda (baking powder)	Kettle Coffee filter
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## BACKGROUND

For having very strong adhesive properties, during the First World War the manufacture of casein glue was particularly intended for aeronautics - since the ships (planes) in which this glue was used had a structure mostly made of wood.

Like any other natural glue, it has disadvantages: when it absorbs moisture, it develops fungi that feed on it; this disadvantage led to the use of this glue having been abandoned in this area.

## QUESTION

• How do you separate casein (protein) from whey?

## EXPLORE

- 1. Pour two mugs of milk into a kettle and heat over a low heat to about 50 ° C. Do not let it boil. Turn off the stove, but keep the kettle in contact;
- 2. Pour the vinegar drop by drop, stirring constantly until you see that two distinct layers are formed in the milk;
- 3. Let it stand and cool down;
- 4. Filter the mixture using a coffee filter, recovering only the solid part;
- 5. Dry the mass obtained with absorbent paper or a cloth and place it in a bowl;
- 6. Add a cup of coffee from the tap water and mix well;
- 7. Add 3 teaspoons of baking soda and mix well until a homogeneous mixture similar to white glue is obtained;
- 8. Use as glue in handworks.

## **EXPLAIN**

Casein is a protein found in milk and, like other proteins, its solubility depends on several factors, including the acidity of the medium. Adding vinegar, which is acidic, makes the casein stop being soluble and, therefore, separates it from the rest of the milk (whey).

What we did was to sour the milk using vinegar. When the process occurs naturally, it is the lactic acid that causes the casein to separate (as when we leave the milk out of the fridge and it curdles).

The glue obtained in this experiment is a substance called sodium caseinate that results from the reaction between milk casein and sodium bicarbonate. The resulting mixture is quite homogeneous, looking like a "white glue" to buy. It works quite well, namely as paper glue. When it dries, it becomes transparent. It is biodegradable and can be discarded in the environment without any damage.







