# Procedure for producing Quark (Item No.: P7185200)

## Curricular Relevance

**Area of Expertise:** Chemie

**Education Level:** Klasse 10-13

**Topic:** Organische Chemie

**Subtopic:** Lebensmittelchemie: Fette, Kohlenhydrate, Aminosäuren/Proteine, Vitamine, Gewürze

**Experiment:** Verfahren zur Quarkherstellung

| Difficulty | Preparation Time | Execution Time | Recommended Group Size |
|---|---|---|---|
| Intermediate | 10 Minutes | 20 Minutes | 2 Students |

**Additional Requirements:**

**Experiment Variations:**

**Keywords:**

food chemistry, proteins, preparation of quark

## Task and equipment

## Information for teachers

## Additional Information

An extensive range of dairy products are offered in food stores. The procedures for producing them are almost exclusively based on acidification.

## Notes on content and learning objectives

- Quark is won by acidifying milk and subsequently separating off the whey.
- The quark so won is a mixture of protein (casein) and fat, from which cheese can be produced.
- The acidification of milk results in products which keep longer. The flocculation of casein is analogous to the start of digestion in the stomach.

## Notes on the method

This experiment illustrates a practical usage of protein coagulation. Other procedures for coagulating proteins are described in the experiment "Coagulation of proteins".
Point out that protein coagulation can also be seen in milk which is kept too long, it curdles and is then said to have gone "sour".

## Fundamentals and remarks

The production of quark and cheese takes place in several steps.
After cleaning the milk, it is adjusted to the wanted fat content by adding skim milk or cream. This adjusted milk is mostly now pasteurized. Starter cultures are added. The curdling (coagulation) of the milk is achieved by a combination of acidification (at 20 °C) and addition of rennet (at 40 °C). Lactic acid bacteria, so-called acid starters, also also often added.
Rennet is an enzyme obtained from calf's stomachs.
The separated milk protein containing fat, the break, is cleared from the whey by running off or pressing out the whey. After salting, the cured cheese is left to ripen.
Different sorts of cheese caan be produced by variation in the separation of the whey (=milk serum) and warming or ripening the break.

## Hints on going deeper

- Study trip to a dairy which processes milk.
- Extraction of lactose from whey.

## Notes on the set-up and procedure

Preparation:
Use fresh milk and not UHT milk for this experiment, as the high temperature to which the proteins in UHT milk have been heated impairs their curdling on acidification.

Notes on the students experiment:
Lactose ("milk sugar") can be deteced in the filtrate, which is called whey.
Filtration can be difficult, according to the temperature at which precipitation occurs. A linen cloth can be used as alternative to a fluted filter. A very dry "cake" can then be obtained by twisting and squeezing the cloth. Only quark which has been extremely well pressed is released for sale.

## Hazard and Precautionary statements

Acetic acid:

| | |
|---|---|
| H226: | Flammable liquid and vapour. |
| H314: | Causes severe skin burns and eye damage. |
| P280: | Wear protective gloves/protective clothing/eye protection/face protection. |
| P301 + P330 + P331: | IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. |
| P307 + P310: | IF exposed: Call a POISON CENTER or doctor/physician. |
| P305 + P351 + P338: | IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do – continue rinsing. |

## Hazards

- Acetic acid is caustic.
- Avoid skin contact with the liquid.
- Wear protective glasses and gloves.

## Waste disposal

The solutions can be diluted with water and poured to drain, or be used for further experiments.


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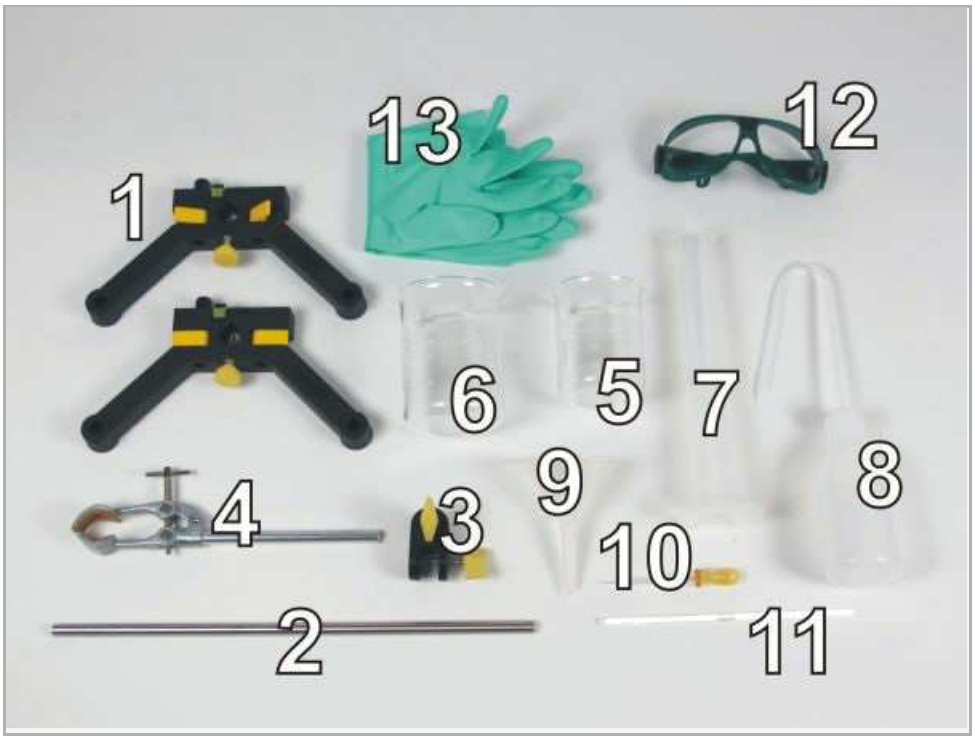
## Task and equipment

### Task

### How can quark be produced from full cream milk?

Win quark (curd cheese) from milk by protein precipitation.

## Equipment




| Position No. | Material | Order No. | Quantity |
|---|---|---|---|
| 1 | Support base, variable | 02001-00 | 1 |
| 2 | Support rod, stainless steel, l=370 mm, d=10 mm | 02059-00 | 1 |
| 3 | Boss head | 02043-00 | 1 |
| 4 | Universal clamp | 37715-00 | 1 |
| 5 | Glass beaker DURAN®, short, 250 ml | 36013-00 | 1 |
| 6 | Glass beaker DURAN®, short, 400 ml | 36014-00 | 1 |
| 7 | Graduated cylinder 100 ml, PP transparent | 36629-01 | 1 |
| 8 | Wash bottle, 250 ml, plastic | 33930-00 | 1 |
| 9 | Filter funnel, d = 75 mm, PP | 46895-00 | 1 |
| 10 | Pipette with rubber bulb | 64701-00 | 1 |
| 11 | Glass rod, boro 3.3, l=200mm, d=6mm | 40485-04 | 1 |
| 12 | Protecting glasses, clear glass | 39316-00 | 1 |
| 13 | Rubber gloves, size S (7) | 39325-00 | 1 |
| | Water, distilled 5 l | 31246-81 | 1 |
| | Acetic acid 99...100%, pure 1 l | 31301-70 | 1 |
| | Indicator paper, pH1-14, roll | 47004-02 | 1 |
| | folded filter,qual.,150 mm,100pcs | 47580-04 | 1 |
| Additional material | | | |
| | Pasteurized milk (not UHT milk!) | | |

# Set-up and procedure

## Set-up

## Hazards

- Acetic acid is caustic.
- Avoid skin contact with the liquid.
- Wear protective glasses and gloves!




## Setup

Assemble the stand as shown in figures 1 to 4.


Fig. 1


Fig. 2


Fig. 3


Fig. 4

Adjust the funnel so that it hangs upright above the 400 ml beaker (Fig. 5).

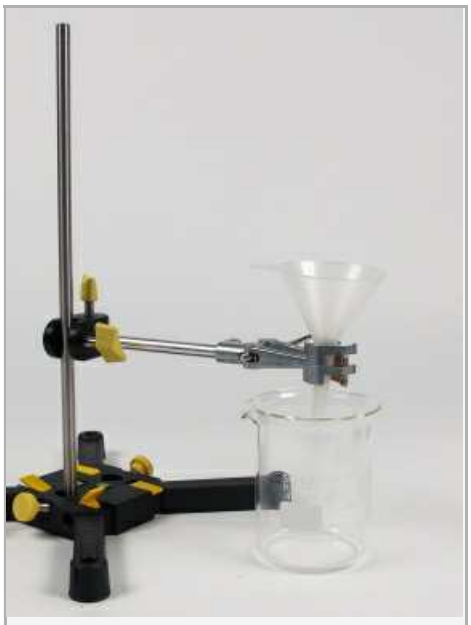


Fig. 5

## Procedure

Pour 50 ml of milk into a 250 ml beaker and add to it the same amount of water (Fig. 6).

Fig. 6

Add acetic acid dropwise, while stirring, until a flocculent precipitate is obtained (Fig. 7). Test the pH of the mixture with universal indicator paper.


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Fig. 7

Filter off the precipitate obtained in a fluted filter held in a beaker (Fig. 8). Put the filtrate aside.

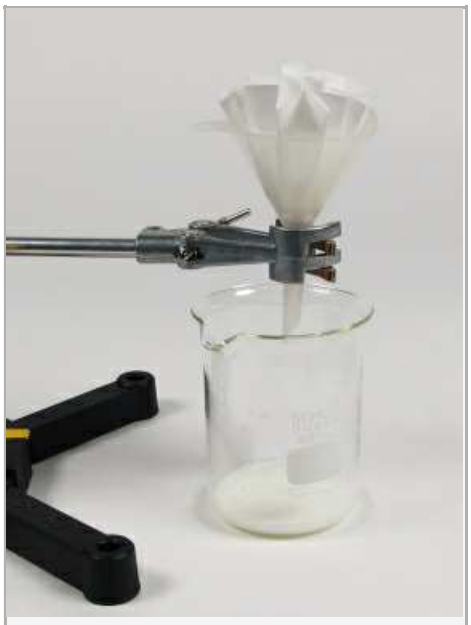

Fig. 8

Wash the residue in the filter three times with 20 ml distilled water (Fig. 9). After each 20 ml wash, use the glass rod to press liquid out of the residue.

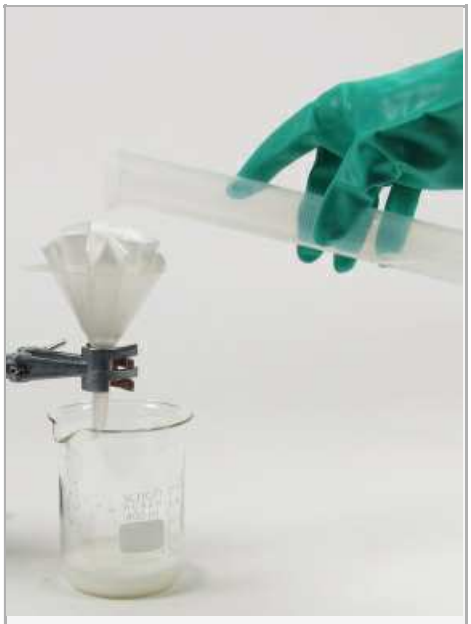

Fig. 9

## Waste disposal

The solutions can be diluted with water and poured to drain, or be used for further experiments.

# Report: Procedure for producing Quark

## Result - Observations

Note your observations.

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## Evaluation - Question 1

Draw conclusions from your observations.

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## Evaluation - Question 2

Which foodstuff can be procuced from the residue which you have isolated?

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## Evaluation - Question 3

Quark is produced with various fat contents.

Which types can be obtained in food stores?

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## Evaluation - Question 4

The fat content of quark and cheese is frequently given in % of the dry mass. Calculate the absolute fat content of a cheese in % from the following information:

Water content: 60 %

Fat in the dry mass: 45 %

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## Evaluation - Question 5

Complete the following statements.

1. Quark can be won by ..... milk and subsequently removing the .....
2. Quark consists mainly of .....