Comparison of raw milk and homogenised milk

(Item No.: P1442801)

Curricular Relevance

Area of Expertise: Biologie

Education Level: Klasse 5-7

Topic: Natur und Technik

Subtopic: Mikroskopie

Experiment: Vergleich von Rohmilch mit homogenisierter Milch

Difficulty	Preparation Time	Execution Time	Recommended Group Size
Easy	10 Minutes	30 Minutes	1 Student

Additional Requirements:

- Raw milk
- Homogenized milk with approx. 3,5% fat

Experiment Variations:

Keywords:

Task and equipment

Information for teachers

Information
Milk is an important basic food because it supplies the body with proteins for building up muscles, calcium for the stabilization of bones, and vitamins. Unprocessed fresh milk from the cow has a fat content ranging from 3.5 to 5 percent. The fat content of purchased milk is reported in percent and printed on the milk carton. The fat content of commercially available milk is either at 0.3%, 1.5% or 3.5%. Consequently, fat is withdrawn from the milk before it is sold and then the concentrations desired are subsequently added. Milk is homogenized in order to prevent the fat from floating on the surface in bottles or cartons. You will explore the effects of homogenization on the size of lipid droplets.

Information on obtaining materials
Raw milk can be obtained directly from a farming operation, a dairy company, or various health-food stores. It does not matter from which animal the raw milk comes, however, it should be comparable with the homogenized milk derived from the same mammal species. For this reason, cow milk is the best choice. Homogenized fresh milk (approx. 3.5%) from the supermarket should be available as a reference sample.

Information on milk
Milk has been an important basic food for over thousands of years. The preservation and refinement methods have been continually further developed. Pasteurization, centrifugation, and homogenization are the most important of these methods. Milk in its natural state creams, i.e. the fatty components, the cream, separates from the more aqueous phase and floats on the surface. This fat can be skimmed off and used as cream. A fat layer in fresh-milk bottles is not desired. The even distribution of fat consequential to homogenization is also required to achieve an agreeable taste.

Information on how to perform the experiment

ad 1: Examination of raw milk
The students must increase the resolving power to a maximum step by step view to examine the milk samples.
The lipid droplets of various sizes and the high proportion of large drops are distinctly recognizable in the photographic images.

ad 2: Examination of homogenized milk
The lipid droplets are very small and homogeneous in size in homogenized milk. Only few larger spherules are visible.

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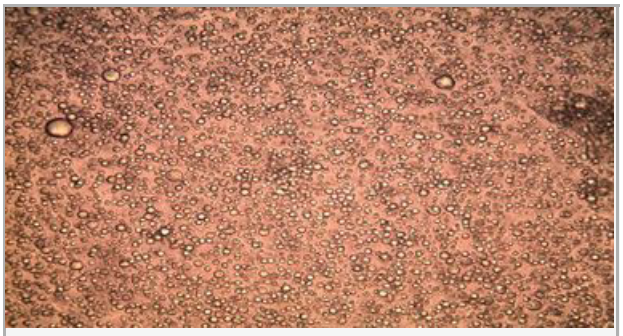

Raw milk, 400x

Fresh whole milk (for drinking), 400x

ad 3: Comparison
Description see ad 1 and 2.
The following formulation would be possible:
As a result of homogenization, very fine lipid droplets which are uniform in size are created.

ad 4: Which homogenization methods are used?
Milk is extruded through narrow jets with high pressure. The lipid droplets are broken down further once they hit a receiving sheet of metal. They are now small enough not to reunite and hence they will no longer be able to float on the surface.

Additional information:
It is currently still controversial whether homogenization could be harmful to human health. It is being discussed whether more or less other proteins concomitantly resulting from fragmentation could pass the intestinal walls of infants along with the lipids, and whether homogenization might perhaps thus stand in connection with an observed increase of milk allergies.

Additional experiment:
After microscopy, the samples are put into two large containers and left to stand in a refrigerator until the next lesson. The difference in creaming (sedimentation) behavior may be demonstrated this way.

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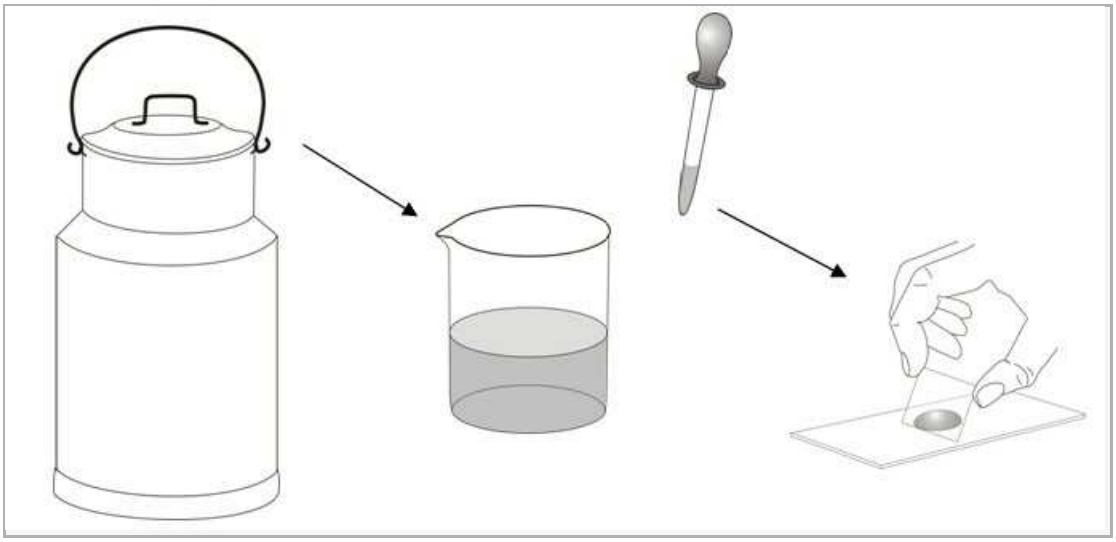
Comparison of raw milk and homogenised milk (Item No.: P1442801)

Task and equipment

Task

Compare raw milk with homogenized milk!



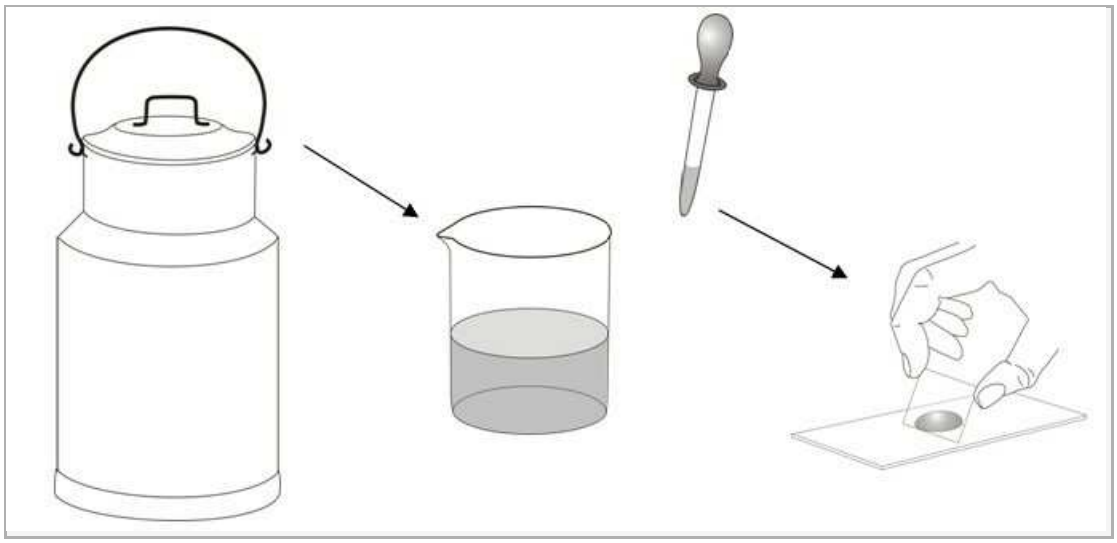
Equipment

Position No.	Material	Order No.	Quantity
1	Euromex BioBlue BB.4250 microscope	EUR-BB-4250	1
2	Microscopic slides, 50 pcs	64691-00	1
3	Cover glasses 18x18 mm, 50 pcs.	64685-00	1
4	Beaker, low form, plastic, 100 ml	36011-01	2
5	Dropping pipette with bulb, 10pcs	47131-01	1

Set-up and procedure

Methods and observations

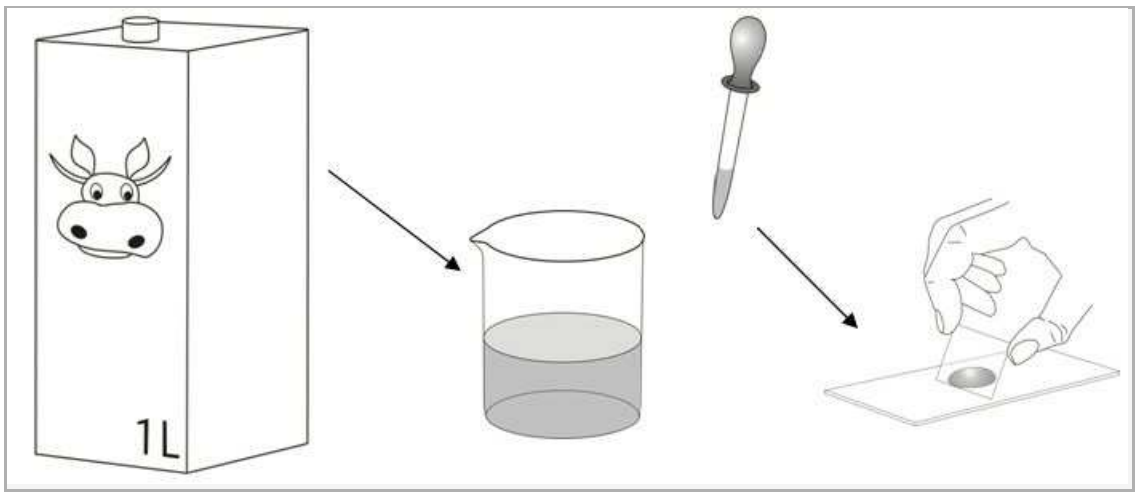
1. View raw milk under the microscope



Examine the specimens first with the lowest and then with the intermediate objective, finally, with the highest power.

Draw a sketch in the report.

2. View homogenized milk under the microscope



Draw a sketch in the report.

Report: Comparison of raw milk and homogenised milk

Result - Observations 1

Draw a sketch of the raw milk.

Result - Observations 2

Draw a sketch of the homogenized milk.

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Evaluation - Question 1

Compare your drawings. Describe the lipid droplets (shapes and sizes) of both samples.

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Evaluation - Question 2

Complete the following sentence:

As a result of homogenization, ...

.... are created.

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Evaluation - Question 3

Which homogenization methods are used?
Gather information either at a dairy company or on the internet how this processing method works!

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