For Students

Milk – Keep refrigerated

Task description

You surely are aware of how important milk and milk products are as food. In this activity, you will get to know the composition of milk and various kinds of milk. Further you will understand the role of acidity for the *precipitation*/*turning sour* of milk, and you will examine by experimenting yourself the effect of temperature on the increase of the acidity of milk. In addition you will prepare yogurt at home. Finally you will be able to distinguish between healthy food and non-healthy food products.

Phase 1

This phase consists first in your visiting of a supermarket or a local grocery shop, from where you *yourself* will purchase milk, and you will also observe the different kinds of milks available. You can do this in company with other classmates of yours.

_ i. At the shop, observe where these products are maintained, and take a record of different types of commercial available milk.

_ ii. Purchase one small carton EITHER of fresh full-fat milk OR of another carton of long-life sterilised milk. (Your teacher will arrange what kind of milk you must buy.)

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_ iii. At home, record on your notebook the composition of your commercially obtained milk, and place it in the refridgirator.
_ iv. Remember to bring this note along with you in school for the in-class discussion. This discussion will take place in your next chemistry class in school.

Phase 2

In this phase, you will examine at home the effect of temperature on the acidification of milk. You will use ONE of two kinds of milk for this activity. Fresh pasteurised milk OR long-life sterilised milk. You must have got from a shop a carton of the kind of milk assigned to you.

_ A.1. Record the expiration dates of your milk.
_ A.2. Open the carton, and split its content into three approximately equal parts, by placing them in plastic disposable cups. Label with a permanent marker the cups as 1, 2, 3. Leave cup 1 in the fridge. Place cup 2 in a normal spot in the house (e.g. somewhere in the kitchen). Place cup 3 in a hot spot in the house (e.g. near a hot radiator in winter time).
_ A.3. Every morning and evening examine the condition of the milk. Take cup 1, and If you observe that the milk has already precipitated, then fist approach it to your nose and smell it, record your findings, noting the time of your observation. If the milk appears normal, then take a small amount (not more than 10 mL) from the cup, put it in a GLASS, and place the glass in the microwave for about 15 seconds. (ASK YOUR MOTHER TO HELP YOU WITH USING THE MICROWAVE.) You must observe milk boiling. Take note of your observations. Repeat this process with the other two cups 2 and 3.

NOTE: Use only glass for heating the milk in the microwave.

Phase 3

In this phase, you will prepare yogurt at home. YOU WILL CARRY OUT THIS ACTIVITY AT HOME AFTER ONE WEEK AFTER STARTING phase 2.

Yogurt is the product of galactic fermentation of fresh milk under the effect of a culture. The culture contains in equal proportions *Sreptococcus Thermophilus*, and *Bactobacillus bulgaricus*. The latter produces the largest amount of galactic acid. Full-fat yogurt is produced ususally from

fresh milk. In this activity, you will prepare yogurt by using as culture a small amount of commercially available yougurt.

_ i. For this you will need fresh cow or sheep milk and ready natural yogurt obtainable from supermarkets. It is advisable to bye these products yourself from a supermarket or a local grocer. You can do this in company with other classmates of yours.

_ ii. At the shop, observe where these products are maintained. Also check and take a record of different types of commercial available yogurt.

_ iii. At home, record on your notebook the composition of your commercially obtained milk and yoghurt and place them in the refridgirator.

_ iv. Remember to bring this note along with you in school for the in-class discussion (Phase 3).

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You must ask your mother to help you with this preparation. She must do herself the boiling of the milk, and should collaborate with you in the other stages.

Procedure for yoghurt preparation

(*For the prepation of one portion*)

_ B.1. A quantity (140-200 mL) of cow or sheep milk is boiled for about 5 minutes.*

_ B2. After this, the milk is transferred to a porcelain cup or a glass, where it is allowed to cool down to 45^{o}C.

- To check the temperature, you can use a clean kitchen thermometer if it is available. *Never use for this purpose medical thermometers, especially mercury glass thermometers.* If a kitchen thermometer is not available, you can check the temperature by first washing and drying your hands, and then dipping one of your figures (the pointer) into the milk. To have the about right temperature, you figure must feel hot enough to maintain it for a short time into the hot milk. *Think of the explanation for this feeling*.

_ B.3. Then, a small quantity (less than a teaspoonful) from the commercially obtained yogurt, is diluted in a small quantity of cool boiled milk, added to the cup or glass with the boiled milk (at 45^{o}C), and the mixture is stirred well with a spoon.

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* *Boiling is necessary mainly to kill the unwanted micro-organisms. If milk precipitates during boiling, it is unsuitable for making yogurt. Milk containg antibiotics (that came from animal treated with them) is also unsuitable and cannot settle.*

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_ B.4. The so prepared mixture is left to settle at 45°C for 3-4 hours. (A simple method is to leave it in a hot spot of the house, placed in a proper container, which will be covered with a woolen cloth.)

_ B.5. After this, the yogurt is left to cool slowly of its own to room temperature and then placed in the fridge (at 5°C) where the settling is completed after a stay of 6-7 hours.

• Like milk, acidity of yogurt increases with time and with temperature. Therefore, the yogurt must be kept in the fridge, where it can be maintained for a relatively long time (about one week). Even in the fridge, its acidity increases, so it becomes more sour with time. Forrnation of *mould* on its surface is sign that the yogurt is unsuitable for eating.

Phase 4

In this phase, you will discuss in class your experiences from the activities with milk and yoghurt. To this purpose, you must have prepared before coming to class (at home) **statements** and/or **formulated epistemic questions** about their observations and data. You will also discuss and compare natural milk and yoghurt with other commercially available types of milk and yoghurt that contain various additives.

Natural foods versus foods with additives

A powdered milk to be used for coffee or tea has on the front part of its envelope the note “with vegetable fat”, and the following list of ingredients on the back side:

Glycose syrop, hydrogenated vegetable fat, milk protein, stabiliser: E340, anti-agglomerant: E551, emulsifier: E471, 433, colourant: E160a.

You will discuss in class the following questions. If you have any idea about any of these ingredients, discuss it in class.

- *Which of the ingredients correspond to actual milk ingredients?*
- *What is hydrogenated vegetable fat, and what is the purpose of its use?*
- *Which of the ingredients are additives foreign to milk, and what is their function?*
- *Are there any health dangers associated with any of the above additives?*

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