

The Journey from Milk to Curd

Have you seen the process of curd formation at home? You might have also tried doing it yourself! Have you ever wondered, why we always need to add that small amount of curd to milk so that milk turns into curd? Can the same process be done using lemon juice? How can one differentiate between spoiled milk and curd? How can milk be transported to long distances without getting spoiled?

In this learning unit, you would study curd formation from milk under different conditions and hence, try to understand what exactly changes when milk turns into curd. At the end of the unit, you should be able to come up with the best combination of conditions which would favor curd formation and also convert milk into curd in very little time.

Material Required

For one setup (a group of 3-4 students): 200 mL Milk (fresh), 20 mL curd (prepared at home), sodium bicarbonate, lemon juice, dilute acid (HCl or vinegar), baker's yeast, beakers, glass rod, glass slides, thermometer (0°C to 100°C) , gas burner or electric hot plate, refrigerator or ice (if available).

Before you begin with the main task, your teacher will conduct two small games for the class.

Task 1: Differentiate!

1. **Racing the Unknowns:** Take a drop of each liquid (milk and curd) on a glass slide and find the ways in which milk and curd can be differentiated.
2. **Smudge It:** Take a drop of each liquid on glass. Smudge each drop of it with your forefinger in a circular motion 5 times and answer the following questions:
 - How the spread is like - Uniform/even spread or dispersed into clumps?
 - Does the mass spread to the outer region of the smudged area or does it concentrate at the centre?

Preparing further for the task

- a) In the above task, how did you differentiate between milk and curd?

- b) Have you seen the process of making curd at home? What are the steps involved?

Task 2: Will it form curd?

Now, design an experiment to determine how temperature, chemicals and stirring might affect the process of curd formation. Note the details in the following table and the time when these were set up. If you wish to check the presence of any other substance or any effect of any other process on curd formation, you may do so.

Table 1: Experimental Setup

Beaker No.	Volume of Milk	Temperature of milk	Volume of curd	Extra Additions	To be kept at/in (surrounding temp)

- Keep the tubes/beakers in a warm place and observe the tubes every hour for any physical changes up to 6 hours.
- As soon as you observe any change in the milk samples, like thickening or clump formation, record the time, i.e. how many hours after addition of curd did you see the change? These observations can be recorded in table 2 below.
- Observe these samples further for changes in consistency. Use a litmus paper to monitor changes in acidity or basicity.
- Also, record any additional changes observed like change in smell or colour or texture.

Table 2: Observation table

Sr. No.	Condition	After how many hours do you see any change?	What kind of changes do you see?

Let's discuss

1. What changes did you observe in the tubes/ beakers for the conditions you tested?

2. Which condition you tested showed fastest curd formation and in how many hours?

3. Did you observe any change in the milk to which no curd was added? Do you think it will remain unchanged and why?

4. Which conditions favoured curd formation?

5. Why do you think a small amount of curd is to be added? Can curd formation occur even without adding that small amount of curd?

6. In which season, do you think, will curd formation happen fastest?

7. Other than curd, which substances did you add to milk? Did it speed up or slow down the process of curd formation? Why?

8. What do you think is added to milk so that it is transported to long distances to prevent its spoilage? Why?

9. Observe the tubes/ beakers to which lemon juice or dilute acids were added. Did you see curd being formed in them?

10. Why can't we get curd just by the addition of acids?

11. Did you observe the beakers in which a few granules of yeast were added? What can you infer from the experiment?

12. Did you or any group check if the process of stirring affects the curd formation? If yes, how did it affect?

13. In this experiment, we turned milk into curd. Can you turn curd into milk? Why or why not?

References

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2. Definition of curdle: <http://www.dictionary.com/browse/curdle?s=t>
3. Lactic Acid Bacteria: <http://www.encyclopedia.com/science/encyclopedias-almanacs-transcripts-and-maps/lactic-acid-bacteria>