The Science Lab

HOW DO PEOPLE MAKE CURD?

You will need:

Paper

Pen

What to do:

1. Become a journalist for a day and ask your parent/grandparent/others how they set curd.
2. Do some research online to identify recipes and things to keep in mind while starting a new batch of curd.

Record: what you learn from your investigation in the table.

Some questions	What you've learnt
What should a good batch of curd smell, look, and taste like?	
What kind of milk (e.g., cow, goat, buffalo, pasteurised, full fat, skimmed, soy) is best for curd?	
Does the milk need to be treated in any special way (e.g., cooled, boiled, warmed) to set curd?	
What should we add (~ starter) to milk to get a new batch of curd?	
Can we get a batch of curd if we leave milk aside for 5–8 h without adding anything to it?	
How long does curd take to set?	
What environmental conditions make curd setting faster/slower?	
What kind of containers (e.g., plastic, stainless steel, earthen) improve the quality of curd?	
*	
*	

Note: use the rows marked * to include other questions on curd formation that you think may be useful to learn about.

Discuss: what you learn about curd formation in class. Can you identify 3–4 things about curd formation that all your sources (yours and your classmates') agree upon?

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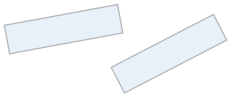
The Science Lab

HOW IS CURD DIFFERENT FROM MILK?

You will need:

Milk

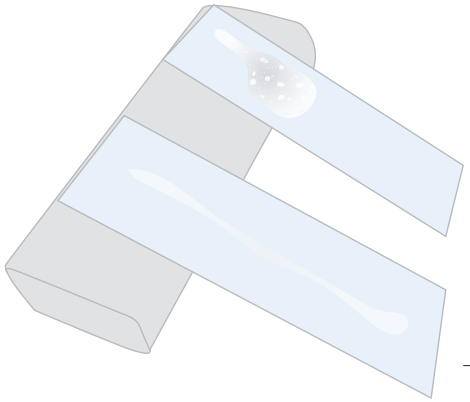
Curd



Glass slides

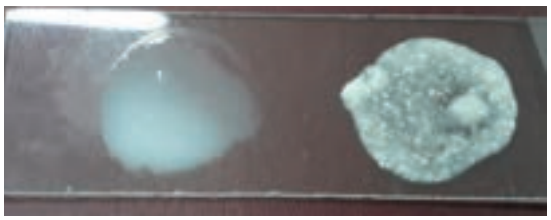
What to do:

1. Compare the smell of the milk and curd. Can you describe the smell of each in one word? What words have your classmates used to describe each of them?
2. Place a drop each of milk and curd on separate slides. Hold the slides up and tilt to compare their runniness.
3. Place a drop each of milk and curd, side by side, on a single slide. Smudge each drop separately moving your forefinger over it in circular motion at least 5 times. Compare the appearance of the two smudges.
4. Put a drop of milk on the corner of a pH strip. Do the same with curd to compare the acidity of the two liquids.



A drop of curd on a glass slide

A drop of milk on a glass slide



Photographic representation with milk (left) & curd (right)

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HOW IS CURD DIFFERENT FROM MILK?

Record: what you learn from your investigation in the table.

	Milk	Curd
How does it smell?		
How thick/runny is it?		
How uniformly does it spread? (Is the smudge even/clumped? Does it remain concentrated at the centre or does it disperse to the edges?)		
What is its pH?		
Others		

Discuss:

- Would you be able to identify a drop of curd by its:
  a. Smell?
  b. Runniness?
  c. Smudge pattern?
  d. pH?
- Which of these seems like a more reliable method to identify curd? Why?
- Can you think of other ways to tell milk and curd apart?

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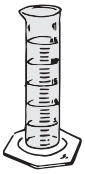
CURD FORMATION

You will need:

Milk

Curd



Measuring cylinder

Dropper

Beakers/bowls

What to do:

1. Design an experiment to determine conditions for curd formation within 6 h using:
   a. The lowest volume of milk.
   b. The lowest volume of curd.
   c. The ideal volume/volume ratio of milk/starter curd.
2. Set up the experiment and leave the beakers in a warm place.
3. Observe the contents of the beakers every hour and record the time point at which you notice the first change in physical consistency.
4. Continue observing the beakers every hour, recording changes in smell and pH.

Experimental set up:

Beaker no:	Volume of milk (ml):	Volume of curd (ml):	Incubation temperature:
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			

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CURD FORMATION

Observe: Record your observations in the table below

Beaker no:	Change in physical consistency (runny/semi-solid/solid) and pH (with time point of change)
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	
11.	
12.	

Discuss:

1. Can curd formation occur without adding any curd to milk? Why?
2. Why do you think some curd needs to be added to milk to get a fresh batch of curd?
3. What is the lowest volume of milk/volume of curd ratio that results in curd?
4. Which experimental set-up showed the fastest curd formation? How many hours did curd formation take in this set-up?
5. Which experimental set-up showed the slowest curd formation? How many hours did curd formation take in this set-up?
6. When did you notice the earliest signs of change:
   a. In physical appearance?
   b. In smell?
   c. In pH?
7. The aim of this experiment is to turn milk into curd. Do you think it is possible to turn curd into milk? Why?

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STARTER FOR A NEW BATCH OF CURD

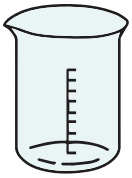
You will need:


Milk


Curd


Lemon juice


Red & green chillies


5 beakers/bowls

What to do:

1. Distribute equal volumes (20 ml) of warm milk in 5 beakers.
2. Label the beakers 1, 2, 3, 4, & 5 respectively.
3. Add:
   a. A few drops (1 ml) of curd to the milk in beaker 2.
   b. 4–5 drops of lemon juice to the milk in beaker 3.
   c. 1 whole red chilly and its (separated) stalk to the milk in beaker 4.
   d. 1 whole green chilly and its (separated) stalk to the milk in beaker 5.
4. Mix the contents of beakers 2–5 well with separate spoons.
5. Leave all the beakers aside at room temperature.
6. Observe the contents of the beakers after 10 minutes, 6 hours and 12 hours respectively.

Beaker	Time	Did you get curd? (Y/N)	Other observations (smell, pH, etc)
1.  Warm milk only	After 10 min		
	After 6 h		
	After 12 h		
2.  +  Warm milk Curd	After 10 min		
	After 6 h		
	After 12 h		

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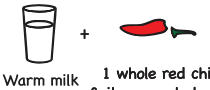
STARTER FOR A NEW BATCH OF CURD

Beaker	Time	Did you get curd? (Y/N)	Other observations (smell, pH, etc)
3.  Warm milk + A few drops of lemon juice	After 10 min		
	After 6 h		
	After 12 h		
4.  Warm milk + 1 whole red chilli & its separated stalk	After 10 min		
	After 6 h		
	After 12 h		
5.  Warm milk + 1 whole green chilli & its separated stalk	After 10 min		
	After 6 h		
	After 12 h		

Discuss:

1. Do the contents of beakers 2-5 have anything in common in their physical appearance, smell, or pH? If yes, what?
2. Are the contents of any of the beakers similar to that of 1? How, and till what timepoint in the experiment?
3. What are the main differences between the contents of beakers 2-5? When does this difference first become obvious?
4. Can we get a new batch of curd with any starter that increases the acidity of milk? Why?
5. Do you think adding a combination of curd + chillies, or curd + lemon juice, or curd + chillies + lemon juice alters the process of curd formation in any way? How, and why?
6. Can you design an experiment to test your prediction?

To ponder upon:

What do you think would happen if you:

- Use cold or boiling hot milk in Step 1?
- Use fresh/ 1-day old/ 2-day old/ 3-day old curd in Step 3a?
- Use some store-bought pasteurised yoghurt in Step 3a?
- Boil curd before adding it in Step 3a?
- Use double or triple the amount of lemon juice in Step 3b?
- Leave the stalks intact in 3c & 3d?
- Leave out Step 4?

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DOES THE TEMPERATURE OF MILK MATTER?

You will need:

60 ml milk (fresh)

3 ml curd

3 beakers/bowls

What to do:

1. Label the beakers 1, 2 & 3 respectively.
2. Pour 20 ml of:
   a. Refrigerated milk in beaker 1.
   b. Boiling-hot milk in beaker 2
   c. Milk that is warm enough to touch in beaker 3.
3. Add 1 ml each of curd to the three beakers.
4. Mix the contents of each beaker well with separate spoons.
5. Leave the 3 beakers at room temperature.
6. Test the contents of the beakers (for smell/runniness/smudge & pH) after 10 minutes, 4 hours, and 6 hours respectively.

1

Warm milk + curd
37 - 40˚C

2

Hot milk + curd
> 45˚C

3

Cold milk + curd
4-10˚C

4

Milk only

Observe:

Are the contents of the beakers different in any way? Record your observations in the table.

Beaker	Time	Did you get curd? (Y/N)	Other observations
1.	After 10 min		
	After 4 h		
	After 6 h		
	After 12 h		

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DOES THE TEMPERATURE OF MILK MATTER?

2.	After 10 min		
	After 4 h		
	After 6 h		
	After 12 h		
3.	After 10 min		
	After 4 h		
	After 6 h		
	After 12 h		

Discuss:

1. Is the initial temperature of milk important in curd formation? In what way?

2. Is the beaker with cold milk any different from the one with boiling hot milk after 6 h? How, and why?

3. Do you think you'd get different results if you increased the volume of starter curd you added to the beakers with milk in Step 3? Why? Can you think of an experiment to test your prediction?

4. Do you think you'd get different results if you incubated the milk in Step 5 at warmer (~37°C) or cooler (~4–12°C) conditions? Why? Can you think of an experiment to test your prediction?

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