



## Curiosity Guide #801

### Fruit Science

Accompanies Curious Crew, Season 8, Episode 1 (#801)

#### Fruit Curdlers

Investigation #9

#### Description

What do sour milk, cheese, and cottage cheese all have in common?  
You may be surprised!

#### Materials

- Fresh pineapple
- Fresh lemon
- Knife
- Blender
- 2 cups
- 2 small clear jars with lids
- Teaspoon measure
- Skim milk
- Strainer

#### Procedure

- 1) Peel the lemon and squeeze the juice into a small cup. Set aside.
- 2) Cut part of the fresh pineapple. Place the pineapple pieces in a blender to puree them.
- 3) Pour the puree through a strainer over another cup to extract some fresh pineapple juice.
- 4) Pour some milk into each of the jars.
- 5) Add one teaspoon of fresh lemon juice to one jar of milk.
- 6) What do you notice?

- 7) Try swirling the milk and observe. What do you notice now?
- 8) Add 1 teaspoon of pineapple juice to the second jar of milk.
- 9) What do you observe?
- 10) Again, try swirling the milk and observe. Did anything change?
- 11) Place the lids on each jar. Observe the jars later to compare.

## My Results

## Explanation

Milk is an emulsion, with milk fats suspended in water. The milk itself has proteins, including whey and casein. The casein does not suspend well in water without the support of other proteins called micelles. The micelles provide a spherical structure to suspend the casein. The spherical structure of the micelles changes under certain conditions. When this happens, the micelles release the casein, which allows the casein proteins to clump together. We call clumping together "curdling."

This curdling process is the beginning stage of making cheeses and can be achieved in different ways. Lemon juice quickly affects the milk. This is because the acid in the lemon juice changes the pH level and quickly disrupts the micelle structures so the casein can clump. Disruption to the micelles structures happens naturally to milk as the milk gets old and begins to sour on its own.

The pineapple juice separates the casein differently. Pineapple juice is not acidic like the lemon juice. Instead, the pineapple has protease enzymes that break apart the micelle structures to free the casein proteins. Although curdling does not happen as quickly with the pineapple, pineapple juice will separate the milk, too. The remaining liquid is called whey, which is mostly water with tiny amounts of lactose and whey proteins. The curds are cottage cheese.

**Try this!** Most people enjoy fresh fruit, but dried fruit is a great snack, too. Choose the fruits you'd like to include, such as pineapples, bananas, apples, pears, peaches, plums, strawberries, mangoes, or berries. First peel the washed fruit if necessary and remove the seeds. Then slice the fruit into thin slices. You can either dunk the fruit in lemon juice or sprinkle with sugar to help keep the fruit from browning. Lay the fruit pieces on a baking pan with parchment paper and heat in a 200-degree oven for 3 to 5 hours until the edges dry and the fruits begin to shrivel. Let the treats cool on a rack and then enjoy. Yum, that's one in a melon!

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