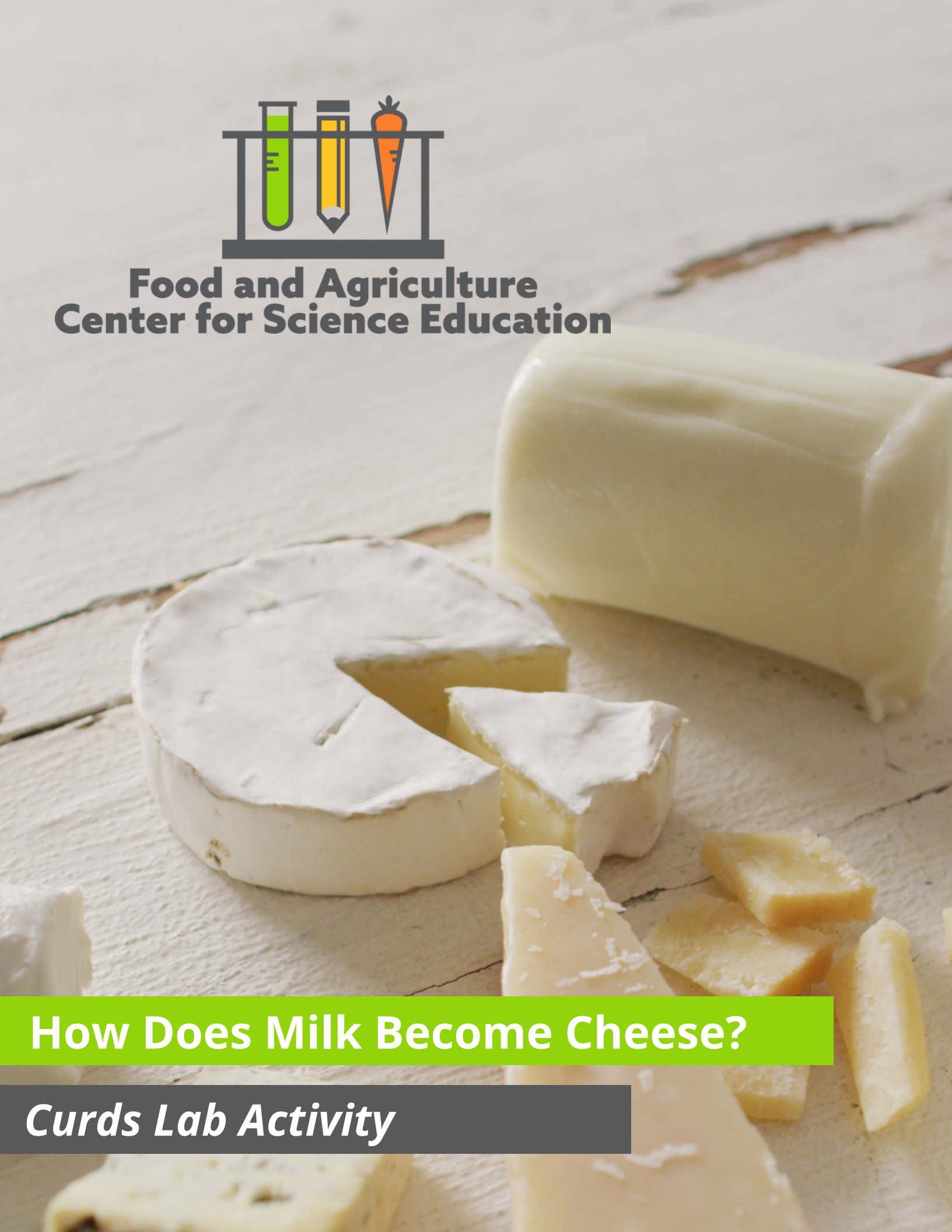

Food and Agriculture
Center for Science Education

How Does Milk Become Cheese?

Curds Lab Activity

Science Explanation

Milk is a colloid. A colloid is a heterogeneous liquid in which particles are suspended in the solution rather than fully dissolved. For milk, this means tiny globs of butterfat (a protein) are suspended throughout the liquid.

Lemon juice, an acid, lowers the pH of the milk. The lower pH causes the casein particles to stick together and appears as solid chunks or curds. Casein is one of several proteins found in milk. When milk is a colloid, casein has a negative charge. Since negative charges repel, casein won't stick together or coagulate. The addition of the acid lowers the milk's pH. The lower pH neutralizes the charge on the surface, allowing the casein particles to stick together or coagulate. Coagulation and denaturing of milk proteins (through acid and heat or the addition of enzymes) are essential in processing milk into other food products.

Material List

- 1 cup of whole milk
- 1/2 cup of lemon juice
- Mug warmer or hot plate
- Spoon
- 1 cup measuring cup
- 1/2 cup measuring cup
- pH strips

Procedure

1. Make observations about the milk. Record these observations in Table 1, Milk observations (at start).
2. Test the pH of regular milk and record the milk's pH in Table 1, Milk pH (at start).
3. Mix one (1) cup of warmed milk with ½ cup of lemon juice. Stir until curds appear.
4. Record your observations in Table 1, Milk observations (after lemon juice).
5. Test the pH of the milk with curds. Record this in Table 1, Milk pH (after lemon juice).

Observations

TABLE 1

Milk observations (at start)		**Milk observations (after lemon juice)**	
Milk pH (at start)		**Milk pH (after lemon juice)**	

Encourage Further Experimentation:

Notice: Explain how the milk's appearance becomes different when acidic lemon juice is added.

Wonder: Why does the milk change with the addition of acidic lemon juice?

Question: Would all milk produce similar results?

Predict: How might the results vary if we used a different type of juice (orange, pineapple, lime)?

Source: https://www.youtube.com/watch?v=m9sIBgfllFs