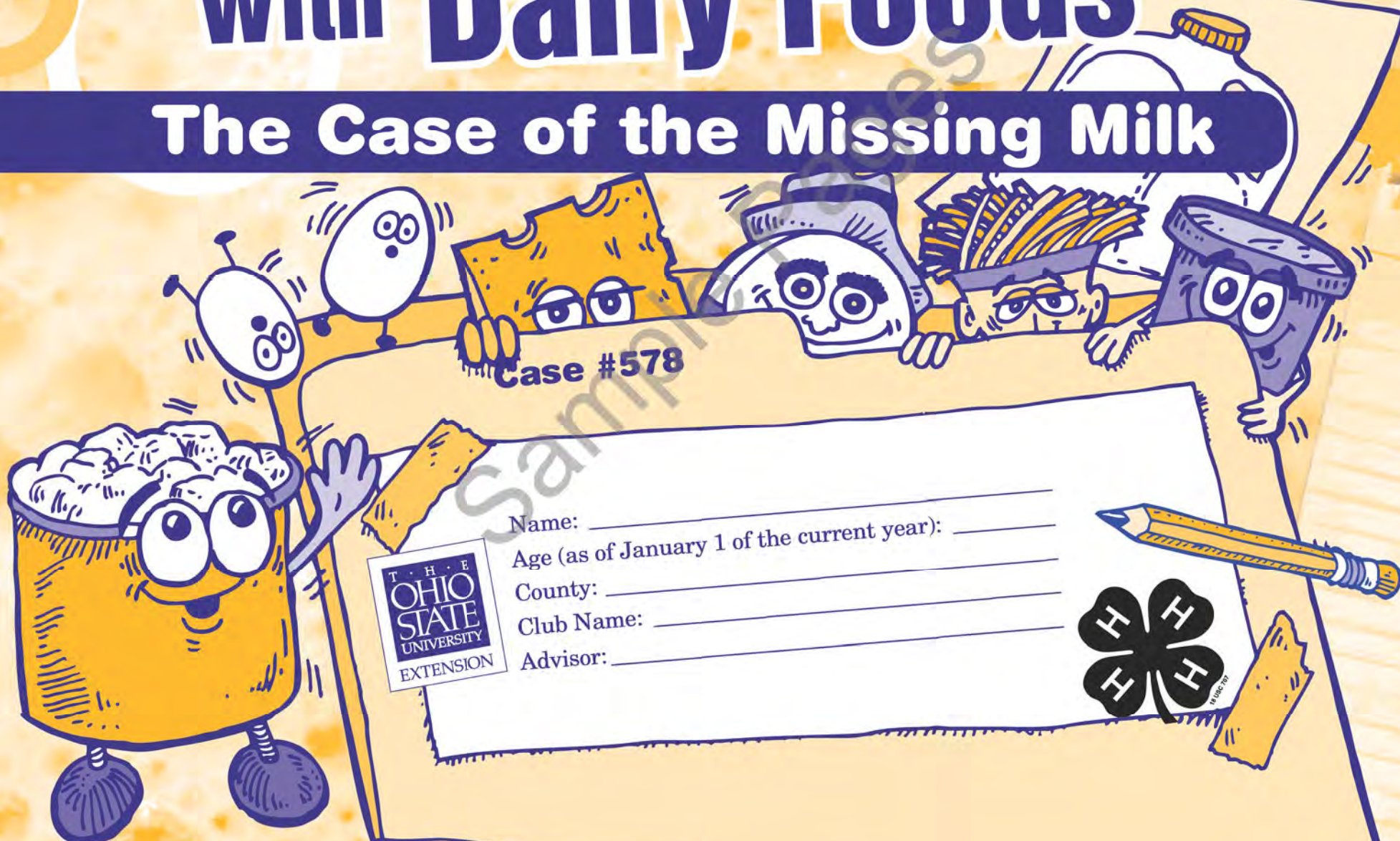


Science Fun With Dairy Foods

The Case of the Missing Milk



Case #578



Name: _____
Age (as of January 1 of the current year): _____
County: _____
Club Name: _____
Advisor: _____



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Contents

Notes to the Project Helper _____	2
Member Project Guide _____	4
Activity 1: Background Check on Milk _____	8
Activity 2: Tracking Milk's Movement _____	12
Activity 3: Shaking Up the Suspects _____	16
Activity 4: Turning On the Heat _____	20
Activity 5: Mixed-Up Milk _____	24
Activity 6: Bringing in Back-Up _____	28
Glossary _____	33
Shopping List _____	34
Investigational Tools List _____	34
Summary of Learning Outcomes _____	35
Photos _____	36

Member Project Guide

Welcome to *Science Fun with Dairy Foods: The Case of the Missing Milk!* This project is designed for 4-H members with beginning-level skills with science experiments. After completing this project, you are encouraged to explore other Science, Technology, Engineering, and Math (STEM) and Food and Nutrition project books.

Check your county's project guidelines (if any) for completion requirements in addition to the ones below, especially if you plan to prepare an exhibit for the fair.

We know you're new to the Dairy Police Task Force. Follow the instructions below, and you'll be on your way to solving this case.



Investigation Guidelines

Step 1: Complete **all six** activities.

Step 2: Take part in **at least two** Super Sleuth Learning Experiences.

Step 3: Become involved in **at least two** Leadership/Citizenship Activities.

Step 4: Complete a Project Review.



You might want to take photos and have photos taken of yourself as you conduct the experiments throughout this book. Space has been provided for your photos on pages 36–37.

Step 1: Activities

Complete **all six** activities. The More Challenges activities are optional but might bring you closer to solving the case. Like any investigator, you need to take good notes. When you begin an activity, jot down the date you start it. When you finish an activity, review your work with your project helper. Then, ask your project helper to initial and date your findings.



Activities	Date Started	Date Completed	Project Helper Initials
1: Background Check on Milk			
2: Tracking Milk's Movement			
3: Shaking Up the Suspects			
4: Turning On the Heat			
5: Mixed-Up Milk			
6: Bringing in Back-Up			

Step 2: Super Sleuth Learning Experiences

Super Sleuth Learning Experiences are meant to complement project activities, providing you with a chance to investigate the milk mystery in more detail. What are some Super Sleuth Learning Experiences you could do to show the interesting things you are discovering about the milk mystery? Here are some ideas:

- Attend a clinic, workshop, demonstration, or speech on a topic related to dairy products.
- Help organize a club meeting based on this case.
- Go on a related field trip, or tour a local dairy farm.
- Host a workshop to share tips about dairy products.
- Prepare your own demonstration, illustrated talk, or project exhibit.
- Participate in county judging.



Once you have a few ideas, record them here. Complete **at least two** Super Sleuth Learning Experiences. Then, describe what you did in more detail, and ask your project helper to date and initial in the appropriate spaces.



Plan to Do	What I Did	Date Completed	Project Helper Initials
<i>Demonstration</i>	<i>Showed club members how milk can be made into ice cream using two plastic bags, ice, and some salt.</i>	<i>5/5/YR</i>	<i>S.C.</i>

Step 3: Leadership and Citizenship Activities

Choose **at least two** Leadership/Citizenship Activities from the following list (or create your own), and write them in the table below. Record your progress by asking your project helper to initial next to the date as each one is completed. You may add to or change these activities at any time. Here are some examples of Leadership/Citizenship Activities:

- Teach someone about the various kinds of dairy products.
- Help another member prepare for his or her project judging.
- Help organize a club field trip to a local ice cream factory.
- Encourage someone to enroll in *Science Fun with Dairy Foods*.
- Arrange for someone to speak to your club about dairy products.
- Plan your own Leadership/Citizenship Activity.



Leadership/Citizenship Activity	Date Completed	Project Helper Initials
<i>Organized a club field trip to the local ice cream plant.</i>	<i>5/5/YR</i>	<i>S.C.</i>

Activity 1: Background Check on Milk

Welcome to the Dairy Police Task Force!

Learning Outcomes

Project Skill: Learning about different kinds of dairy products

Life Skill: Thinking critically, navigating your environment

Educational Standard: NGSS 2-PS1-1. Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties

Success Indicator: Researches dairy products and discovers their properties

Glossary

Words in **bold** throughout this book are defined in the glossary.



Case #578 Facts:

A local family just reported that milk has disappeared from their refrigerator. The milk was in the fridge in the morning, but then it disappeared! We don't know if it was stolen or if something more sinister happened.

You are the lead detective on this case. Throughout these six activities, ask questions, make observations, and do some tests to find out what happened to the milk. With your scientific knowledge and investigative skills, we're hoping you can crack this case and help find the missing milk.

Before you can figure out where the milk went, you need to learn more about it. Where did it come from? How was it made? How do milk varieties compare with one another?



Start Investigating

Go to the dairy aisle in your local grocery store. What kinds of dairy products can you find there? Note the items below.

Time needed: 20 minutes

Gather Your Investigational Tools:

- | | | |
|-----------------|-------------------|-------------------------|
| 1 cup skim milk | 1 cup whole milk | 4 glasses |
| 1 cup 1% milk | 1 cup heavy cream | 1 one-cup measuring cup |
| | | 1 food scale |



Now Investigate:

- Pour a small glass of each milk variety. Note how it looks while being poured. Is it thin or thick? Does it flow slowly or quickly? Write your observations in the chart below.
- Sip each milk sample. In the chart, note how the milk feels in your mouth. Is it watery, thick, or creamy?
- What does each milk variety smell like? Note that in the chart, too.
- Place your measuring cup on the scale, and set the scale to zero. Fill the measuring cup with one of the milk varieties. How much does it **weigh**? Note the measurement in the chart, and repeat for each milk type. Rinse out and dry the measuring cup between varieties.

	It looks...	It flows...	It tastes...	It smells...	It weighs...
Skim Milk					
1% Milk					
Whole Milk					
Heavy Cream					

Outline the Facts

SHARE How difficult was it to fill out the chart? _____

REFLECT Are all milk varieties the same? Why or why not? _____

GENERALIZE Which milk varieties do you find drinkable? Which ones aren't? Why? _____

APPLY How does your family use different milk varieties? _____



More Challenges

Dairy products such as milk solids, skim milk powder, whey powder, sodium caseinate, and lactose are found in foods in and outside of the dairy aisle, too. The next time you and one of your parents go to the grocery store, see how many foods you can find with these dairy products listed in their ingredients in aisles other than the dairy aisle.



Did You Know?

A cow gives almost 200,000 glasses of milk in her lifetime. That's 25,000 gallons!

Source:
www.bordenonline.com

Resources

The Dairy Connection:
www.nationaldairycouncil.org

Background Information

People have been drinking milk for centuries. It comes from mammals (animals that nurse their young) such as dogs, cats, and whales. Cows, goats, and sheep have an udder, a bag-like organ that contains mammary glands where milk is produced. When animals eat grass, they **digest** the grass. Then, the vitamins and minerals in the grass go into the animal's bloodstream. The nutrient-rich blood goes to the animal's mammary glands and gets converted by cells into milk. Converting a meal into milk can take a long time. A typical dairy cow takes 50–70 hours to convert her meal of grass into milk!

Regardless of the kind of animal that milk comes from, milk is the most complete food you can eat. With all its important nutrients, milk is an essential part of keeping you healthy and strong. It provides energy to help fuel your body, and the protein in milk helps you grow, repair muscles, and build tissue.

Sources

King, Hazel. *Milk and Yogurt (Food in Focus)*. Chicago: Heinemann-Raintree, 1998.

Ross, Catherine, and Susan Wallace. *The Amazing Milk Book*. Addison-Wesley, 1991.