

YEAR

2 – 3

Magic Milk



40 mins

METHOD:

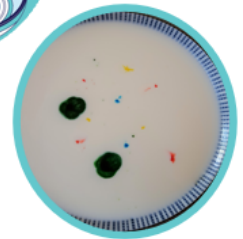
MATERIALS

- Full fat cows milk.
- Water.
- 2 x shallow dish.
- Liquid dishwashing detergent.
- Cotton bud sticks.
- Liquid food dyes in assorted colours.

1. Pour the milk into 1 dish & water into the other.



2. Place drops of the various food colourings into the centre of the milk & water.



3. Place some of the detergent onto a plate/bowl and dip a cotton bud stick in it until the end is well covered.

4. Tap the cotton bud stick gently on the surface of the water. Repeat with the milk and observe the magical results.



WHY?



The reason the colourful dyes move so magically around in the milk when detergent is applied is because of surface tension. Surface tension is like an elastic web of liquid molecules on top of the liquid and when they are disturbed they move around & then reform. The detergent also reacts with the fat in the milk to make many mini chemical reactions within the milk which keep the liquid molecules moving for longer.

Magic Milk Experiment

Lesson Outline:

Time allocation: 40 minutes

Format: Group work.

Student outcomes:

- Visualize the scientific principle of surface tension.
- Understand the composition of milk and how the molecules in milk undergo a chemical reaction with the detergent.
- Enhance food literacy and food experience skills.

Materials:

FOR EACH GROUP

- full fat cow's milk
- water
- 2 shallow dishes (saucer/bowl/Styrofoam tray)
- several food colourings of differing colours
- liquid dishwashing detergent
- cotton bud sticks
- Step by step instructions for student groups (printed or displayed on screen)

Optional/ Extra Material:

Preparation:

Prior to the experiment assemble all the necessary items for the children to work in groups of 2 – 4 students.

Setup: 5 mins

Set up enough individual work stations to cater for the number of groups in your class. Supply each group/ station with the necessary supplies to perform the experiment. You may wish to have only one larger carton of milk/ water that can be passed around the groups when required as opposed to individual portions at each station.

Introduction: 2 mins

In this experiment we are going to explore the magical world of milk and make some beautiful dancing rainbows. The experiment will also see if the same thing happens with water.

Activity: 30 mins

Place the students into groups at their experiment stations and direct them to use the step-by-step guide to create their own 'magic milk'.

Ask: What happened when you put your cotton tip into the water? Did the same thing happen in the milk?

Ask: Does anyone think they know why the food colouring moved around? Does anyone know why it was better in the milk than the water?

The experiment relies upon disrupting the surface tension of the liquid.

Surface tension is like a stretchy elastic membrane of the liquid molecules on top of the liquid. When it gets broken it moves and reforms as all the old and new liquid molecules move around.

When we use milk the fat & protein molecules in the milk have been manipulated at the processing factory to be blended throughout the milk so that the creamy fat molecules do not rise to the top (homogenised/homogenisation).

Detergent molecules work by being attracted to fat and oil so that when we are cleaning dishes and clothes the dirt reacts with the detergent and lifts off the object we want to clean.

This means that in the experiment the liquid molecules in the milk not only move when the surface tension is broken but also react chemically with the detergent molecules, forming lots of mini reactions between the fat and detergent molecules that keep the liquid moving for longer.

You may choose to play the Questacon demonstration here, which performs and explains the experiment.

Conclusion: 2 mins

We have learnt that liquids have tension on their surface which can get disturbed or broken and move.

We also have learnt that depending on what molecules are in the liquid they can behave in different ways.

In this experiment we learnt a little about detergent molecules and the way in which milk is made and how they chemically react together.

Take away message:

- Milk really is quite magical; not only is it full of essential nutrients but the ingredients within it can be manipulated during processing, and even used in experiments to perform chemical reactions.
- Processing milk in different ways is also why we see so many different types of milk available in the supermarket.

Extension activity:

Students could compare other liquids within their experiment design; such alternative milks (soy/ oat), low fat milk and oil. Making predictions, recording, and comparing their observations about how each type of liquid behaves.

Further Topic Inquiry:

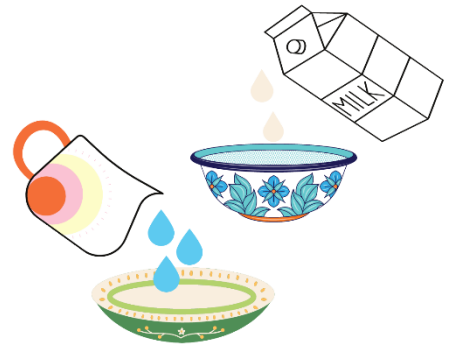
This experiment can be further explored within the context of the Health & Physical Education, Science and Design & Technologies curriculum. Providing an opportunity for students to develop strategies to ensure safety and wellbeing at home and at school, such as identifying and choosing healthier foods and drinks for themselves. Recognising the benefits food technologies provide for health and food safety and ensuring that a wide variety of food is available and can be prepared for healthy eating. Developing sound knowledge of chemical and physical science.

Refresh.ED provides unit resources for specific year groups within their Food & Drink Choice, Food & Drink Experience, Food & Drink Source and Food, Drink & Health focus areas. Of particular interest in relation to extending learning within this area are the units.

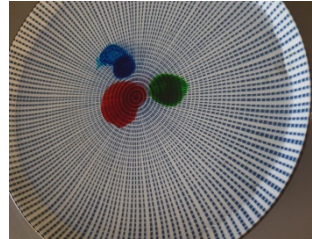
- Year 1 Choosing Food Groups.
- Year 2 Introducing Serves.
- Year 3 Eating for Variety.
- Year 4 Balanced Diet

STEP – BY – STEP MAGIC MILK EXPERIMENT

1. Pour a little of the milk into one dish and water into the other dish. Enough to cover each dish well, about 1-2 cm deep.



2. Place several dots of food colouring into the centre of both the milk and water dishes.



3. Dip a cotton bud stick into the dish of water several times and observe what happens.
4. Now take a cotton bud stick and dip it into the liquid detergent, making sure it is nice and covered.
5. Dip the cotton bud stick into the dish of milk several times and observe what happens.

Overview

In this experiment students are introduced to the scientific principle of surface tension. This experiment also provides an opportunity to further develop understanding of nutrition through learning centred around the molecular structure of milk.

Some key new vocabulary students will be introduced to include: surface tension, detergent, fat and protein molecules, homogenisation.

Key Messages

- Surface tension can be visualized using a fatty liquid, coloured dyes and liquid detergent.
- Science is involved in the manufacture of what we eat and drink.

Learning Outcomes:

- Understand the scientific understanding principle of surface tension.
- Visualize disruption to the surface tension of a liquid.
- Enhance food literacy and food experience skills.

General capabilities:

Literacy, Critical & creative thinking, Personal & social capability.

Year 2 Australian Curriculum Links

| Strand/ Sub- strand | Curriculum content descriptions |
|---|---|
| HEALTH & PHYSICAL EDUCATION | |
| Personal, social & community health. <i>Being healthy, safe & active.</i> | Recognise situations and opportunities to promote health, safety and wellbeing: exploring how eating healthy foods can influence health and wellbeing (ACPPS018). |
| SCIENCE | |
| Science understanding. <i>Chemical sciences.</i> | Different materials can be combined for a particular purpose (ACSSU031). |
| Science as human endeavour. <i>Nature & development of science.</i> | Science involves observing, asking questions about, and describing changes in, objects and events (ACSHE034). |
| Science inquiry skills. <i>Planning & conducting.</i> | Participate in guided investigations to explore and answer questions (AC SIS038). |
| ENGLISH | |
| Literacy. <i>Interacting with others.</i> | Listen for specific purposes and information, including instructions, and extend students' own and others' ideas in discussions (ACELY166). |
| TECHNOLOGY | |
| Design technologies. <i>Knowledge & understanding.</i> | Explore how plants and animals are grown for food, clothing and shelter and how food is selected and prepared for healthy eating (ACTDEK003). |
| <i>Processes & production skills.</i> | Sequence steps for making designed solutions and working collaboratively: identifying roles for each member of a group when working collaboratively (ACTDEP009). |

Additional Year 2 WA Curriculum Links

| Strand/ Sub- strand | Curriculum content descriptions |
|--|---|
| TECHNOLOGY | |
| Design technologies. <i>Knowledge & understanding:</i> <i>Technologies & society.</i> | People design and produce familiar products, services and environments to meet local and community needs (ACTDEK001). |
| <i>Food & fibre production.</i> | Food and fibre choices for healthy living (ACTDEK003). |
| SCIENCE | |
| Science inquiry skills. <i>Processing & analysing data & information: communicating.</i> | Represent and communicate observations and ideas in a variety of ways (AC SIS042). |

Year 3 Australian Curriculum Links

| Strand/ Sub- strand | Curriculum content descriptions |
|---|--|
| HEALTH & PHYSICAL EDUCATION | |
| Personal, social & community health. <i>Being healthy, safe & active.</i> | Identify and practise strategies to promote health, safety and wellbeing (ACPPS036). |
| SCIENCE | |
| Science inquiry skills. <i>Planning & conducting.</i> | With guidance, plan and conduct scientific investigations to find answers to questions, considering the safe use of appropriate materials and equipment (AC SIS054). |
| <i>Questioning & predicting.</i> | With guidance, identify questions in familiar contexts that can be investigated scientifically and make predictions based on prior knowledge: working in groups to discuss things that might happen during an investigation (AC SIS053). |
| ENGLISH | |
| Literacy. <i>Interacting with others.</i> | Listen to and contribute to conversations and discussions to share information and ideas and negotiate in collaborative situations (ACE LY1676). |
| TECHNOLOGY | |
| Design technologies. <i>Knowledge & understanding.</i> | Investigate food and fibre production and food technologies used in modern and traditional societies (ACTDEK012). |

Additional Year 3 WA Curriculum Links

| Strand/ Sub- strand | Curriculum content descriptions |
|--|--|
| SCIENCE | |
| Science inquiry skills. <i>Processing & analysing data & information: communicating.</i> | Represent and communicate observations, ideas and findings using formal and informal representations (AC SIS060). |
| TECHNOLOGY | |
| Design technologies. <i>Technologies & society.</i> | Role of people in design and technologies occupations. Ways products, services and environments are designed to meet community needs (ACTDEK1010). |
| <i>Technologies context: engineering principles & systems.</i> | Forces, and the properties of materials, affect the behaviour of objects (ACTDEK011). |

External Supporting Resources for Teachers

- **National Science & Technology Centre** (NSTC Canberra): Demonstration & explanation of the experiment.

<https://www.youtube.com/watch?v=K0QXTANGvZc>

- **Discover Dairy Australia:** How milk is made (processing overview).

<https://www.youtube.com/watch?v=QfrRaQp1MMU&t=4s>