

2017 Experiment Challenge

Let Kids Love Food -

Ginger milk curd

Clara Hui, Tiffany Wai

Marymount Secondary School (Team B)

16 Years Old



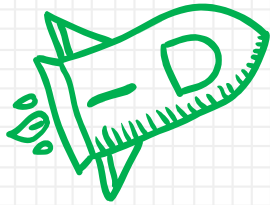
Introduction of Ourselves



Clara Hui

Tiffany Wai

- We are students coming from Marymount Secondary School.
- **We love Chemistry** as it is fun and related to every aspect of our lives.
- As simple as a daily activity such as **cooking**, there is already a lot of science in it. So we hope to explore the **Magical Science** behind the cooking of **FOOD** with **KIDS** and enjoy the “**AHA**” moment together.



Ginger Milk Curd

A Traditional Chinese Dessert,
made by pouring hot milk into ginger juice.



Big Question:

Why does the milk change to curd by
mixing with ginger juice?

Target Age Group : 10-12 year old



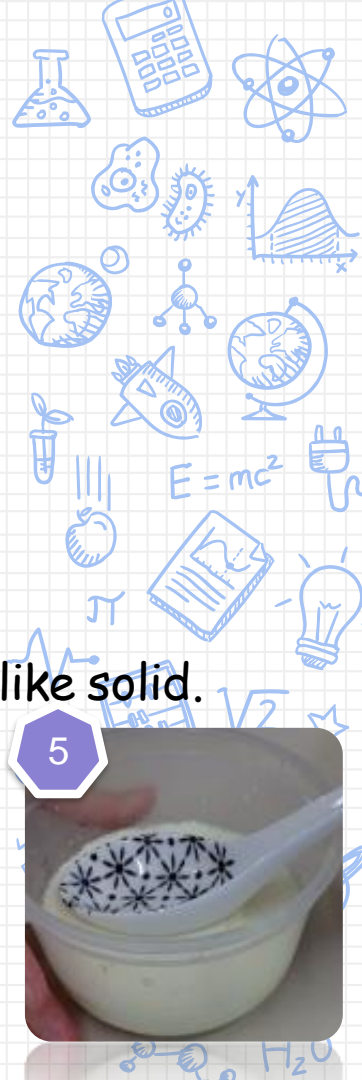
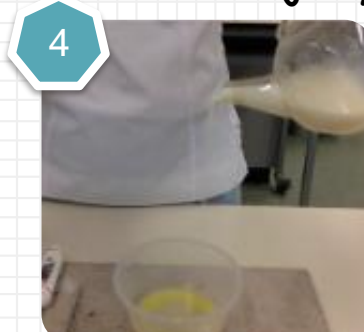
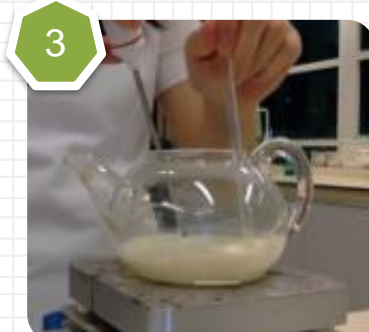
Procedure*

*Please watch the video to know more about the apparatus and the procedures.

(video of the successful way making it)

Steps:

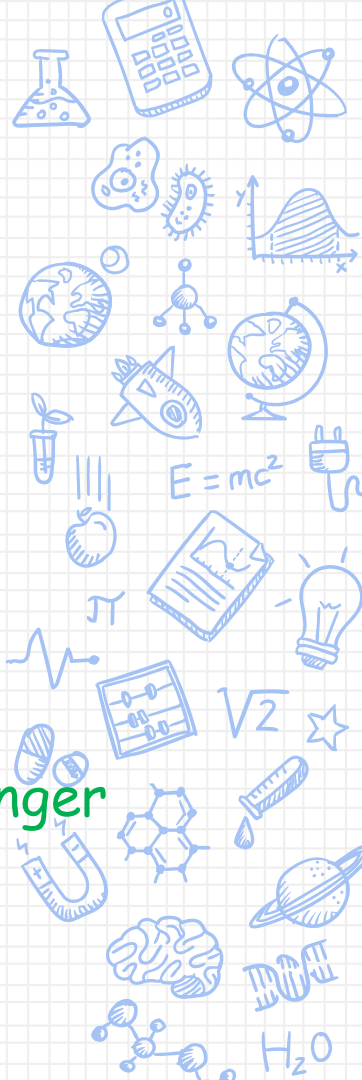
1. Grind gingers and extract the juice.
2. Pour 15 mL ginger juice into a plastic bowl.
3. Heat the milk until it reaches 80°C.
4. Pour the milk into the ginger juice in one go.
5. Set and wait for 15 minutes.
6. Put a spoon on top of the milk to see if it has set into jelly-like solid.





Time to “Observe – Ask – Think – and – Try”!

- ✓ What do you observe after adding milk to ginger juice?
- ✓ What is the chemical reaction between milk and ginger juice?
- ✓ What will happen if we change the type of milk?
- ✓ What will happen if we change the temperature of milk?
- ✓ Are there any other juices having the same effect as ginger juice on milk?
- ✓ Try all these factors in our experiment!



Magical Science behind Ginger Milk Curd – Milk Coagulation

Milk contains a lot of **milk proteins** which are originally **soluble** in it.

Milk proteins dislike water. There are tails on their surface which help them suspend in the milk.

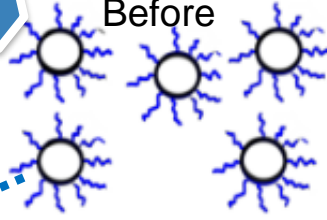
Ginger contains substances called **Protease** (a type of enzyme) which can change the structure of milk proteins.

Protease cuts off the tail from milk protein surface.

Once the **structure of milk proteins is changed**, they will stick together and become **insoluble** in the milk. This process is called **Milk Coagulation**.

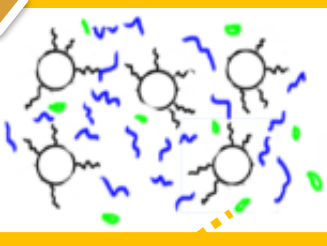
1

Before



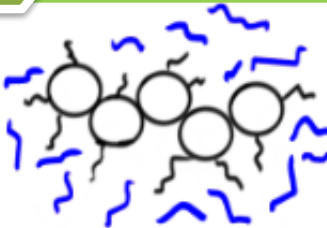
2

Mixed with ginger juice



3

Waited for 15 min after mixing



Get the Idea with Analogy!







Imagine milk proteins are kids. They dislike coldness (water). They wear thick coats (tail of milk protein).

But, the kids meet a robber (protease), who forcefully removes their coats (tail of milk protein). So they are exposed to coldness.

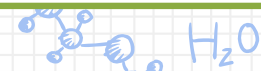
Therefore, the kids stick together closely to reduce their exposure to coldness. The kids coagulate together.

1. What will happen if we change the type of milk used?

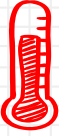







| Type of milk | Milk coagulates or not? | Texture of milk curd | Result |
|---|-------------------------|----------------------|--|
| Milk with lower protein content  | ✓ | softer |  |
| Milk with higher protein content  | ✓ | harder |  |

Possible reason:
A higher protein content → more raw materials for coagulation to occur → result in harder texture.



2. What will happen if we change **the temperature of milk**?







| Temperature of milk | Milk coagulates or not? | Texture of milk curd | Result |
|--|-------------------------|----------------------|--|
|  40°C | ✓ | softer |  |
|  60°C | ✓ | harder |  |
|  100°C | ✗ | ✗ |  |

Possible reason:

High temperature such as 100°C may cause damage to protease (denatured) → cannot cause protein coagulation.



3. Are there any other juices having the same effect as ginger juice on milk?

| Type of fruits | Milk coagulates or not? | Texture of milk curd | Result |
|---|-------------------------|----------------------|--|
| <p>Kiwi fruit</p>  | ✓ | harder |  |
| <p>Pineapple</p>  | ✓ | softer |  |
| <p>Papaya</p>  | ✓ | harder |  |

Possible reason:

These fruits may contain protease or other substances that can cause the milk to coagulate.



Expectation of Learning Outcome

Skills

Kids are able to follow the procedure and precaution to make ginger milk curd.

Knowledge

Kids understand:
what coagulation of milk is and how ginger juice causes the coagulation of milk

Scientific Investigation skills

Kids understand doing science requires:
(i) observation (ii) asking questions (iii) proposing hypothesis, (iv) designing experiments and (iv) drawing conclusion based on results

Create

Kids try to design new experiments to test other new factors, such as pH, that may affect the coagulation of milk

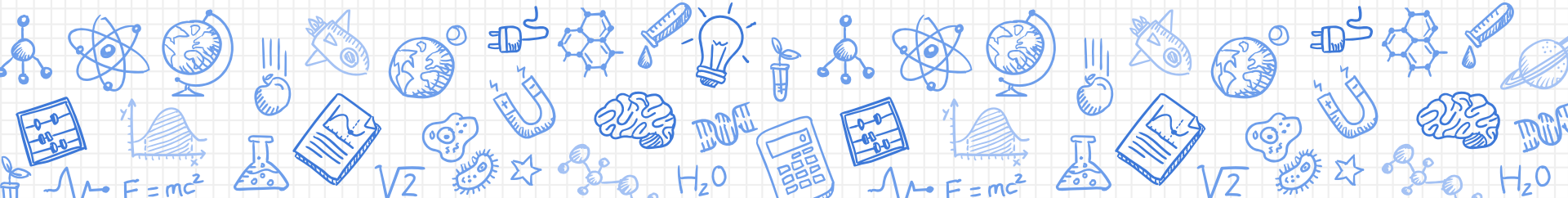
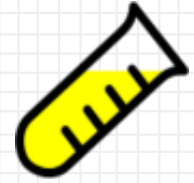


Safety Consideration

SAFETY FIRST

THE SAFE WAY
IS THE BEST WAY

- ✓ Ginger juice and hot milk will be provided to kids. They do not need to do the grinding and boiling of solutions.
- ✓ **Heat-resistant gloves** will be provided to kids when they pour the milk to the ginger juice.
- ✓ **Plastic bowls** used are PP plastic, which can withstand high temperature.



Process of Teamwork Engagement

1

Start!



Searched for interesting topics that are related to food with high nutritional value.

2

Focus!



Kids like to eat desserts. So we narrowed down the topics to healthy desserts.

3

Select!



We choose Ginger Milk Curd because it is very delicious and rich in protein and calcium. Moreover, it is a very local Hong Kong dessert that many kids may have tried before.

4

Trial and error!



We tried to make the milk curd ourselves but failed many time. We modified the experiment every time when we failed. Through this we discovered many factors would affect the protein coagulation.

5

Inspired!



This is a topic allowing room for kids to do further investigation after learning basic concepts of milk coagulation as there are many factors affecting the process. They can choose any factors, such as pH, and modify the experiment to their own design, practicing scientific investigation.