



# Science @ home

## SIMPLE HANDS-ON ACTIVITIES EXPLORING REAL-LIFE SCIENCE

### The Big Balloon Blow-Up

#### Do yeast need sugar to grow?

**Microorganisms** are very tiny living things that you need a microscope to see. *How many can you think of?*

Bacteria, viruses and some fungi are all types of microorganism. Scientists at the Roslin Institute study microorganisms that infect farm animals, to help us understand how they make animals and humans sick and what they can do to stop them.

In this activity, you will carry out a simple science investigation the same way our scientists do it, by using the **scientific method**. We will give you an example to try out, and some ideas for our you to **create your very own science investigation**.

## Let's get started!

**1** Yeast is a type of **fungus**, it is a living thing. Look at the picture of the type of yeast we use to bake bread. **What do you think it needs to grow?**

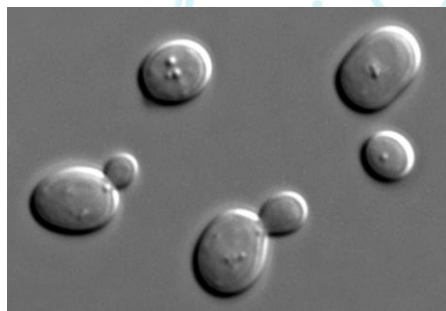
Mark your answers true or false.

1) Yeast needs food ☐

2) Yeast needs water ☐

3) Yeast needs warmth ☐

4) Yeast needs space ☐



**Yeast under a microscope** There are five yeast cells here. Some are bigger than others, that is because **yeast grow**. Two are about to **reproduce** (make another yeast cell), can you find them?

**How can we tell if yeast are growing?** Well, when yeast grow they let out a gas, we can "see" that gas if we trap it in a balloon.

## What do you need?

- ☐ Dried yeast (baker's yeast)
- ☐ 2 Balloons\*
- ☐ 2 Elastic bands\*
- ☐ Warm water
- ☐ Sugar & spoon
- ☐ 2 Empty plastic bottles\*
- ☐ Ruler & pen

**2** When we do an experiment we make a prediction about **what we think the answer will be**. This is called making a **hypothesis**.

**Do you think that the yeast need sugar to grow? Why/why not?**

Write your hypothesis here:

.....

.....

.....

.....



Grown-ups: Please read through the advice for supervising adults before continuing.

\*if you have only one of these items, don't worry, you can just repeat the experiment

## Thinking caps on!

1. How will you measure if your yeast are growing? *Hint: Look at box 1* .....
2. What does yeast need to make to blow up a balloon *Hint: How do you blow up a balloon?* .....



# Do your experiment

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  - Grown-ups:** Blow the balloons up and release the air 5 times to stretch it.
  - Add **100ml of warm water** (bath water temperature) to each bottle.\*
  - To one bottle, add **2 teaspoons of sugar**, gently swirl to **dissolve** the sugar. Do not add sugar to the other bottle. *Why do we have a bottle with no sugar?*
  - Add a **packet of dried yeast to each bottle** and gently swirl the bottles to mix.
  - Grown-ups:** Blow up the balloons a little bit and then place it on the necks of the bottles. Secure the balloons with an elastic band.
  - With a pen, place **two dots** on the middle of the balloons **2cm apart**. You can make a smiley face if you like!
  - Wait for 5 minutes, then **measure the distance between the two dots**. Write this number in the results table (box 4).
  - Gently swirl** the bottle 6 times, then repeat steps 7 and 8 **three more times**.



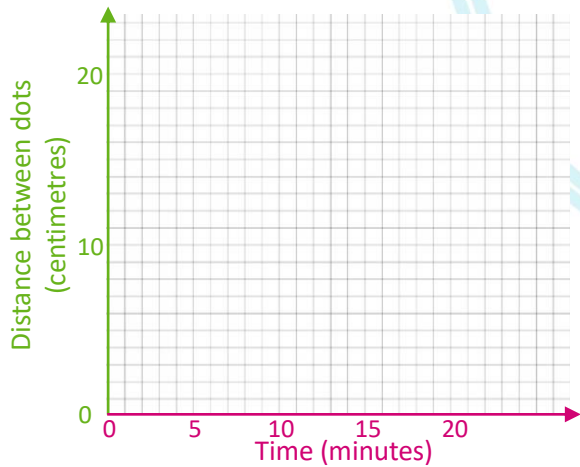
\*If you only have one bottle, don't worry! Just repeat steps 1 – 8, skipping step 3.

- 4

  - Write down the **results** of your experiment in this table and note any **observations** (things you see happening).

Time (mins)	Bottle with Sugar Distance between dots	Bottle without Sugar Distance between dots
0	2cm	2cm
5		
10		
15		
20		

- The **results** from your experiment can be put into a **graph**. Graphs help us to understand **data**.



# What did you discover?

- 5

When we do an experiment, we make a summary of **what we found out** by looking at our **data**. This is called making a **conclusion**.

**Do yeast need sugar to grow?** Write your conclusion here.

.....

.....

Was your **hypothesis** correct? .....

.....

# What next?

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The yeast make the gas as they eat the sugar and grow. The gas that has filled your balloon is called **carbon dioxide**. It's the same gas that you breathe out. Now try some more yeast investigations, here are some ideas but you can design your own!

**Does the amount of sugar you add affect the amount of gas in the balloon?** Repeat the experiment with different amounts of sugar.

**Do yeast need warm temperatures to grow?** Repeat the experiment with ice cold water.



# Excuse-moo... Why does cow burping affect our planet?

## Real-Life Research

Scientists working in Scotland have discovered a link between cows and global warming. All scientists work to solve real-world problems, read about how they are trying to help our planet by making cows more eco-friendly.

### 1 What is global warming?

Global warming is the heating up of our planet because of human activity, this heating is causing dramatic changes in **climate**.

**What changes in climate can you see here? Can you think of others caused by global warming?**



### 2 What are greenhouse gases?

**Greenhouse gases** cause global warming by making a layer high up in the air (our atmosphere) that traps heat, like a greenhouse. There are different types of greenhouse gases, including carbon dioxide, the gas that we and yeast make when we breathe.

**What are humans doing that increases greenhouse gases? Can you think of others?**



By reducing the amount of greenhouse gases the planet is producing, we can slow down global warming and climate change.

### 3 How do cows contribute to global warming?

As well as breathing out carbon dioxide, cows also produce lots of a gas called **methane** when they burp (a small amount comes out of the other end too!).

Methane is a greenhouse gas, and it has over 25 times the warming effect of carbon dioxide, meaning that it heats the planet much more than carbon dioxide.



Methane is also used in gas cookers

### 4 Can you stop cows burping methane?

It turns out that the methane isn't made by cows – it's made by microorganisms that live in the first of a cow's four stomachs! Scientists noticed that **some cows burp out less methane than others**, and to understand why, they looked at the cows' **DNA** (the instructions for making living things) and the types of microorganisms in their stomachs. They found a link between messages in the cows' **DNA** and having low methane-producing microorganisms.

If farmers choose these cows for their herds, less methane would be burped out, which could help to slow down global warming.

### Think and discuss

1. Do you think feeding cows different types of food could affect the amount of methane produced?
2. Do you think it's important to find ways to reduce the amount of methane produced by farmed animals?

# A guide for grown-ups

## 1. About this resource

This series of simple hands-on activities aims to support families to do Science @Home and is brought to you by the [Easter Bush Science Outreach Centre](#) at the University of Edinburgh. All of our activities are based on the scientific method, which is used in school and in scientific research to answer scientific questions. This resource can be used to encourage your young science explorer(s) to ask and answer their own scientific questions. It also gives a little peek into how scientists at the Roslin Institute answer their own questions about science. Share your investigations by tagging [@EBSOClab](#) & [@roslininstitute](#)

## 2. Advice about supervising the activity

- Read and follow the instructions with your young science explorer, this activity is to be carried out by children working with a grown-up. The grown-up is fully responsible for carrying out this investigation safely.
- This activity has been designed for 8-13 year olds. Younger children will need more support with reading through the instructions and carrying out the investigation.
- Do not eat or drink during the experiment, just like in a science laboratory!
- Children can choke on uninflated or broken balloons. A grown-up is required to inflate the balloon. Keep uninflated balloons away from children and discard broken balloons immediately.
- Take care when using hot water - if it is too hot it could scald you and it will kill the yeast. The water should be similar temperature to bath water. It should be warm when you touch it, before you add it to the bottle.
- It is important to keep the yeast warm during the experiment, one way to do this is to place the bottle in a basin of warm water. This is called a water bath – we use water baths in the laboratory to keep things at a constant temperature.
- Wash your hands with soap and warm water after your experiment, just as we do in the lab!



## 3. The Scientific Method

All good investigations begin with a question, the scientific method is how scientists answer those questions:

**HYPOTHESIS** Predict - what do you think the result will be?



**METHOD** How are you going to do your investigation?



**RESULTS** What did you see? Can you measure it? Can you make a table or a graph of your results?



**CONCLUSION** What did you find out? Was your hypothesis correct? If not, why do you think this is?

## 4. Yeast Fact file

**Does yeast need sugar?** Yes, sugar is a food source for yeast. It uses the sugar to produce energy, which it uses to grow.

**Does yeast need oxygen?** Not always, yeast can grow in the absence of oxygen in a process known as fermentation. During fermentation yeast produces carbon dioxide and alcohol, this is how beer is made.

**Do yeast need warm temperatures to grow?** Yes, baker's yeast grows best between 25-35°C. If the temperature is too high the yeast will die, and if it is too low it will stop growing.

## 5. Find out more about this research

You can read more about the science behind our Real-Life Research activity by reading this [news article](#) on the Roslin Institute website.



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