



## National Curriculum Links

### Key Stage 2 Science

Working Scientifically

### PSHE

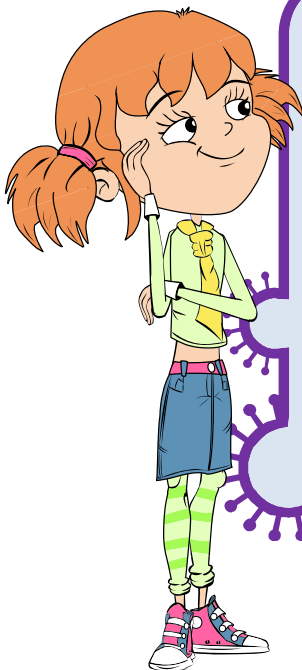
Core Theme 1: Health and Wellbeing

### English

Reading and Comprehension

**Estimated Teaching Time**  
50 minutes

# 1.2 Micro-organisms Useful Microbes



Section 1.2, Useful Microbes, highlights to students that not all microbes are harmful by examining the various ways we utilise certain organisms for our benefit.

In the activity, *Yeast Races*, students observe first hand how microbes can be put to good use in the food industry.

Students observe how yeast makes dough rise through the process of fermentation.



### Learning Outcomes

#### All students will:

- understand that some microbes can help keep us healthy.
- understand that some microbes can be put to good use.



## 1.2 Micro-organisms

### Useful Microbes

#### Key Words

Culture  
Fermentation  
Incubate  
Micro-organisms  
Probiotics

#### Materials Required

##### Per student

- ☐ A copy of [SW 1](#)
- ☐ A copy of [SH 1](#)

##### Per group

- ☐ 2 plastic cups
- ☐ Flour
- ☐ Yeast solution
- ☐ Sugar
- ☐ 2 Graduated cylinders (or other container with measurements on the side)
- ☐ Basin
- ☐ Hot water

#### Available Web Resources

- 'Yeast Races' demonstration film.
- An alternative 'yogurt making' activity.
- 'Yummy Yogurt' demonstration film.

#### FASCINATING FACT

Elie Metchnikoff won the Nobel Prize in 1908 for his 'discovery' of probiotics. He was convinced that Bulgarian peasants lived longer than other people because of the microbes in the sour milk they drank! The microbes were later identified as *Lactobacillus bulgaricus*.

#### Background Information

Microbes are single-celled organisms, most of which are helpful or beneficial, although some of them cause illness and disease. One of the main ways in which microbes are beneficial is in the food industry. Cheese, bread, yogurt, chocolate, vinegar and alcohol are all produced through the growth of microbes. The microbes used to make these products cause a chemical change known as **fermentation** – a process by which the microbes break down the complex sugars into simple compounds like carbon dioxide and alcohol. Fermentation changes the product from one food to another.

When the bacteria *Streptococcus thermophilus* or *Lactobacillus bulgaricus* are added to milk they consume the sugars during growth, turning the milk into yogurt. So much acid is produced in fermented milk products that few potentially harmful microbes can survive there.

*Lactobacillus* is generally referred to as a good or 'friendly' bacterium. The friendly bacteria that help us digest food have been termed probiotic bacteria, literally meaning 'for life'. It is these bacteria that we find in yogurts and probiotic drinks.

Yeast, *Saccharomyces cerevisiae*, is used to make bread and dough products through fermentation. In order to multiply and grow, yeast needs the right environment, which includes moisture, food (in the form of sugar or starch) and a warm temperature (20° to 30°C is best). As the yeast ferments it gives off gases which get trapped in the dough and the lump of dough expands.

#### Advance Preparation

1. Copy [SW 1](#) and [SH 1](#) for each student.
2. Purchase flour, sugar and dried yeast.
3. Prior to starting the activity make up a liquid yeast solution as outlined on pack purchased. This may vary between different brands. **If made too far in advance the yeast will start to ferment.**

**NB:** make up the yeast solution as outlined with water and dried yeast; do NOT add sugar until stated in the main activity.

#### Alternative Suggestion

If graduated cylinders are not available, tall glasses may be used as an alternative. Mark the outside of the glass at the base line level and at every allocated time point, and then measure the distance between each line.

Add food colouring to the different cylinders to create a more visual affect for the students.





## 1.2 Micro-organisms Useful Microbes

# Lesson Plan

### Introduction

1. Begin the lesson by explaining that microbes can have both harmful and beneficial effects on our health. Ask the class what they know about beneficial or 'friendly' bacteria. Many children will have already heard about probiotic bacteria in yogurts.
2. Explain that microbes are helpful in the breakdown of dead animals and plants, in helping animals and humans digest foods and in turning milk into yogurt, cheese and butter.
3. Highlight that bread dough rises through the action of helpful fungus known as yeast. The yeast eats the sugars present in food and produce gas and acids. These acids change the taste, smell and form of the original foodstuff whereas the gas makes the dough rise.
4. Tell the class that in this activity they are going to see exactly how we can use useful microbes to make bread rise.

### Main Activity

1. This activity is for groups of 2 – 5 students.
2. Highlight to the students that a useful fungus known as yeast is used to make bread. The yeast helps the bread rise through a process called fermentation.
3. Supply the class or groups with the Yeast Races Recipe ([SH 1](#)). The recipe can also be found on our website [www.e-bug.eu](http://www.e-bug.eu) for white board use.
4. Have students carry out the activity in their groups. When the recipe is complete, students should observe the yeast and record their observations on the student worksheet ([SW 1](#)).
5. Can the class explain why the yeast and sugar solution moved faster than the yeast alone?  
*Fermentation was carried out at a faster rate when the sugar was present.*

### Plenary

1. Check for understanding by asking the class the following questions:
  - a. What is the process which caused the yeast mixture to rise?  
*Yeast growing and using the sugars for energy; the yeast produces gas bubbles which cause the dough to rise.*
  - b. What would have happened if there were no live yeast in the mixture?  
*Nothing, it's the growing yeast that causes the breakdown of sugars and makes the dough rise.*
  - c. Why was the mixture kept in a basin of warm water?  
*Most microbes prefer to grow at 37°C and will multiply faster if grown at this temperature. The faster the microbes grow the more breakdown of sugars will occur and the faster the yeast mixture will rise up the cylinder.*
  - d. What other food products are made using bacteria or fungi?  
*Cheese, bread, wine, beer, sour cream.*

### Extension Activity

Each student should go home and search in their kitchen for food they think may contain microbes, they should identify whether they think these foods should be kept in the cupboard or in the fridge to slow down growth of bad microbes which may be present.



# Yeast Races



**Label** one of your plastic cups **A** and one **B**



Add **4 dessert spoons** of **flour** to each of your cups



Add enough **yeast solution** to plastic **cup A** until it looks like thick milkshake.



Add enough **yeast and sugar solution** to plastic **cup B** until it looks like a thick milkshake.



Pour the contents of **cup A** into graduated **cylinder A** until it reaches about **30ml**



Pour the contents of **cup B** into graduated **cylinder B** until it reaches about **30ml**



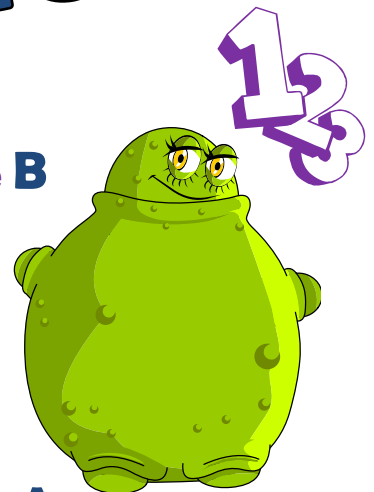
**Record** the exact **height** of the dough in each cylinder.



**Place** both measuring cylinders into a **basin** of hot water

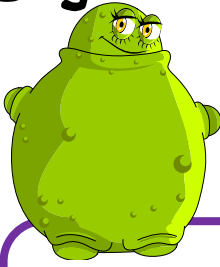


**Measure** the height of the dough every **5 minutes** for 30 minutes





e-Bug



# Yeast Races

## Procedure

1. Follow the instructions on the Yeast Races Handout.

123

## My Results

Time	YEAST	
	Volume of dough	Change in volume of dough / ml
0	0	0
5		
10		
15		
20		
25		
30		

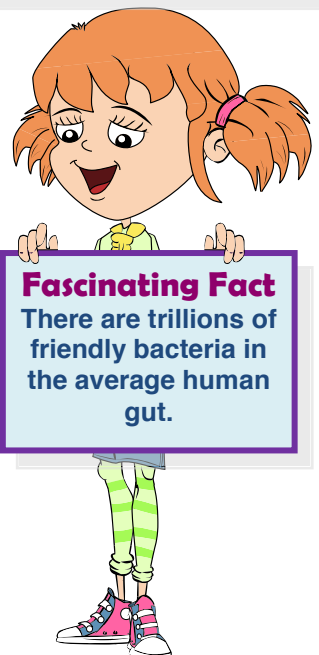
YEAST AND SUGAR	
Volume of dough	Change in volume of dough / ml
0	0

### Did you know?

The average adult carries approximately 2kg of good microbes in their guts – the same weight as 2 bags of sugar!

## My Conclusions

1. What caused the dough to rise up the container?  
\_\_\_\_\_
2. What is this process called?  
\_\_\_\_\_
3. Why did the dough in container B move faster than container A?  
\_\_\_\_\_
4. What other food products are the result of bacteria or fungi growing and changing substances?  
\_\_\_\_\_



### Fascinating Fact

There are trillions of friendly bacteria in the average human gut.

