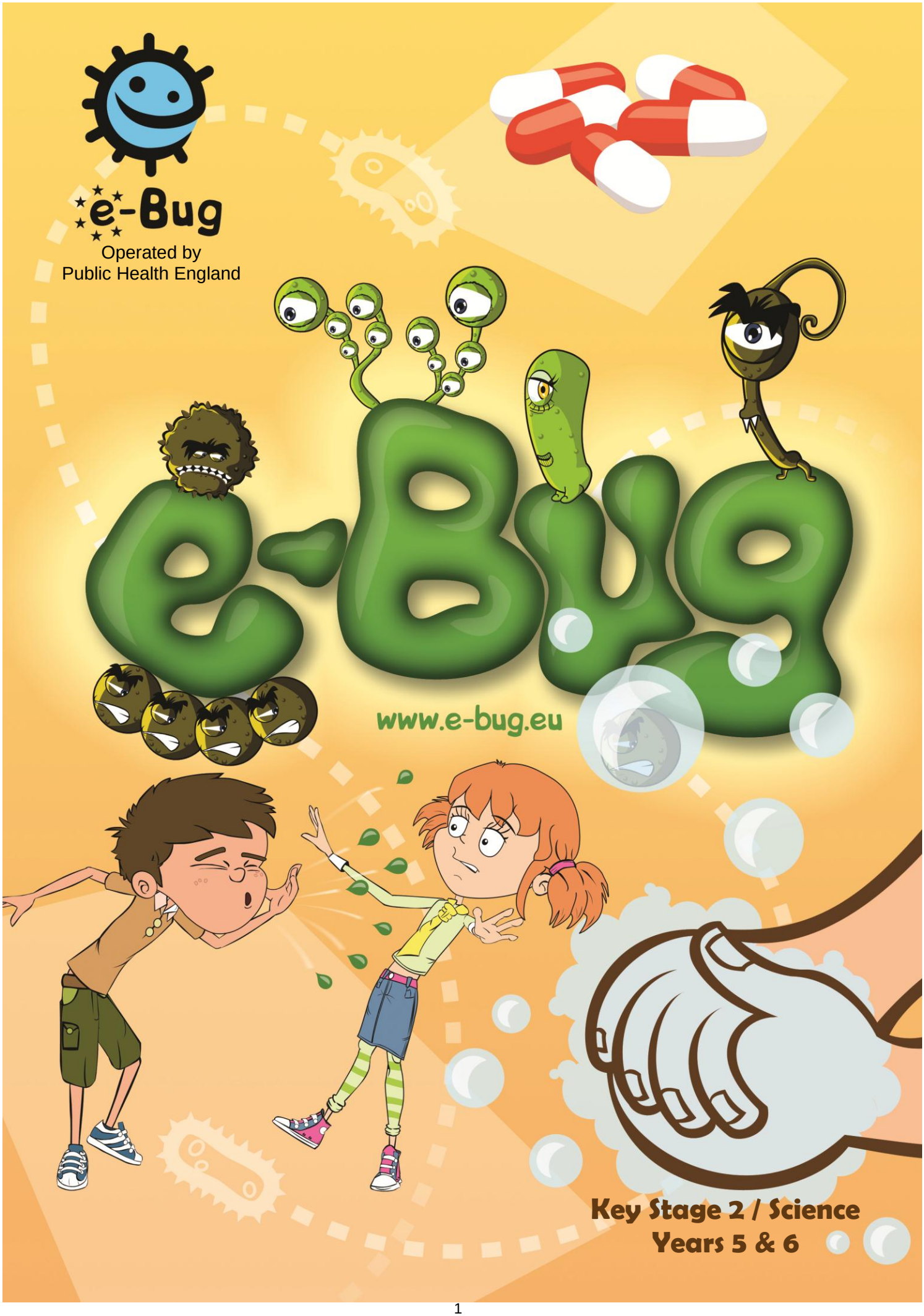
e-Bug
Operated by
Public Health England
e-Bug
www.e-bug.eu
Key Stage 2 / Science
Years 5 & 6

Welcome to e-Bug

e-Bug has been designed to bring the world of microbes and antibiotics to life for children in the school environment. The resource has been created by Public Health England (formally the Health Protection Agency) to improve young people's knowledge and to foster an interest in science. These tools can be used freely by educators, and may be copied for classroom use but may not be sold.

e-Bug is a curriculum supplement series (Key Stage 1, 2, 3 and 4) that complies with the Department of Education and QCA educational standards for Junior and Senior schools. Its main aim is to teach young people about microbes, appropriate use of antibiotics, how microbial infections are spread and can be prevented through improved hygiene and vaccine use. The packs teach that antibiotics are a valuable resource that should not be misused. Over 27 European and international countries are involved in the e-Bug project, and the resources were evaluated by more than 3000 children in England, France and the Czech Republic. The e-Bug pack is supported by a website from which all the pack resources, videos demonstrating the activities and additional activities can be downloaded (**www.e-Bug.eu**). The website contains complimentary interactive games which teach the key messages of e-Bug while children have fun.

The pack consists of 11 topics divided into four main sections which can be used in sequence or as individual activities designed to fit into 50 minute classroom slots.

Each of these sections contain background information for teachers, detailed lesson plans, modifiable student worksheets and handouts, as well as

- Creative inquiry based activities to promote active learning
- Highlighted learning outcomes which deepen students understanding of the importance of microbes, their spread, treatment and prevention
- Activities that encourage students to take more responsibility for their own health
- Activities that highlight the importance of responsible antibiotic use

The pack may be used in isolation or in conjunction with the presentations, images, videos and extra activities on the e-Bug website.

We would like to thank everyone involved in the development of this resource which will help the next generation of adults to use antibiotics more wisely. We would especially like to thank the teachers and students across the UK, France and the Czech Republic who participated in focus groups and the evaluation process and helped ensure that these materials are not only fun and exciting but also effective!

As educators, your feedback is invaluable to us. Your comments will help the e-Bug resource grow and evolve. Please send any comments, queries and suggestions to

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Or alternatively visit the e-Bug website at **www.e-Bug.eu** or e-mail us at **e-Bug@phe.gov.uk**

We do hope you enjoy using e-Bug and will find this an in invaluable addition to your classroom.

Dr Cliodna AM McNulty
Head of Primary Care Unit
Public Health England
England

e-Bug

An International education resource covering the world of microbes and disease.

e-Bug partnership and collaboration consists of the following countries:

- Belgium
- Bulgaria
- Croatia
- Czech Republic
- Cyprus
- Denmark
- Finland
- France
- Germany
- Greece
- Hungary
- Ireland
- Italy
- Latvia
- Lithuania
- Norway
- Poland
- Portugal
- Romania
- Russia
- Saudi Arabia
- Slovak Republic
- Slovenia
- Spain
- The Netherlands
- Turkey
- United Kingdom

Visit our website to view our partner profiles and translated versions of the resources.

e-Bug is operated by Public Health England.

Pack Content

1. Micro-organisms

1.1 An Introduction

Students learn about the different types of microbes – bacteria, viruses and fungi. They learn that microbes have different shapes and that they are found everywhere.

1.2 Useful Microbes

A yeast racing competition is used to demonstrate to students that microbes can be beneficial.

1.3 Harmful Microbes

Close examination of various illnesses illustrates to students how and where in the body harmful microbes cause disease. Students test their knowledge of harmful microbes by completing a crossword puzzle and word hunt.

2. Spread of Infection

2.1 Hand Hygiene

By taking part in a classroom experiment students learn how microbes can spread from one person to another through touch and why it is important to wash hands properly.

2.2 Respiratory Hygiene

In this fun experiment students learn how easily microbes can be spread through coughs and sneezes and recreate a giant sneeze.

2.3 Food Hygiene

Students make a chicken sandwich for their classmates and observe just how far they have spread harmful microbes.

2.4 Farm Hygiene

Students learn through group discussion, 'social networking', and a farm journey board game, the risks and benefits of various farm microbes.

3. Prevention of Infection

3.1 The Body's Natural Defences

A detailed presentation and animations show how the body fights harmful microbes on a daily basis. This section provides the basic knowledge required for further learning about vaccinations and antibiotics.

3.2 Vaccinations

Students use their reading comprehension and creative skills to answer questions on, and act out, the discovery of vaccinations by Edward Jenner.

3.3 Oral Hygiene

Students learn how they can prevent tooth decay. The activities demonstrate the importance of brushing teeth twice a day and how much sugar is in many common drinks.

4. Treatment of Infection

4.1 Antibiotic Use and Medicine

Through teacher-led discussion and debate, students learn the importance of using antibiotics and other medicines appropriately.

Additional Web Resources Available

1. Micro-organisms

1.1 An Introduction

- ✓ 'Microbe Mania' demonstration film.
- ✓ A variety of microbial photographs.

1.2 Useful Microbes

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

1.3 Harmful Microbes

- ✓ Images of microbes found in 1.1.
- ✓ Harmful microbes student hand-outs, SH 1 and SH 2, available in MS PowerPoint format.

2. Spread of Infection

2.1 Hand Hygiene

- ✓ 'Horrid Hands' demonstration film.
- ✓ 6 steps of hand washing poster.

2.2 Respiratory Hygiene

- ✓ 'Super Sneezes' demonstration film.

2.3 Food Hygiene

- ✓ Food hygiene student hand-outs, SH 1 and SH 2, available in MS PowerPoint format.
- ✓ Extension activity answers in MS PowerPoint format.

2.4 Farm Hygiene

- ✓ PowerPoint slides for main farm activity.
- ✓ Interactive 'Farm Fun' game to reinforce message of this lesson.
- ✓ A film clip on Junior website showing the recommended method of hand washing with soap.

3. Prevention of Infection

3.1 The Body's Natural Defences

- ✓ A MS PowerPoint presentation of SH 1.
- ✓ An animation illustrating how the immune system functions.

3.2 Vaccinations

- ✓ 'Vaccine Play' demonstration activity.
- ✓ The story of Jenner in MS PowerPoint format.

3.3 Oral Hygiene

- ✓ A PowerPoint presentation.
- ✓ A video demonstration of effective tooth brushing at home.

4. Treatment of Infection

4.1 Antibiotic Use and Medicine

- ✓ Comic strip available in MS PowerPoint format.

Contents

Microorganisms – An Introduction 11

Microorganisms – Useful Microbes 21

Microorganisms – Harmful Microbes 27

Spread of Infection – Hand Hygiene 37

Spread of Infection – Respiratory Hygiene 43

Spread of Infection – Food Hygiene 49

Spread of Infection – Farm Hygiene 59

Prevention of Infection – The Body's Natural Defences 83

Prevention of Infection – Vaccinations 87

Prevention of Infection – Oral Hygiene 93

Treatment of Infection – Antibiotic Use and Medicine 105

Glossary 113

Acknowledgements 117

National Curriculum Links

Key Stage 2

e-Bug Pack Content	Science	PSHE*	Other subjects
1. Micro-organisms **1.1 An Introduction**	Working Scientifically Living things and their habitats	Core Theme 1: Health and Wellbeing	English Reading and Comprehension
1. Micro-organisms **1.2 Useful Microbes**	Working Scientifically	Core Theme 1: Health and Wellbeing	English Reading and Comprehension
1. Micro-organisms **1.3 Harmful Microbes**	Working Scientifically	Core Theme 1: Health and Wellbeing	English Reading and Comprehension
2. Spread of Infection **2.1 Hand Hygiene**	Working Scientifically Animals Including Humans (*Upper KS2 only*)	Core Theme 1: Health and Wellbeing	English Reading and Comprehension
2. Spread of Infection **2.2 Respiratory Hygiene**	Working Scientifically Animals Including Humans (*Upper KS2 only*)	Core Theme 1: Health and Wellbeing	English Reading and Comprehension
2. Spread of Infection **2.3 Food Hygiene**	Working Scientifically Animals Including Humans (*Upper KS2 only*)	Core Theme 1: Health and Wellbeing	English Reading and Comprehension
2. Spread of Infection **2.4 Farm Hygiene**	Working Scientifically Living things and their habitats (*Upper KS2 only*)	Core Theme 1: Health and Wellbeing	English Reading and Comprehension
3. Prevention of Infection **3.1 The Body's Natural Defences**	Working Scientifically (*Lower KS2 only*) Animals, including Humans (*Upper KS2 only*)	Core Theme 1: Health and Wellbeing	English Reading and Comprehension
3. Prevention of Infection **3.2 Vaccines**	Working Scientifically	Core Theme 1: Health and Wellbeing Core theme 3: Living in the Wider world	English Reading and Comprehension
3. Prevention of Infection **3.3 Oral Hygiene**	Working Scientifically Animals Including Humans (*Upper KS2 only*)	Core Theme 1: Health and Wellbeing	English Reading and Comprehension
4. Treatment of Infection **4.1 Antibiotic Use and Medicine**	Working Scientifically Animals, including humans (*Upper KS2 only*)	Core Theme 1 Health and Wellbeing Core theme 3: Living in the Wider world	English Reading and Comprehension

*Taken from PSHE Association Programme of Study (Key Stages 1-4), supported by the Department for Education.

A complete, non-condensed version of the e-Bug curriculum links can be downloaded from the teachers pages of the e-Bug website, www.e-bug.eu

National Curriculum Links

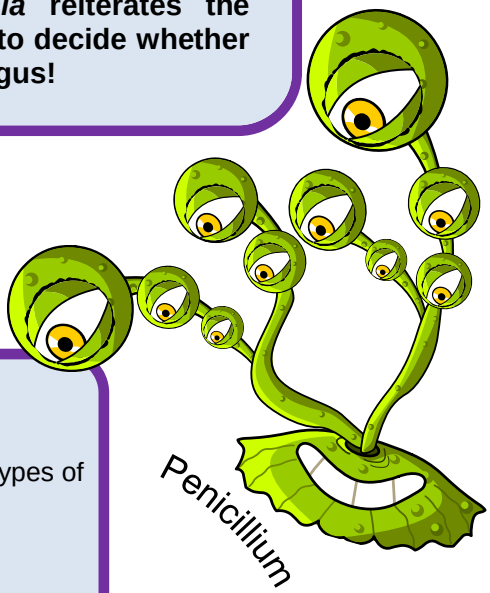
Key Stage 2
Working scientifically
Living things and their habitats
PSHE
Core Theme 1: Health and Wellbeing
English
Reading and Comprehension
Estimated Teaching Time
50 minutes

1.1 Micro-organisms An Introduction

In this section students are introduced to the world of microbes, firstly by exploring the different types and shapes of microbes and later, by close examination of beneficial and harmful microbes.

The introductory activity allows students to combine their observational and creative skills to make a microbe of their own choice hence reinforcing various microbial types and shapes.

The extension activity *Microbe Mania* reiterates the classroom lesson and allows students to decide whether the microbe is a bacterium, virus or fungus!



Learning Outcomes

All students will:
- understand that bacteria, viruses and fungi are three different types of microbes.
- understand that microbes are found everywhere.

More able students will:
- understand that microbes come in different shapes and sizes.

1.1 Micro-organisms
An Introduction

Key Words

Bacteria
Bug
Cell
Disease
Fungi
Germ
Microbe
Micro-organism
Microscope
Pathogen
Probiotic
Viruses

Materials Required

Per Student

- ☐ A copy of SH 1
- ☐ A copy of SW 1
- ☐ A copy of SW 2
- ☐ Petri dish (optional)
- ☐ Microbial images from www.e-bug.eu

Per Group

- ☐ Play dough in a variety of colours (for home made recipe see TS 4)

Available Web Resources

- 'Microbe Mania' demonstration film.
- A variety of microbial photographs.

FASCINATING FACT

Antonie van Leeuwenhoek created the first ever microscope in 1676. He used it to examine various items around his home and termed the living creatures (bacteria) he found on scrapings from his teeth 'animalcules'.

INTRO TS 1

Background Information

Micro-organisms, more commonly known as germs, bugs or microbes, are tiny living organisms too small to be seen with the naked eye. They are found almost everywhere on earth. Some microbes are beneficial and others can be harmful to humans (this will be explored in later sections). Although extremely small, microbes come in many different shapes and sizes. There are three main groups of microbes:

Viruses are the smallest of the microbes and are generally harmful to humans. Viruses cannot survive by themselves. They need a 'host' cell in order to survive and reproduce. Once inside the host cell, they rapidly multiply and destroy the cell in the process!

Fungi are multi cellular organisms (made up of more than one cell) that can be both beneficial and harmful to humans. Fungi obtain their food by either decomposing dead organic matter or by living as parasites on a host. Fungi can be harmful by causing infection or being poisonous to eat; others can be beneficial or harmless, e.g. *Penicillium* which produces the antibiotic penicillin. There are also fungi that are not microbes and some that can be eaten like *Agaricus*, commonly known as the white button mushroom.

Bacteria are single-celled organisms that, under the right conditions, can multiply once every 20 minutes. During their normal growth, some produce substances (toxins) which are extremely harmful to humans and cause disease (e.g *Staphylococcus*); other bacteria are completely harmless to humans, and others can be extremely useful to us (e.g. *Lactobacillus* in our food). Some are even necessary for human life such as those involved in plant growth (e.g. *Rhizobacterium*). Harmless bacteria are called non-pathogenic, while harmful bacteria are known as pathogenic. Over 70% of bacteria are non-pathogenic.

Bacteria can be divided into three groups based on their shapes – cocci (balls), bacilli (rods) and spirals. Cocci can also be broken down into three groups by how the cocci are arranged: staphylococci (clusters), streptococci (chains) and diplococci (pairs). Scientists can use these shapes to tell which infection a patient has.

Advance Preparation

- Prepare a copy of SW 1 and SW 2 for each student.
- Prepare SH 1 poster for the classroom or on the white board.
- Purchase or follow the recipe in TS 4 to make play dough in a variety of colours.
- Download a variety of microbe images from www.e-bug.eu for student viewing.

1.1 Micro - organisms
An Introduction

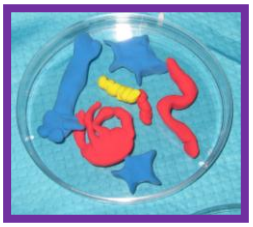
Lesson Plan

Introduction

1. Begin the lesson by asking children what they already know about germs or bugs. Ask the children if they, or anyone in their family, have ever been sick? What was the disease and what do they think caused it?
2. Explain to the children that some diseases called infections are caused by germs and that germs are tiny living organisms called microbes. Show the children that there are three different types of microbes: bacteria, viruses and fungi. Use the colour poster provided (**SH 1**), which is also found on the e-Bug website (**www.e-bug.eu**), for whiteboard presentation format.
3. Explain that microbes are so small that they can only be seen through a microscope. Use the web activity or provide students with **SH 2** to demonstrate the different sizes of microbes.
4. Emphasise that although some microbes cause disease, there are also beneficial microbes. Ask children to identify some useful microbes. If they cannot, provide examples for them e.g. *Lactobacillus* in yogurt and probiotics drinks, penicillin from fungi, yeast in bread, etc.
5. Highlight to the class that microbes can be found EVERYWHERE: floating around in the air we breathe, on the food we eat, on the surface of our bodies, in our mouth, nose and gut/tummy.

Main Activity

1. This activity can be done either individually or in groups.
2. Provide each group with either a colour handout (**SH 1**) of the different types of bacteria or place colourful posters on the classroom walls from the website **www.e-bug.eu**. These handouts will show the range of shapes and sizes of microbes and whether they are useful or harmful microbes.
3. Provide each group with play dough in various colours, petri dishes and a copy of **SW 1**.
4. Ask each child/group to recreate a microbe or groups of microbes in their petri dish based on the coloured images provided.
5. Each child must decide if their microbe is useful or harmful and provide its name. It is important to let the children get as creative as possible whilst taking into consideration the actual structure of microbes.
6. Remind the class that fungi are the largest microbes and viruses are the smallest.
7. If time permits, students can then present their microbes to the class.



INTRO TS 2

1.1 Micro - organisms
An Introduction

Lesson Plan

Plenary

Check for understanding by asking the children the following questions:

1. What are the most common types of microbe?
   There are three main types of microbes known as bacteria, viruses and fungi.
2. What are germs?
   A germ is another name used to describe a harmful microbe.
3. Where is a microbe found?
   Microbes are found EVERYWHERE, floating around in the air we breathe, on the food we eat, on the surface of our bodies, in our mouth, nose and gut/tummy.
4. Are all microbes harmful?
   No, although there are microbes which can be harmful to us there are also a lot of microbes that are very useful to us, for example, Saccharomyces (fungi) is a yeast that is used to help bread rise, Lactobacillus (bacteria) help make yogurt and cheese.
5. What are the different shapes of bacteria?
   Spirals (Campylobacter), Rods (Lactobacilli) and Balls (Staphylococcus).

Extension Activity

1. Provide each student with a copy of **SW 2** and **SH 1**.
2. By reading the descriptions and using the information on their handouts students must decide whether the microbes are bacteria, virus or fungi.
   a. *Staphylococcus is a bacterium.*
   b. *Lactobacillus is a bacterium.*
   c. *Dermatophytes are fungi.*
   d. *Influenza is a virus.*
   e. *Penicillium is a fungus.*
   f. *Campylobacter is a bacterium.*

Cross Curricular Extension

1. The main activity can be done by creating **geometric microbes (maths)** or **knitted or felt microbes (art)** to cover alternative aspects of the curriculum. See the website for further information www.e-Bug.eu

Images:

Glasgow City of Science

INTRO TS 3

Home-made play dough Recipe

Play dough is a soft, pliable material that can keep children occupied for considerable lengths of time. Play dough is available to purchase under a range of different brand names but it may be cost effective to make your own. Home made play dough has the added advantage that you can choose your preferred palate of colours. The home made play dough is non-toxic, brightly coloured and easily sculpted making it an ideal tool for creative play and this activity.

Ingredients

- 1 cup of plain flour
- 1 cup of water
- 1/2 cup of salt
- 2 tablespoons of cream of tartar
- 2 tablespoons of oil
- Food colouring

Method

1. **Mix** together the **dry ingredients**
2. **Add** the **water** and **mix** until smooth
3. **Add** the **food colouring** followed by the **oil**
4. **Cook** on a **medium heat**, **stirring constantly**, until the dough leaves the side of the pan in a ball
5. **Allow** to **cool** before use

INTRO TS 4

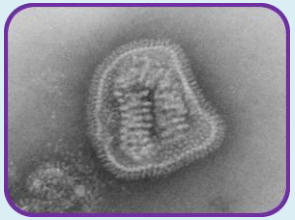
What are Microbes?

- Microbes are living organisms
- They are so small we need a microscope to see them
- They come in different shapes and sizes
- They are found EVERYWHERE!
- Some microbes are useful or even good for us
- Some microbes can make us ill

There are 3 different types of microbes:

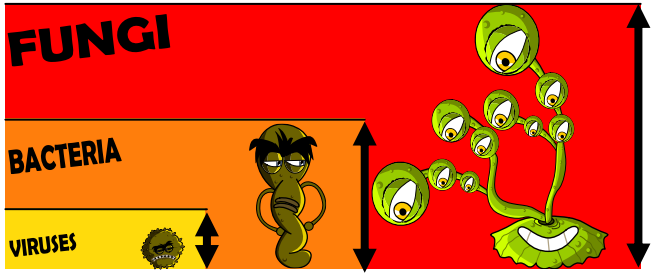
VIRUSES

Influenza



- Viruses are even smaller than bacteria and can sometimes live INSIDE bacteria!
- Some viruses make us sick.
- Diseases like CHICKENPOX and the FLU are caused by viruses.
- Viruses can spread from one person to another but it depends on the type of virus.

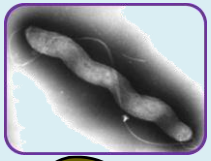
Microbe Size



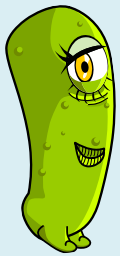
BACTERIA

- There are three different types of bacteria. They look like:

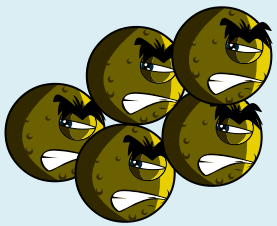
Spirals (*Campylobacter*)



Rods (*Lactobacillus*)



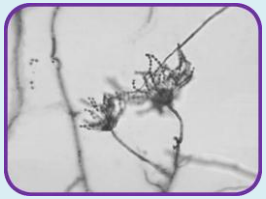
Balls (*Staphylococcus*)



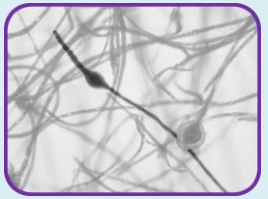
- Bacteria are so small that 1000s could fit on the full stop at the end of this sentence.
- Some bacteria are helpful in cooking, for example, making yogurt and cheese.
- Some bacteria are harmful and cause infection.

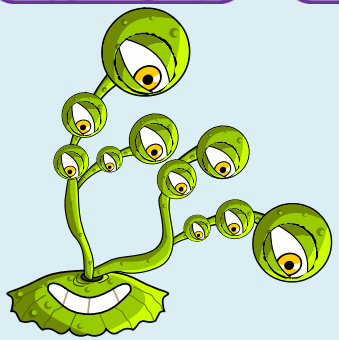
FUNGI

Penicillium



Dermatophyte





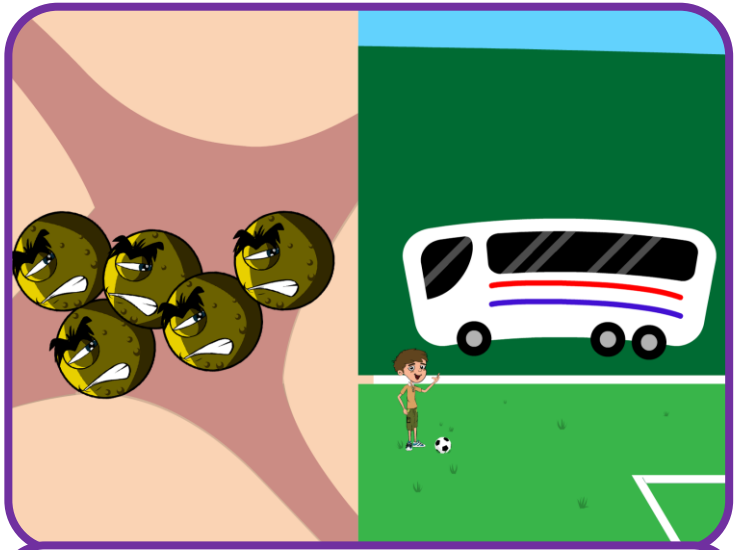
- Fungi are the largest of all microbes.
- Fungi can be found in the air, on plants and in water.
- Mould, which grows on bread, is a type of fungus.
- Some antibiotics are made by fungi!

INTRO SH 1

How big is a Microbe?

1. If you were as big as EUROPE...

2. A FUNGUS would be the size of a football pitch!



3. A BACTERIUM would be the size of a BUS!

4. A VIRUS would be the size of a FOOTBALL!

What are Microbes?

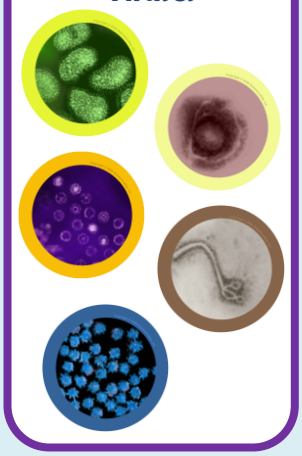
Make your own Microbe

Design a microbe of your choice, either a bacterium, a virus or a fungus using the materials provided.

Before you start, decide if your microbe will be beneficial or harmful! Here are some pictures which might help!

Bacteria

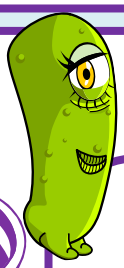
Viruses



Fungi

Top Tip

Bacteria come in lots of different shapes and sizes – some are round like balls, some are like spirals and some are long like rods. Some even use tail like structures to help them swim and move!



Draw your microbe here

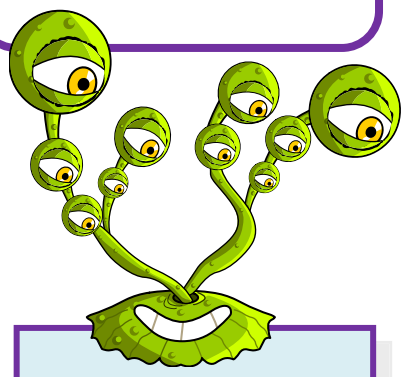
My Observations

1. Is it a beneficial or harmful microbe?

_____

2. Choose a name for your microbe.

_____



Fascinating Fact

YOU are home to 1000 million microbes!

This is a picture of my _____

INTRO SW 1

Microbe Mania

There are 3 different types of microbe – bacteria, viruses and fungi.

From the pictures and descriptions, can you work out which microbe is which?

Hint

Remember there are three different types of bacteria

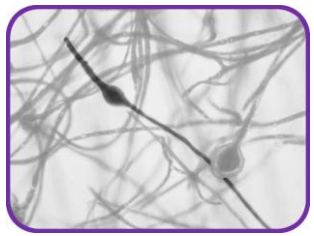
- rods
- spirals
- balls

My name is ***Staphylococcus***. I am round in shape and I like to live in your nose or armpit! If I live on your skin I can give you spots. If I get into your bloodstream I can make you ill! What am I?

Staphylococcus is a: _____

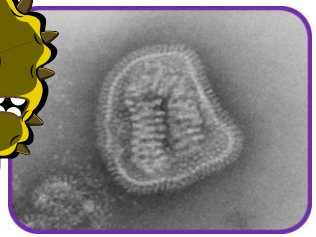
My name is ***Lactobacillus***. People call me 'friendly' because I change milk into yogurt! When you eat me in yogurt I live in your guts and help you digest other food. What am I?

Lactobacillus is a: _____



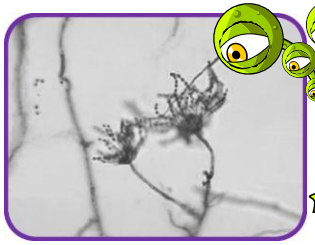
I'm called a ***Dermatophyte*** and I like to live on your skin. I especially like living in damp places like between the toes on sweaty feet! When I live there I give people athlete's foot! What am I?

Dermatophytes are: _____



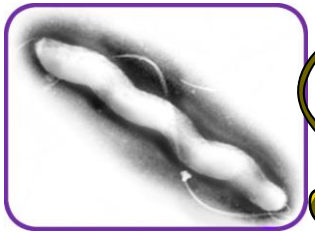
My name is ***Influenza*** but my friends call me the 'flu'. I'm very generous; I like to give people headaches and fever. I easily spread from person to person through coughing and sneezing. What am I?

Influenza is a: _____



My name is ***Penicillium*** and you'll find me growing on old oranges or stale bread making them look mouldy. Humans use me to make an antibiotic called Penicillin which can make them better, but only from bacterial infections! What am I?

Penicillium is a: _____



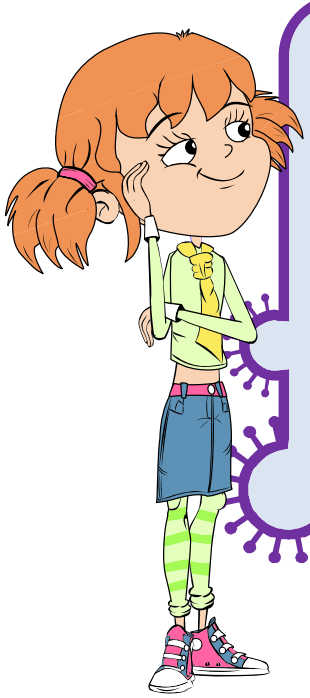
My name is ***Campylobacter***. I have a pretty spiral shape and I like to live in chickens but if I get into your tummy I make you very ill – I can give you diarrhoea! What am I?

Campylobacter is a: _____

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.*

USE TS 1

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 thermophilous*** 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 gasses 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** 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

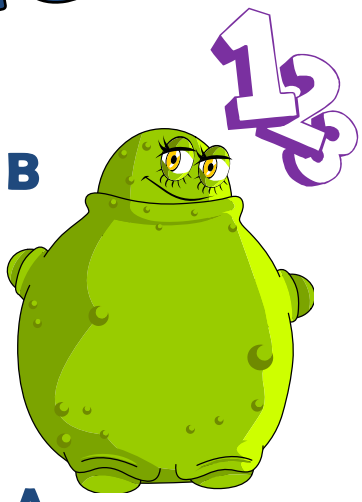
1. Check for understanding by asking the class the following questions:
   a. What is the process which caused the yeast mixture to rise?
   Yeast growing and using the sugars for energy; the yeast produces gas bubbles which cause the dough to rise.
   b. What would have happened if there were no live 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

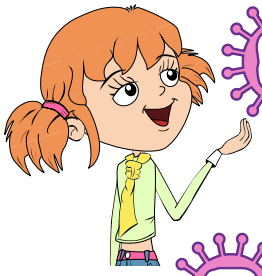
Each student should go home and search in their kitchen for food they think may contain microbes, they should identify whether they think these foods should be kept in the cupboard or in the fridge to slow down growth of bad microbes which may be present.

USE TS 2

Yeast Races



1. **Label** one of your plastic cups **A** and one **B**
2. Add **4 dessert spoons** of **flour** to each of your cups
3. Add enough **yeast solution** to plastic **cup A** until it looks like thick milkshake.
4. Add enough **yeast and sugar solution** to plastic **cup B** until it looks like a thick milkshake.



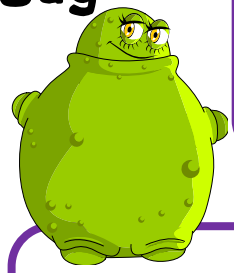
5. Pour the contents of **cup A into graduated cylinder A** until it reaches about **30ml**
6. Pour the contents of **cup B into graduated cylinder B** until it reaches about **30ml**
7. **Record** the exact **height** of the dough in each cylinder.

8. **Place** both measuring cylinders into a **basin** of hot water
9. **Measure** the height of the dough every **5 minutes** for 30 minutes

USE SH 1

Yeast Races

e-Bug



Procedure

1. Follow the instructions on the **Yeast Races Handout**.

My Results

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

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?

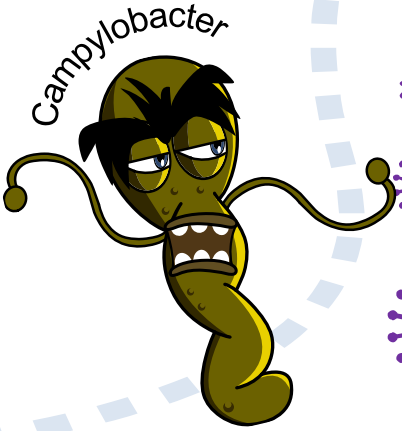
   _____

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.

USE SW 1



National Curriculum Links

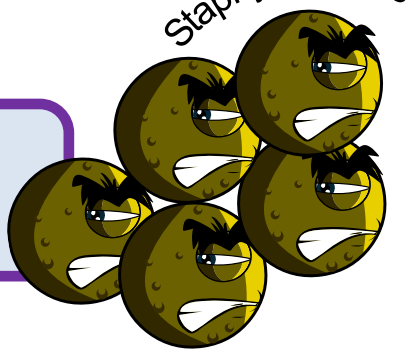
Key Stage 2
Science
Working Scientifically
PSHE
Core Theme 1: Health and Wellbeing
English
Reading and Comprehension
Estimated Teaching Time
50 minutes

1.3 Micro-organisms Harmful Microbes

Section 1.3, Harmful Microbes, introduces students to the variety of health issues caused by harmful microbes.

Students are encouraged to discuss as a class how some microbes can be harmful and what students can do to prevent themselves from getting ill. This lesson also highlights that not all illnesses are caused by microbes.

The word searches and crosswords found in the extension activity help to reinforce words associated with harmful microbes and illness.



Learning Outcomes

All students will:

- understand that sometimes microbes can make us ill

1.3 Micro-organisms
Harmful Microbes

Key Words

Bacteria
Colonise
Dermatophytes
Flora
Fungi
Germs
Hygiene
Infected
Infectious
Pathogens
Toxin
Virus

Materials Required

Per Student
- ☐ Copy of SW 1
- ☐ Copy of SW 2

Per Class/Group
- ☐ Copy of SH 1
- ☐ Copy of SH 2

Available Web Resources

- ☐ Images of microbes found in section 1.1
- ☐ SH 1 and SH 2 available in MS PowerPoint format.

FASCINATING FACT

Did you know that there are more microbes on the planet that any other species of living thing!

Background Information

Some microbes can be harmful to humans and can cause disease: the *Influenza* virus can cause the flu, *Campylobacter* bacteria can cause food poisoning and the dermatophyte fungi, such as *Trichophyton,* can cause diseases such as athlete's foot and ringworm. Microbes like these are known as **pathogens** or **germs**. Each microbe can make us ill in different ways.

When harmful bacteria reproduce in our bodies, they can produce harmful substances called **toxins** which can make us feel ill or in worse case scenario, damage tissues and organs.

Viruses act like parasites. Once they enter our bodies they need a host cell to survive. Once inside a cell, they multiply and burst free when fully grown and in doing so destroy the host cell.

Fungi generally do not kill their host. **Dermatophytes** prefer to grow or colonise under the skin and the products they produce while feeding cause swelling and itching.

Someone who has harmful disease-causing microbes in them is said to be **infected.** Many harmful microbes can pass from one person to another by a number of different routes – air, touch, water, food, aerosols (such as sneezes and water vapour), animals, etc. Diseases caused by such microbes are said to be **infectious** diseases.

In many instances, our normal body flora (microbes) also help prevent harmful microbes growing by either colonising the area so that there is no room for the harmful microbes to grow or by altering the environment. For example, the normal flora in our gut keeps us healthy by preventing harmful bacteria like *Clostridium difficile* multiplying. When our normal body flora is compromised, *Clostridium difficile,* can grow and cause diarrhoea and in very severe conditions, cause perforation (a tear or puncture) of the gut.

Advance Preparation

1. Prepare a copy of SW 1 and SW 2 for each student.
2. Download SH 1 and SH 2 from the website, www.e-bug.eu, or copy these sheets for the class.

HARM TS 1

1.3 Micro-organisms
Harmful Microbes

Lesson Plan

Introduction

1. Begin the lesson by explaining to the class that sometimes microbes can be harmful to humans. Ask them if they know what makes them ill. Find out how many different words they have for microbes – germs, bugs, etc.
2. Explain to the class that the germ is an everyday word that refers to the bacteria, viruses and fungi that make you sick. Discuss the various microbes with the class and the illnesses they can cause. The microbe images found on the website, **www.e-bug.eu**, in section 1.1 may help students visualise these harmful microbes.
3. Highlight to the class that microbes have adapted to live everywhere, such as in our classrooms, houses, bedrooms, all over our body and on food!
4. Tell the class that harmful disease-causing microbes called pathogens can spread easily from one person to another, and are called infectious diseases because they can cause an infection.

Main Activity

1. This activity is best suited as a class discussion followed by an individual student activity.
2. Show the class each of the picture scenarios (1-6) in teacher section **SH 1** and **SH 2**. The handouts can be shown to the class by photocopying for each person in the class, printing onto acetates for overhead projection or by displaying on the whiteboard from the e-Bug web site (**www.e-bug.eu**).
3. For each scenario, ask the class whether they think a microbe is making Amy or Harry sick. Tell the class each of the stories as explained in **TS 3**. Continue the discussion by asking if anyone in the class has ever suffered from any of Amy's or Harry's symptoms and if so, what kind of treatment they had.
4. **Remember**: There are hand washing, respiratory and food hygiene activities in later sections of the e-Bug resource which will cover these topics in more detail.
5. If time permits, provide the class with a copy of **SW 1** and **SW 2**. The word search and crosswords contain a list of words associated with harmful microbes and illness, which will help reinforce the learning outcomes of this lesson.

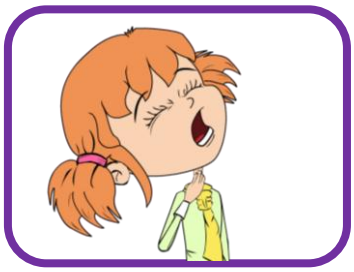
Plenary

1. Check for understanding by asking the students the following questions:
   a. What causes an infection?
      An infection happens when harmful microbes get inside your body and replicate, causing the infected person to get ill.
   b. Are sore throats always caused by harmful microbes?
      Not all sore throats are caused by harmful microbes, sometimes coughing or having a toothache can cause our throats to become red and sore too.
   c. Are all illnesses caused by microbes?
      No, illnesses such as asthma and hay fever are not caused by microbes.
   d. Can you think of any infections caused by harmful microbes?
      Athlete's foot, influenza, measles.

Teaching Points

Amy likes to keep her hands and nails clean. If we look closely at Amy's hands we can see that they are covered in lots of tiny microbes. These microbes are good microbes that live on our skin and help keep us healthy.

Harry is always out playing football and having fun with his friends, however he doesn't worry about washing his hands very often. If we look closely at Harry's hands we can see that they too are covered with lots of tiny microbes although some of these are bad and could make him very ill if they got inside his body.



Amy isn't very well, she has a really sore throat. Sometimes sore throats are caused by coughing and a runny nose, which can make the throat swell up and become quite painful. If this happens then Amy should drink lots of fluids and take painkillers. Sometimes, however, bacteria (e.g. *Streptococcus*) and viruses can also cause us to have a sore throat.

In this picture, do you think that Harry is ill because of microbes? The answer is no, Harry has a condition known as asthma which causes him to get out of breath very easily. Asthma is a disease of the lungs and airways but is not caused by microbes. It is important to remember that not all illnesses are caused by microbes.

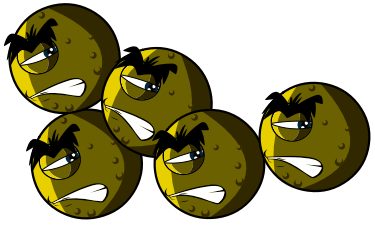
What do you think is wrong with Harry in this picture? Poor Harry has eaten undercooked chicken at a BBQ and has now got food poisoning caused by *Campylobacter*. There are lots of microbes on meat, which although they don't harm the animal can make us very ill! It is important to cook food properly to kill any harmful microbes which may be present.

Amy plays tennis and she has sweaty smelly feet. She is always in a hurry so she doesn't wash or dry her feet properly. Her feet smell and are also very itchy and swollen in between her toes. This is because fungi known as dermatophytes like to live between the toes, especially if they are damp! They cause a disease known as athlete's foot which causes your toes to swell up, the skin between them to crack and become VERY itchy and sometimes smelly!

HARM TS 3

Bad Bug Challenge Answers

F	C	E	A	R	T	M	Y	Y	U	A	N	S	D	F
F	O	M	G	B	F	L	U	M	B	H	N	H	J	K
Z	L	O	N	Z	R	W	K	A	Y	E	A	E	A	L
F	D	S	D	H	G	D	A	S	T	H	M	A	T	A
V	B	H	N	P	H	N	J	O	H	D	D	D	G	T
S	V	V	A	C	G	U	G	H	N	C	I	A	B	H
M	S	O	S	X	J	I	D	F	B	G	R	C	G	L
E	T	G	M	Z	U	N	S	A	M	A	T	H	A	E
A	N	M	D	I	A	R	H	O	E	A	Y	E	J	T
S	Z	X	C	V	T	B	G	T	N	D	H	J	H	E
L	R	T	A	Y	U	N	I	A	O	I	A	F	G	S
E	Q	W	E	R	L	N	F	L	U	E	N	Z	A	F
S	P	O	T	I	O	P	L	B	K	J	D	G	G	O
A	S	D	M	S	L	E	E	P	Y	E	S	S	F	O
H	A	Y	F	E	V	E	R	N	F	G	N	H	K	T

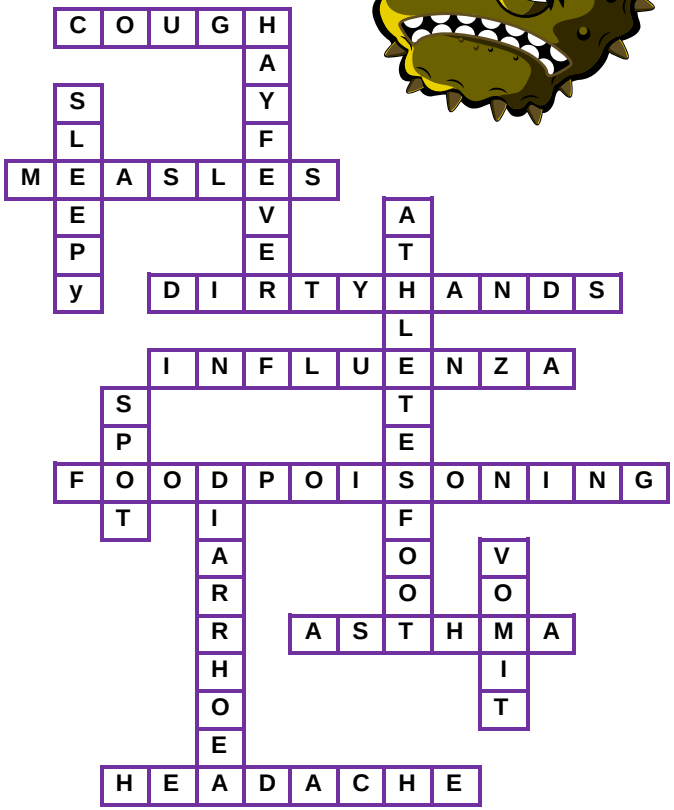


ACROSS

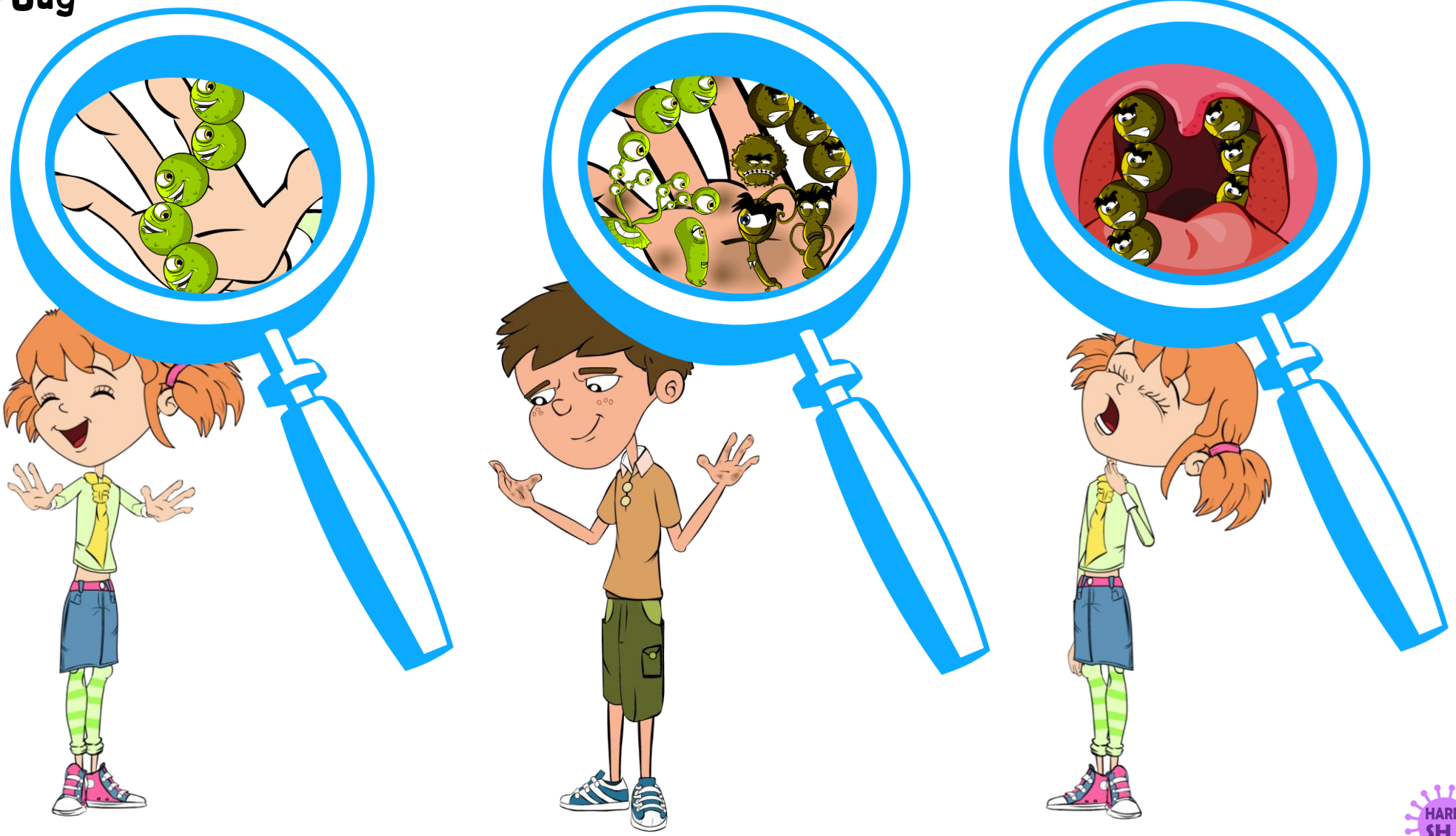
1. I make you do this when you have a cold to spread microbes by causing a tickle in your throat.
4. I am a viral disease that can give you swollen itchy red spots all over your body.
6. I am a part of your body and spread microbes from person to person. Washing me gets rid of me (2 words).
7. I am a viral disease that will make you hot and sweaty.
9. You get me if you don't cook your meat properly or wash your hands after handling raw meat (2 words).
12. I am an allergy, not caused by microbes. I make you so short of breath that you need to use an inhaler!
13. I am another word for a pain in your head.

DOWN

2. I make your eyes swollen and itchy. I am not caused by a microbe. I am caused by flower pollen.
3. How you feel when your body is fighting infection.
5. I am a fungal infection of your feet. I make your toes itchy. I spread if you don't wash and dry your feet well! (2 words).
8. I am often seen on teenagers faces. I am caused by microbes on the skin.
10. Bad microbes in your tummy can sometimes cause this. If you don't wash your hands after going to the toilet it can spread around your school.
11. Watch out! Bad tummy microbes can sometimes take you by surprise and make you do this.



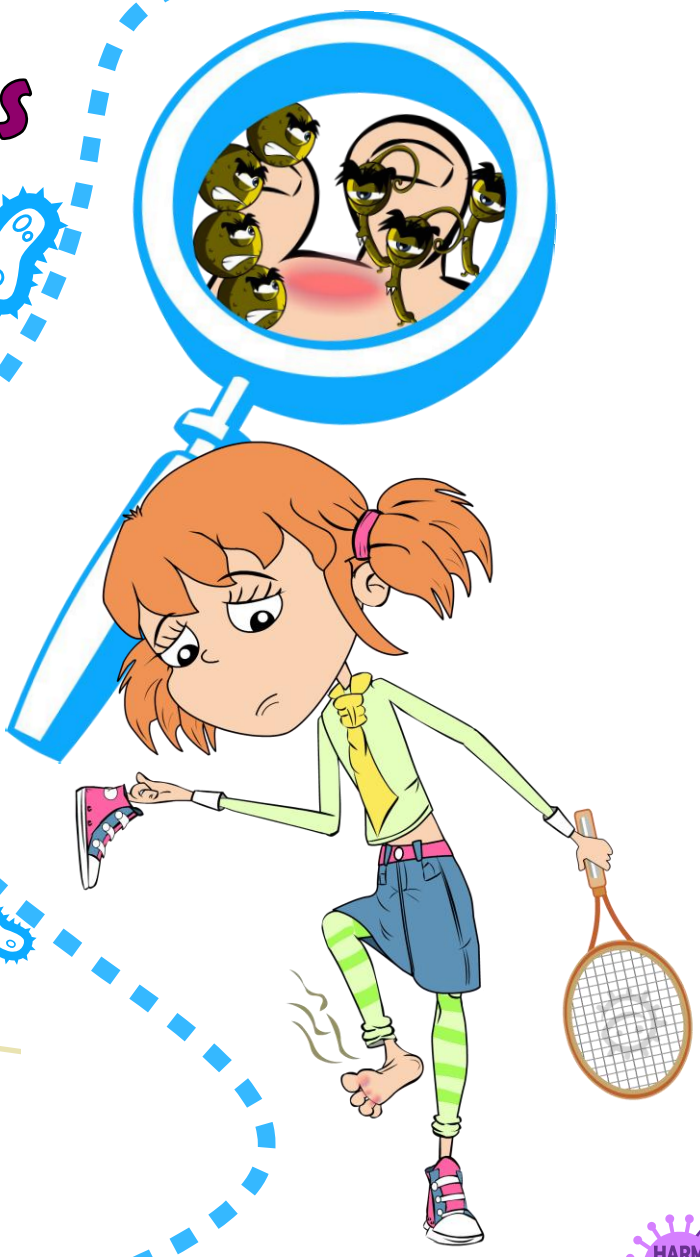
Harmful Microbes



e-Bug

Micro-organisms

Harmful Microbes



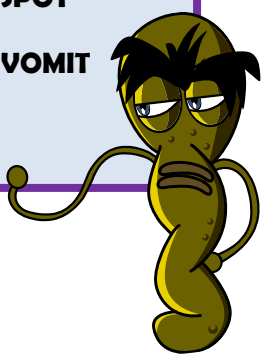
HARM SH 2

Bad Bug Challenge!

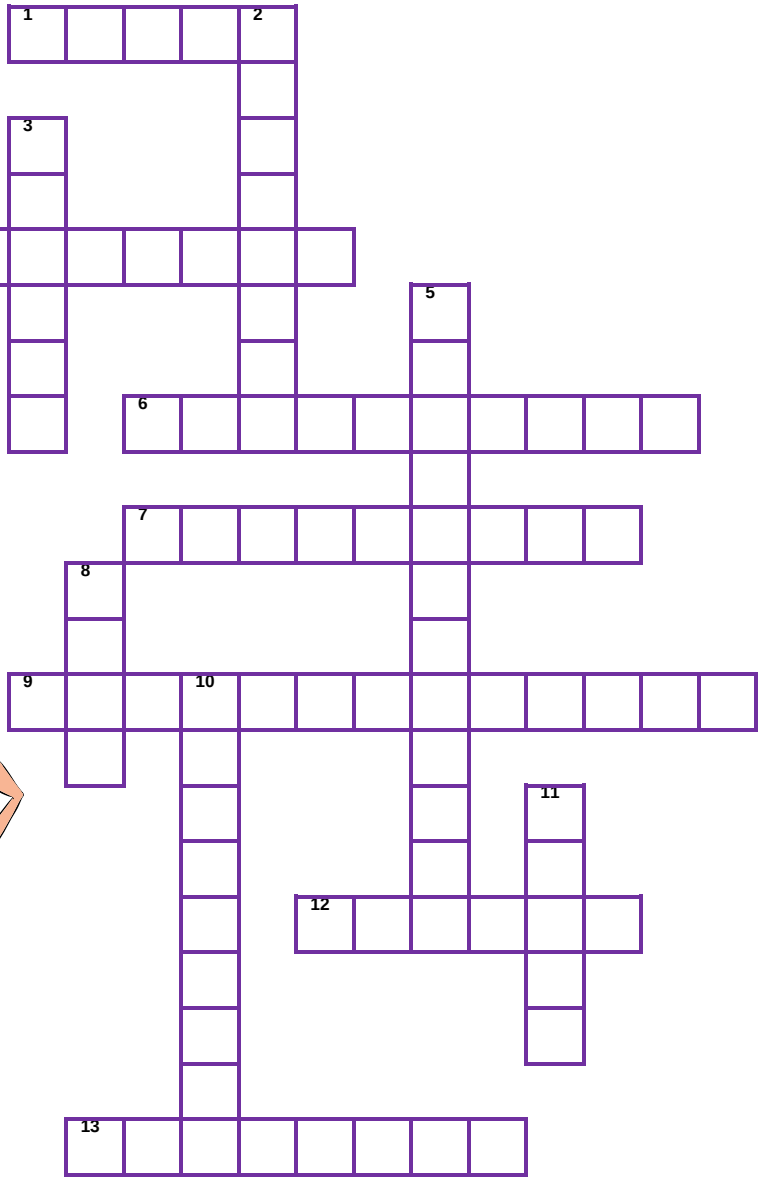
Can you find all the words associated with Bad Bugs in the word search below? Remember that the words can be horizontal (across), vertical (down) or diagonal (top left to bottom right).

F	C	E	A	R	T	M	Y	Y	U	A	N	S	D	F
F	O	M	G	B	F	L	U	M	B	H	N	H	J	K
Z	L	O	N	Z	R	W	K	A	Y	E	A	E	A	L
F	D	S	D	H	G	D	A	S	T	H	M	A	T	A
V	B	H	N	P	H	N	J	O	H	D	D	D	G	T
S	V	V	A	C	O	U	G	H	N	C	I	A	B	H
M	S	O	S	X	J	I	D	F	B	G	R	C	G	L
E	T	G	M	Z	U	N	S	A	M	A	T	H	A	E
A	N	M	D	I	A	R	H	O	E	A	Y	E	J	T
S	Z	X	C	V	T	B	G	T	N	D	H	J	H	E
L	R	T	A	Y	U	N	I	A	O	I	A	F	G	S
E	Q	W	E	R	I	N	F	L	U	E	N	Z	A	F
S	P	O	T	I	O	P	L	B	K	J	D	G	G	O
A	S	D	M	S	L	E	E	P	Y	E	S	S	F	O
H	A	Y	F	E	V	E	R	N	F	G	N	H	K	T

COUGH
HAYFEVER
ATHLETES FOOT
COLD
ASTHMA
SLEEPY
FOOD POISONING
SPOT
MEASLES
DIRTY HANDS
FLU
VOMIT
HEADACHE
INFLUENZA



Bad Bug Challenge!



ACROSS

1. I make you do this when you have a cold to spread microbes by causing a tickle in your throat.
4. I am a viral disease that can give you swollen itchy red spots all over your body.
6. I am a part of your body and spread microbes from person to person. Washing me gets rid of bad microbes (2 words).
7. I am a viral disease that will give you headaches, a runny nose and make you hot and sweaty.
9. You will get me if you don't cook your meat properly or wash your hands after handling raw meat (2 words).
12. I am a disease of the lungs, not caused by microbes. I make you so short of breath that you need to use an inhaler!
13. I am another word for a pain in your head.

DOWN

2. I make your eyes swollen and itchy. I am not caused by a microbe. I am caused by an allergy to pollen.
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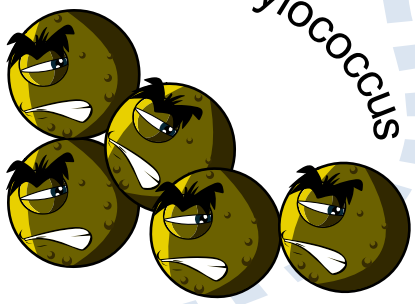
10. Bad microbes in your tummy can sometimes cause this. If you don't wash your hands after going to the toilet it can spread around your school.
11. Watch out! Bad tummy microbes can sometimes take you by surprise and make you do this.

ANSWERS

INFLUENZA	HAYFEVER	MEASLES	HEADACHE	DIARRHOEA
ASTHMA	ATHLETES FOOT	VOMIT	SPOT	COUGH

HARM SW 2



National Curriculum Links

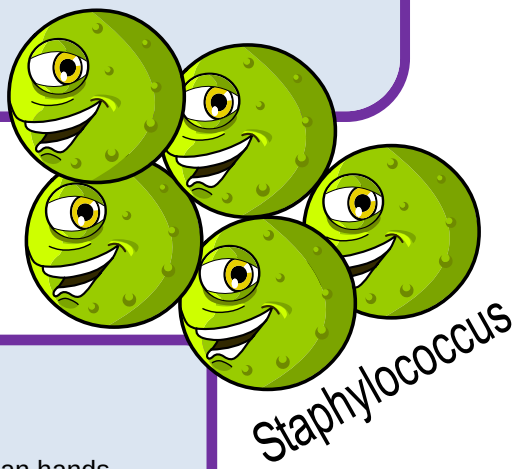
Key Stage 2
Science
Working Scientifically
Animals Including Humans (*Upper KS2 only)*
PSHE
Core Theme 1: Health and Wellbeing
English
Reading and Comprehension
Estimated Teaching Time
50 minutes

2.1 Spread of Infection Hand Hygiene

Section 2.1 covers the topic of the spread of infection through hand hygiene.

Students carry out an experiment to observe how microbes can spread from person to person simply by shaking each others hands.

Students will also make observations and decide which method is best for hand washing and removing microbes.



Learning Outcomes

All students will:

- understand that infection can be spread through unclean hands.
- understand that hand washing can prevent the spread of infection.

2.1 Spread of Infection
Hand Hygiene

Key Words

Antibacterial soap
Contagious
Hygiene
Infection
Infectious
Transfer

Materials Required

Per student

- ☐ Copy of SW 1
- ☐ Copy of SW 2

Per group

- ☐ Copy of SH 1
- ☐ Basin
- ☐ Hand soap
- ☐ Paper towels
- ☐ Cold or warm water
- ☐ Oil based Glo Gel and UV lamp **or** cooking oil and cinnamon

Health and Safety

- ☐ If using cinnamon as an alternative to Glo Gel, take care of children with sensitive skin conditions
- ☐ Ensure that the lead students have no soap allergies or sensitive skin conditions

Available Web Resources

- A 'Horrid Hands' demonstration film.
- 6 steps of hand washing poster.

HAND TS 1

Background Information

Schools are a haven of harmful microbes that spread rapidly from child to child via touch. Washing your hands is one of the best ways to STOP harmful microbes from spreading and preventing us from getting sick.

Our hands naturally secrete oil which helps to keep our skin moist and stops it getting too dry. This oil, however, is a perfect place for microbes to grow and multiply, and the oil helps microbes 'stick' to our skin.

Our hands are naturally covered by our useful bacteria – usually useful *Staphylococcus*. Washing our hands regularly helps to remove the other microbes we collect from our surroundings (e.g. home, school, garden, animals, pets, food). Some of these microbes can make us ill if eaten or breathed in.

Washing hands in water alone, even in cold water, will eliminate visible dirt and grime; however, soap is required to break up the oil on the surface of the hands which traps microbes.

Hands should be washed:

- before, during and after preparing food
- After using the bathroom
- After exposure to animals or animal waste
- After coughing, sneezing or blowing your nose
- If you are ill or have been around ill people

Advance Preparation

1. Copy SW 1 and SW 2 for each student.
2. Copy SH 1 for each group.
3. Arrange four desks side by side for the 4 stations. Each desk should contain one of the following:
   a. A sign reading 'No hand washing'
   b. A basin of cold water, paper towels and a sign reading 'Wash in Cold Water'
   c. A basin of warm water, paper towels and a sign reading 'Wash in Warm Water'
   d. A basin of warm water, hand soap, paper towels and a sign reading 'Wash in Warm Water and Hand Soap'

Alternative Suggestion

If Glo Gel and a UV lamp are unavailable, ask the student at the front to cover their hands in cooking oil or an equivalent non harmful oil and sprinkle well or cover with cinnamon or glitter.

2.1 Spread of Infection
Hand Hygiene

Lesson Plan

Introduction

1. Begin the lesson by asking students how many have washed their hands today? Ask them why they washed their hands (*to wash away any microbes that might be on their hands*) and what would happen if they didn't wash away the microbes (*they might get ill as they will eat or breathe in harmful microbes from their dirty hands*).
2. Tell the students that we use our hands all the time, and they pick up millions of microbes every day. Although many of these microbes are harmless, some could be harmful. Explain to the students that we spread microbes to our friends and others through touch, and this is why we wash our hands. One study found people touch their face 16 times per hour, about 190 times a day!
3. Explain to students that they are going to do an activity to show how best to wash their hands in order to remove any of the harmful microbes which may be on their hands.

Main Activity

1. Divide the class up into four equal separate groups
2. Ask each student to stand in a row one behind the other and designate groups as follows
    a. No hand washing
    b. Wash hands in cold water
    c. Wash hand in warm water
    d. Wash hands in warm water with soap
3. Blindfold the lead person in each group and cover their hands in Glo Gel. The blindfold ensures that they don't wash their hands any better than normal. Ask the lead person to wash their hands according to the group they are in.
4. Once completed, they should take off their blindfold, turn around and shake hands with the person behind them. It is important that they shake hands firmly and well. The second person should then shake hands with the third person and so on until everyone in the group has shaken hands with the person in front of them.
5. When the task is complete, turn down the lights and shine the UV lamp over everyone's hands, starting with group A.
6. Ask students to fill out their answer sheets (**SW 1** and **SW 2**).

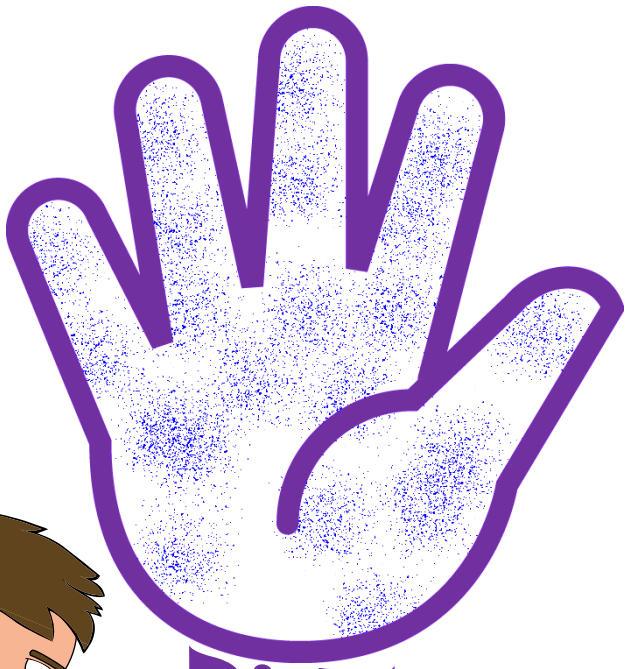
Plenary

1. Discuss the results with the students. What results did they find the most surprising? Explain that the soap takes away the oil in the skin that the microbes use to stick to and hide in.
2. Discuss where the microbes on their hand may have come from. Emphasise to students here that not all the microbes on their hands are harmful; there may be useful microbes too!
3. Emphasise to students that we also need to wash hands properly. Highlight that bacteria like to hide in between fingers and under the nails! It is important to know both WHEN and HOW to wash our hands properly to prevent spreading microbes, or even worse, infection. It is not always easy to wash your hands in school; a solution may be to sneeze on your sleeve.

HAND TS 2

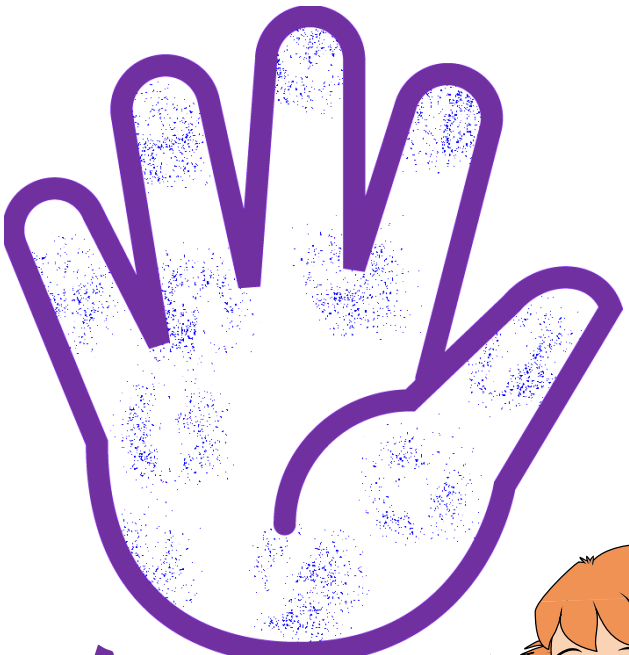
e-Bug

Very Dirty



Dirty

How clean are your hands?



A Bit Dirty

Clean

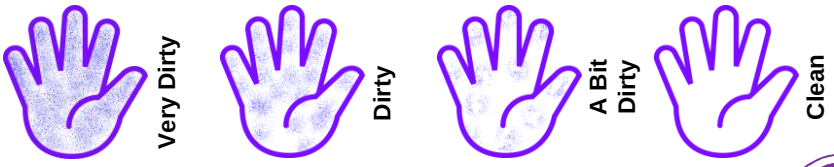
HAND SH 1

Horrid Hands?

Procedure

After the activity, write your results in the box provided using the guide below and see how far the microbes have spread!

What is the best way of washing hands to remove microbes?



My Observations

	After washing (or not washing) and shaking hands				
	Student 1	Student 2	Student 3	Student 4	Student 5
No wash (control)					
Cold Water					
Warm Water					
Warm Water and Soap					

1. On the next page draw where you saw microbes after hand washing and shaking, for your group only.
2. The method of hand washing (not control) that **removed most** microbes from the lead person was:

   ☐ Cold Water ☐ Warm Water ☐ Warm Water and Soap

3. The method of hand washing (not control) that **removed fewest** microbes from the lead person was:

   ☐ Cold Water ☐ Warm Water ☐ Warm Water and Soap

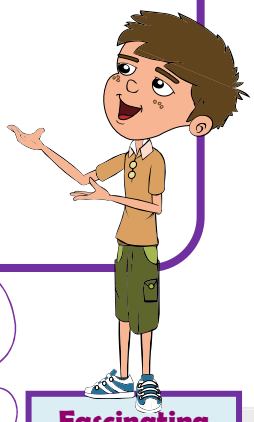
4. The method of hand washing which **spread the most** microbes along the line was:

   ☐ Cold Water ☐ Warm Water ☐ Warm Water and Soap

5. The method of hand washing which **spread the fewest** microbes along the line was?

   ☐ Cold Water ☐ Warm Water ☐ Warm Water and Soap

6. Draw a graph of how far the microbes spread for all four groups (including control).



My Conclusions

1. What is the best way of removing microbes from our hands?

   _____

2. What difference does using soap make?

   _____

3. When should we wash our hands?

   _____

Fascinating Fact

90% of germs found on the hands are under the nails!

HAND SW 1

e-Bug

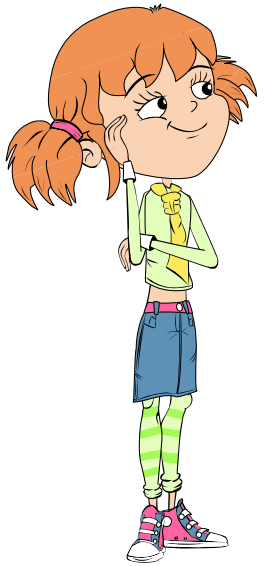
Student 1

Shook hands with...

Student 2

Shook hands with...

Student 3



Student 4

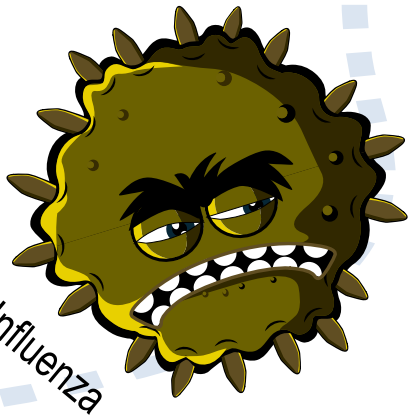
Shook hands with...

Student 5

HAND SW 2

National Curriculum Links

Key Stage 2
Science
Working Scientifically
Animals Including Humans (*Upper KS2 only*)
PSHE
Core Theme 1: Health and Wellbeing
English
Reading and Comprehension
Estimated Teaching Time
50 minutes

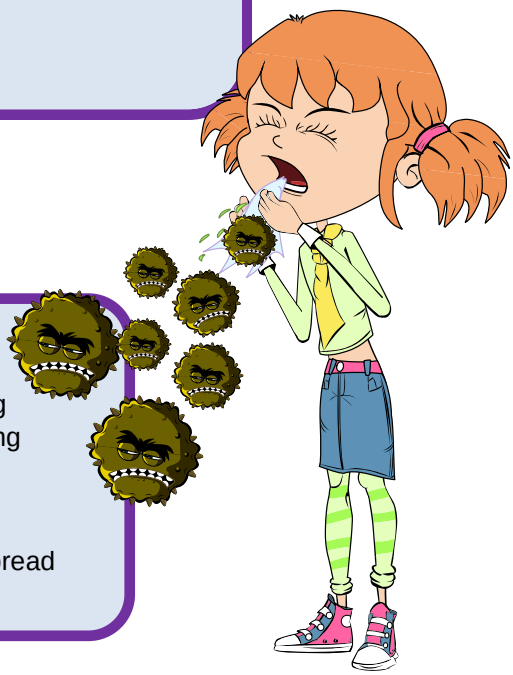


2.2 Spread of Infection Respiratory Hygiene

Section 2.2 covers the topic of the spread of infection and respiratory hygiene.

Students get to observe on a large and fun scale how far germs are carried when they sneeze.

Students also learn through a set of trial experiments that covering their mouths with a tissue when they cough and sneeze helps prevent the spread of infection.



Learning Outcomes

All students will:
- learn that infection can spread through sneezing and coughing
- understand that covering the mouth when sneezing or coughing can prevent the spread of infection

More able students will:
- understand that coughing or sneezing in your hand can still spread infection

2.2 Spread of Infection
Respiratory Hygiene

Key Words

Contagious
Experiment
Prediction
Results
Symptom
Transmission

Materials Required Per Student

- ☐ A copy of SW 1

Per Group

- ☐ A sneezing runway
- ☐ Blue sneezer spray bottle
- ☐ Red sneezer spray bottle
- ☐ Green sneezer spray bottle
- ☐ Measuring tape
- ☐ Giant or gloved hand
- ☐ Giant tissue

Health and Safety

- ☐ Students may require aprons and gloves
- ☐ Ensure that the food colouring is EXTREMELY dilute
- ☐ Ensure that all spray bottles have been thoroughly cleaned and rinsed prior to use
- ☐ Students may need to wear safety goggles

Available Web Resources

- A demonstration of this 'Super Sneezes' activity.

RESP TS 1

Background Information

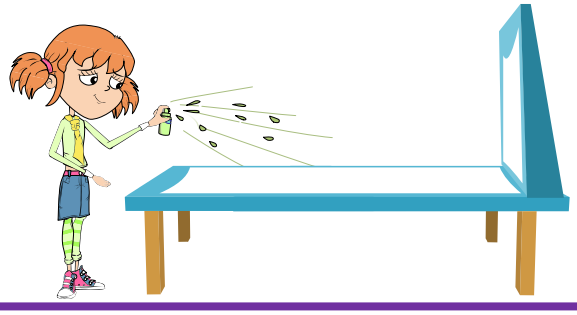
The most common mode of spreading infection is through aerosols, such as coughs and sneezes. They can also be spread via a more direct route, for example through human contact (touching, kissing, dirty hands, sharing toothbrushes, cups) and by eating contaminated food.

Colds and flu are the most common illnesses in the classroom and among the most contagious. Colds and flu are caused by viruses and, as such, cannot be treated with antibiotics. Usually, bed rest and drinking plenty of fluids are recommended. You can also visit the pharmacy for advice on over the counter medications to ease symptoms, however if symptoms persist then a visit to the local doctor is required. Symptoms of colds and flu include headache, sore throat and fever. Colds also cause runny noses! Many sore throats from colds and flu are due to the viruses in the throat making it feel raw, breathing in through the mouth causes the throat to feel dry and continual coughing causing an aching feeling.

Sneezing is a way in which our body tries to get rid of any harmful microbes and dust we might inhale. The harmful microbes and dust get caught on the nose hair and tickle our nose. The nose sends a message to the brain which then sends a message back to your nose, mouth, lungs and chest telling them to blow the irritation away, or sneeze. In the case of colds and flu, millions of virus particles rush out and contaminate the surface on which they land; this could be our food or hands.

Advance Preparation

1. Create a sneezing runway by placing 3 – 4 desks in a row with a vertical back board and covering them with white paper (lining wallpaper is a cheap alternative) as illustrated below.
2. Fill one spray bottle per group with water and food colouring. A different colour for each group makes the activity more exciting for the students.
3. Create a large cut out hand from cardboard for each group with a longer arm section for holding or alternatively cover a student's hand with a disposable glove.
4. Create a large tissue from a section of kitchen roll.



2.2 Spread of Infection
Respiratory Hygiene

Lesson Plan

Introduction

1. Begin the lesson by telling the students that they are going to learn how harmful microbes can be passed from person to person through sneezing and coughing. Ask students what they think people mean when they say 'You gave me the cold' or 'I caught the flu from you'.
2. Explain to students that many diseases are airborne and are spread in tiny droplets of mucus and water coughed and sneezed into the air by people. Tell them that diseases that are spread in this way range from the common cold and flu, to rarer, more serious infections such as meningitis or tuberculosis (TB). The microbe images found on the website, **www.e-bug.eu**, in section 1.1 may help students visualise these harmful microbes.
3. Continue to discuss the cold and flu, explaining that they are caused by viruses and not bacteria. Explain that it is very important for everyone's health that people cover their mouth and nose with a tissue when they cough and sneeze. There are sometimes large outbreaks of flu when 1000s of people in a country get the infection. The spread of infection can be reduced through good respiratory hygiene.
4. Ask students to try and remember the last time they had the cold or flu. Ask them to write down the names of everyone else they knew who had the cold and flu at the same time. Ask them to identify, if they can remember, who developed the symptoms first. Do they think they may have caught the cold or flu from these people?

Main Activity

1. Divide the class into groups of 4 – 5 students
2. Each group should be provided with the sneezing runway, a sneezing bottle, a measuring tape or ruler, a giant hand or glove and a giant tissue. Provide each student with **SW 1**. Ensure they have read and understood the instructions before starting the activity.
3. To demonstrate the distance a sneeze and microbes in the sneeze travel, students in each group should take turns holding the bottle at the end of the runway and simulate a sneeze by squeezing the trigger once over the paper. Before '*sneezing*' (squeezing the trigger) students should predict how far and wide the sneeze will go and fill this in on their results sheet (**SW 1**). After 'sneezing' students should measure and record how far and how wide each student's sneeze spreads and fill this on their results sheet.
4. The next step is to observe what happens when we put our hand over our mouth when we sneeze; the microbes stay on our hands and can spread to anything we touch. One student in each group should be the 'sneezer' and the second student should hold the giant or gloved hand about 2 – 5cm away from the spray bottle. Students should fill both predicted and actual outcomes on their results sheet.
5. Finally, we want to observe what happens when we cover our mouth with a tissue during sneezing. Ask a different student in each group to be the 'sneezer' and ask another student to hold the tissue directly in front of the spray nozzle. Students in the group should fill in both predicted and actual outcomes on **SW 1** and draw a graph of the results.

RESP TS 2

2.2 Transfer of Infection
Respiratory Hygiene

Lesson Plan

Plenary

1. Discuss with students the outcome of their results. Ask them to look at the hand and notice that the spray 'microbes' are still on it.
2. Show them that when they place the hand on the paper, sprayed side down, the microbes transfer to the paper. Explain that sneezing in your hand can spread the microbes to things that we touch, so it is better to sneeze into the tissue and then throw it away and wash your hands as soon as possible.
3. Discuss with students why some countries use the message 'sneeze in your sleeve'.

   As was observed from the activity, microbes can still be passed from person to person through touch if we cover our coughs and sneezes with our hands. The Centre for Disease Control (CDC) in the USA recommend that in the absence of a tissue we sneeze on our sleeve because we are less likely to transmit harmful microbes to other people by doing this.

Extension Activity

1. Students should create some simple rules or an easy message to reduce the spread of coughs, colds and flu in their school, for example:
   - Coughs and sneezes spread diseases
   - Catch it, bin it, kill it
   - Cover your coughs and sneezes with a tissue

2. Transfer these messages to poster format, creating simple effective posters to place around the school or classroom.

FASCINATING FACTS

The colour of your snot can tell a lot about your health.

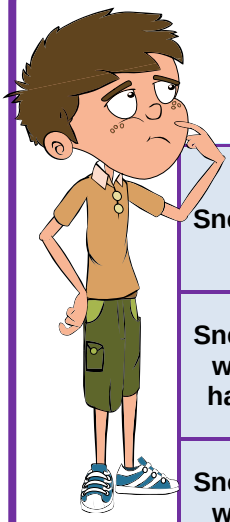
Clear – you're normal.
White – you're congested.
Yellow – you're cold or infection is progressing.
Green – your immune system is really fighting.
Pink or **Red** – this is blood.
Brown – could be blood or something inhaled like dirt.
Black – if you are a smoker or user of illegal drugs, black mucus may mean a serious fungal infection.

RESP TS 3

Super Sneezes

My Observations

How far did your sneeze travel?



		Student 1	Student 2	Student 3	Student 4	Student 5
Sneeze	Length (cm)					
	Width (cm)					
Sneeze with hand	Length (cm)					
	Width (cm)					
Sneeze with tissue	Length (cm)					
	Width (cm)					

Hand in front of sneeze

1. What did you think would happen when you put the hand over the mouth to sneeze?

   _____

2. What actually happened? (Where and how far did the sneeze travel?)

   _____

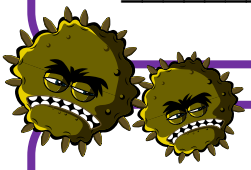
Tissue in front of sneeze

3. What did you think would happen when you put the tissue over the mouth to sneeze?

   _____

4. What actually happened? (Where and how far did the sneeze travel?)

   _____



My Conclusions

1. If we do not wash our hands after sneezing into them what might happen?

   _____

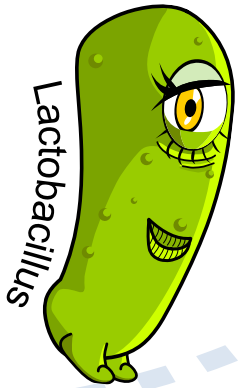
2. What should we do with a tissue after sneezing into it?

   _____

3. Which is best for preventing the spread of infection, sneezing into your hand or into a tissue? Why?

   _____

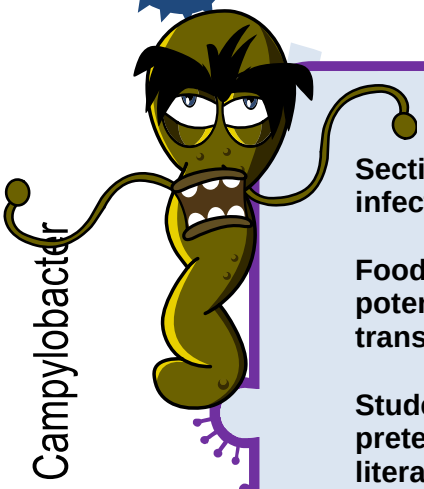
RESP SW 1



National Curriculum Links

Key Stage 2
Science
Working Scientifically
Animals Including Humans (*Upper KS2 only*)
PSHE
Core Theme 1: Health and Wellbeing
English
Reading and Comprehension
Estimated Teaching Time
50 minutes

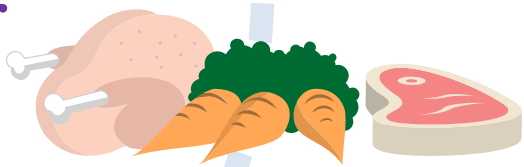
2.3 Spread of Infection Food Hygiene



Section 2.3 covers the topics of the spread of infection and food hygiene.

Food Hygiene teaches students how easily potentially harmful microbes on raw food can transfer to humans.

Students act as chefs for the class and prepare a pretend chicken sandwich. In this activity students literally see how far they have spread harmful microbes!



Learning Outcomes

All students will:

- understand that microbes can be found on our food and can transfer to humans.
- understand that cooking food properly can kill harmful microbes
- understand that bacteria multiply very quickly.

More able students will:

- understand that refrigeration only stops microbes growing, it doesn't kill them

2.3 Spread of Infection
Food Hygiene

Key Words

Cross-contamination
Micro-organism
Pathogen

Materials Required

Per Student
- ☐ A copy of SW 1
- ☐ A copy of SW 2 OR SW 3

Per Group
- ☐ A copy of SH 1
- ☐ A copy of SH 2
- ☐ Glo Gel or powder
- ☐ UV lamp
- ☐ Chicken fillets made from play dough (A recipe can be found in section 1.1)
- ☐ Crepe paper (green and red) or plastic toy food
- ☐ Paper plates
- ☐ Plastic knives
- ☐ Oven area

Health and Safety
- ☐ Care must be taken not to ingest the Glo Gel
- ☐ Do not look directly into the UV light
- ☐ Take care with students who may have sensitive skin

Alternative Suggestion
- Fine glitter or glitter hair gel may be used as an alternative to the Glo Gel. It is important that the glitter transfers easily from one source to another. Different coloured glitter may be used to represent different types of microbe.
- Cinnamon and oil may also be used.

FOOD TS 1

Background Information

Harmful microbes found in food can lead to food poisoning, which can be dangerous and could even kill – though this is rare. The symptoms of food poisoning can last for days and include stomach pains, diarrhoea, vomiting, nausea and fever. The symptoms usually come on suddenly, but can occur several days after eating contaminated food. They will usually get better on their own.

Not all microbes associated with food are harmful, here are examples of some of the good, bad and ugly microbes associated with food.

Useful Microbes can be used to make food and drink, e.g. the yeast *Saccharomyces cerevisiae* is used to make bread and beer. *Lactobacilli* bacteria are used in yogurt and cheese making.

Harmful Microbes can cause food poisoning e.g. the bacteria *Salmonella*, *E. coli* and *Campylobacter* are common microbes found on raw meats and can cause diarrhoea and vomiting in humans and sometimes even death. It is important to know that not just raw meat can cause food poisoning. For example, *Bacillus cereus* is found in rice. Improper reheating of cooked rice can lead to *Bacillus cereus* spores surviving and growing into bacteria that can make you ill.

Food Spoilage Microbes do not usually cause harm to humans. These are generally mould or bacteria, e.g. the fungus *Rhizopus stolonifer* causes bread mould and the bacterium *Pseudomonas* can cause the green discolouration on bacon and other meat.

How can we prevent food poisoning and delay food spoilage?
Most microbes we find on food grow best between 5°C and 40°C in warm and damp places. They generally dislike places that are too warm and are killed at temperatures above 70°C. In cooler temperatures, below 5°C, most bacteria multiply very slowly, if at all. Some bacteria will die, but many survive and can start to multiply again if warm conditions return. This is why we keep our food in the fridge and cook our meat well before we eat it.

Sometimes harmful microbes found on food can spread to other foods, for example via hands or kitchen utensils, and cause illness when those foods are eaten. They can also be spread if raw meats are washed and microbes splash onto work surfaces or other foods. This is known as cross-contamination. You can reduce cross-contamination by washing your hands before and after handling raw meat and also by properly cleaning food preparation surfaces.

Advance Preparation

1. Copy SW 1 and SW2 OR SW 3 for each student.
2. Shape a chicken breast fillet out of playdough for each group and cover with the Glo gel or powder.
3. Establish an oven/microwave area for each group. This could be in the form of a toy oven or a sheet of A4 paper labelled oven.
4. Cut the crepe paper into strips to represent lettuce and tomatoes or purchase plastic toy food.

2.3 Spread of Infection
Food Hygiene

Lesson Plan

Introduction

1. Explain to the students that some microbes like to grow in nice warm damp places, like inside our bodies, and when they find somewhere they like, they grow and multiply! But most microbes don't like places that are overly warm or cold. Tell the class that for this lesson they will be looking at how harmful microbes can enter our bodies through the food we eat.
2. Ask students if they know why we cook food or keep it in a fridge. Explain that putting food in the fridge only slows or stops microbes from growing, it doesn't kill them. The microbes can start growing again when they come out of the fridge. The only way to kill microbes is to cook food until it is really hot and cooked all the way through. This is because very warm temperatures kill many harmful microbes.
3. Discuss with the class which foods contain the most harmful bacteria. Show the class pictures of various food types (**SH 1**) and ask them which they think contain the useful bacteria and which contain the harmful.

   Answers

   Fruit and Vegetables: Useful and Harmful – Most of the microbes found on fruit and vegetables are harmless but sometimes harmful microbes can be found in the soil in which they are grown. It is therefore important to wash all fruit and vegetables before eating.

   Milk: Useful microbes – fresh milk contains *Lactobacillus* bacteria which help us digest food.

   Yogurt: Useful microbes – yogurt also contains *Lactobacillus* bacteria which help us digest food.

   Bread: Useful/Harmless microbes – the yeast *Saccharomyces cerevisiae* helps bread to rise.

   Raw Chicken: Harmful microbes – raw chicken may contain *Salmonella*, *E. coli* or *Campylobacter* bacteria all of which can cause food poisoning in humans.

   Raw Sausages: Harmful microbes – raw meat may contain *Salmonella* or *E. coli* bacteria which can cause food poisoning in humans.
4. Show students how these foods should be stored in the fridge, i.e. meat on the bottom shelf. A web game to help students remember these points can be found at **www.e-bug.eu**.

Main Activity

1. This activity is for groups of 2 – 3 students. Tell the students that they will be making a pretend chicken sandwich. Show them their cooking area.
2. Before they start the activity, ask the students how they think they should prepare the chicken sandwich based on what they have learned in the class. They may wish to follow the guidelines in **SH 2**.
3. When the task is complete ask each group how good they have been in keeping their kitchen clean. Explain to students that their '*raw chicken*' was coated with a special gel that represents the harmful bacteria. They couldn't see the gel because in real life they wouldn't be able to see the harmful bacteria.
4. Shine the UV light on a test area of Glo Gel on your hand so the students can see how it works. Then go around each group and see how much harmful bacteria they spread around their kitchens and on the food they are about to eat.
5. Ask students what they should have done to ensure that the harmful bacteria did not go onto the sandwich or cooked ingredients, i.e. wash their hands and the benches after touching the raw chicken.

FOOD TS 2

2.3 Spread of Infection
Food Hygiene

Lesson Plan

Plenary

1. Provide students with handout **SW 1** to complete.
2. Check for understanding by asking students:
   a. Why were there harmful bacteria all over the kitchen?
   The harmful bacteria are spread all over the food preparation area by the student's hands because they didn't wash their hands after touching the raw meat.
   b. Why is it important to wash hands before and after cooking?
   There may be harmful microbes on our hands and there are a lot of harmful bacteria on the surface of raw meat, many of which can cause food poisoning.
   c. How could we prevent the spread of the harmful bacteria?
   There are many ways in which we can prevent the spread of harmful microbes when preparing food
      i. Wash hands on a regular basis when preparing food, especially after handling raw meat and before touching food which should be eaten raw, i.e. salad vegetables.
      ii. Use separate chopping boards for raw meat, cooked meat, vegetables, bread, etc.
      iii. Use separate knives for raw meat and cooked meat.
      iv. Raw meats should not be washed to avoid harmful microbes splashing onto other foods and surfaces
      v. Clean the food preparation surface after use
   d. If someone ate the contaminated chicken sandwich what might happen?
   They would probably get ill with food poisoning.
   e. Why are there usually no harmful bacteria on cooked chicken?
   We cook chicken well to kill any harmful bacteria living there. The high cooking temperatures kill harmful bacteria.
   f. Why do we store food in a fridge?
   The fridge is quite a cold environment (4°C). In cooler temperatures, below 5°C, most bacteria multiply very slowly, if at all. Some bacteria will die, but many survive and can start to multiply again if they return to warm conditions.
3. Ask students if they were surprised at how many things they touched in their own kitchen when they made a sandwich. Remind them that if the food was contaminated with harmful microbes then they would have spread these harmful microbes all over their kitchen.

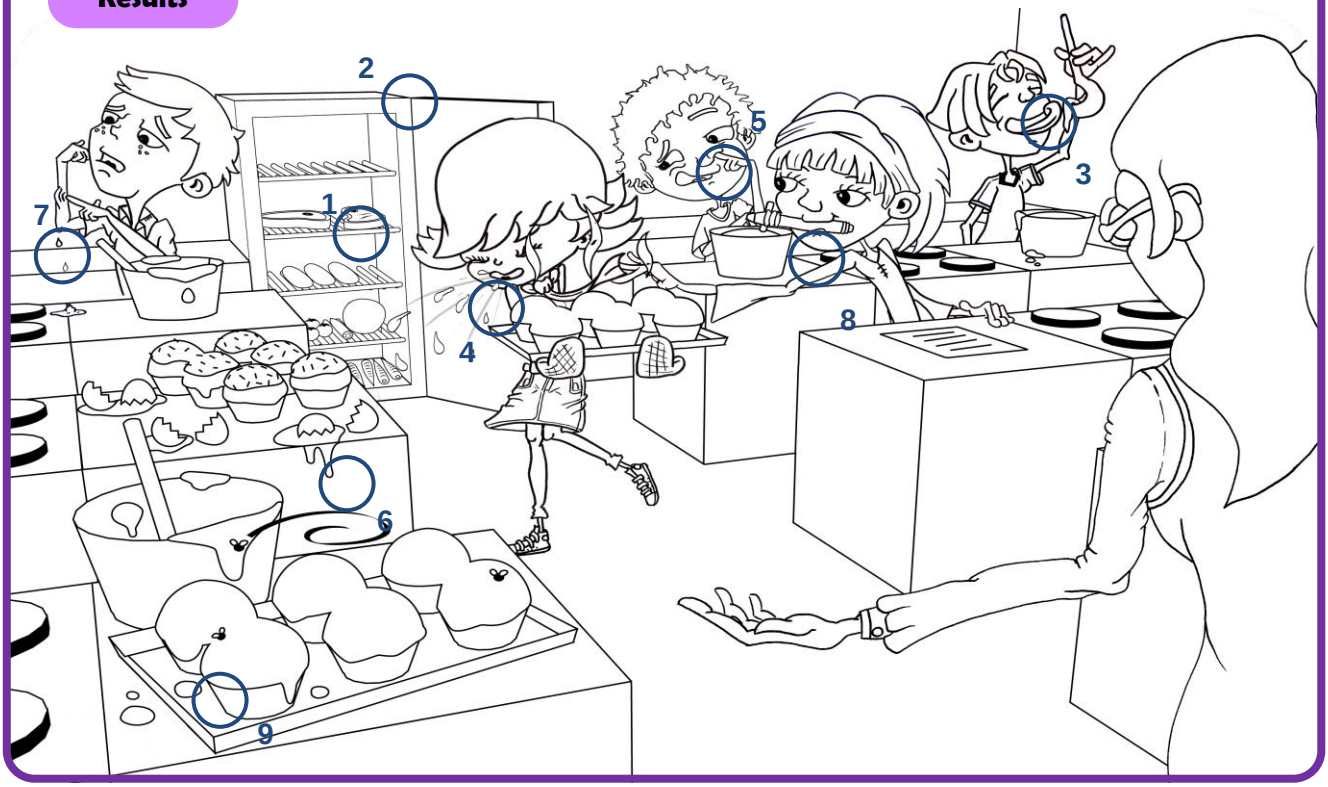
Extension Activity

1. This activity can be carried out either individually or in groups of 2 – 4 students.
2. Provide students with **SW 3**.
3. Students should identify 9 ways in which the group are not being careful about spreading infection and provide a reason for each.

2.3 Spread of Infection
Food Hygiene

Teacher Answer Sheet

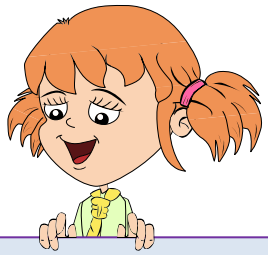
Results



Explanation of Results

1. Raw meat should be kept on the bottom shelf of the fridge or on a plate to prevent the blood and harmful microbes dripping onto and contaminating the other items in the fridge.
2. Normal fridge temperatures (2–5°C) stop microbes from growing and multiplying. Leaving the fridge door open heats up the fridge and allows the microbes to grow and multiply until there are enough to become dangerous.
3. Licking the spoon can spread any harmful microbes from the mouth into the food mixture or alternatively, any unwanted microbes in the raw mixture into the mouth.
4. Using a tissue to cover your mouth when coughing or sneezing helps prevent the spread of infection.
5. Hair and mucus on the inside of the nose trap any unwanted microbes we may breathe in. The 'snot' picked from the nose may contain many harmful microbes which can be spread onto our food or other people by our hands.
6. Raw eggs have been known to harbour harmful bacteria such as *Salmonella,* which could lead to a gut infection if ingested.
7. All cuts and spots should be covered when cooking, to stop microbes spreading from blood to food.
8. The pencil may have come into contact with harmful microbes around the room and putting it in the mouth can spread these microbes to the mouth or gut.
9. Flies are known to carry potentially harmful microbes from source to source. Covering food when it is out of the fridge can reduce flies from spreading microbes to the food If a fly's last meal was from the waste bin, the bad microbes can stick to the fly's mouth and transfer onto our food when they land there!

FOOD TS 4



Which of the following foods have useful microbes and which have harmful microbes?

Fruit and Vegetables

Milk

Yogurt

Bread

Chicken

Sausages

How to make a chicken sandwich

e-Bug

1. **Cut** the **chicken** into small pieces and put on a plate.

2. Put the **chicken** in the **oven** to cook.

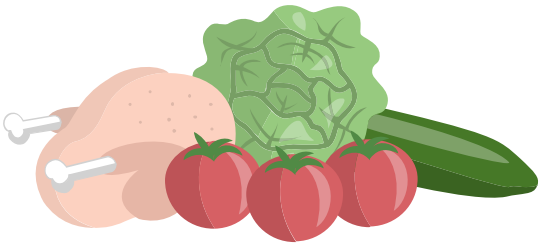
3. Cut your **lettuce, tomatoes** and **cucumber**.

4. When ready, take the **chicken** out of the oven.
.

5. Prepare the **bread** for the sandwich.

6. **Layer** the sandwich with the salad ingredients and chicken and **serve** on plates.

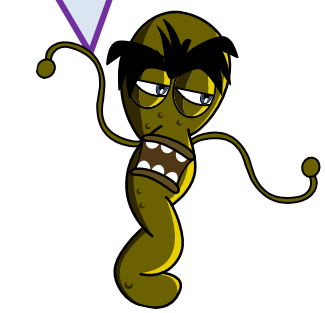
7. **Everyone** sit around their benches ready to **eat**.



FOOD SH 2

How clean was the kitchen?

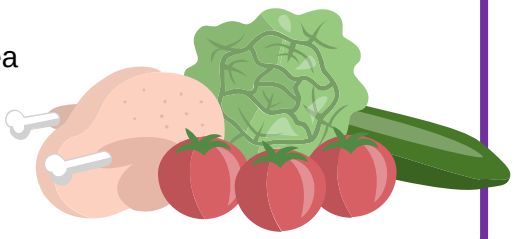
e-Bug



My Observations

After preparing the sandwich this is where I saw the bacteria:

- ☐ On the sandwich
- ☐ On the chicken
- ☐ On the preparation area
- ☐ On my hands
- ☐ Other places



What about YOUR Kitchen?

1. Imagine all the bacteria on your hand are painted blue and you will leave a blue mark every time you touch something.
2. In the box provided draw a plan of your kitchen. Make a blue mark on everything you would touch to make a sandwich.

My Conclusions

1. If we do not wash our hands after touching the raw chicken what could happen?

   _____

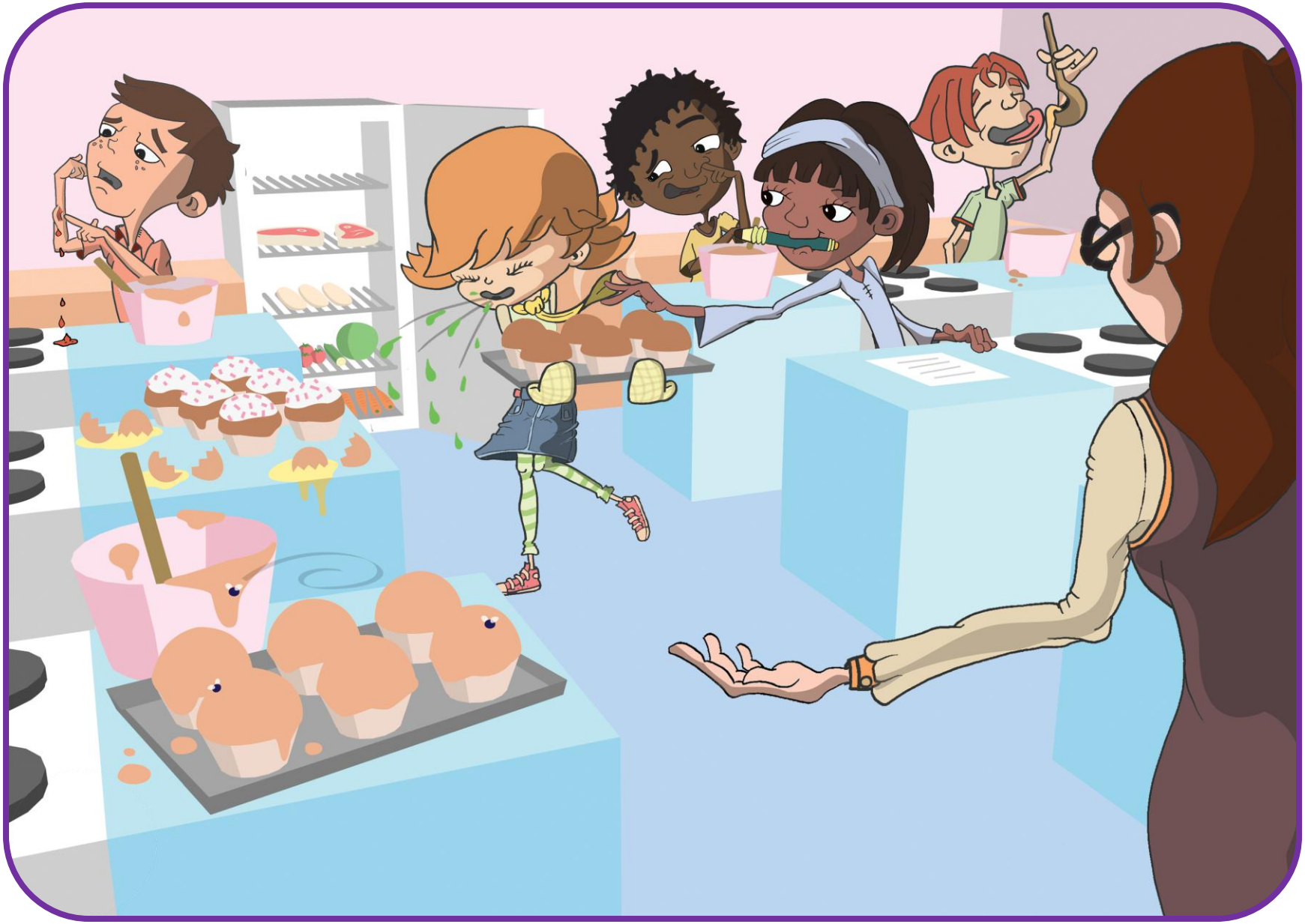
2. How can we stop the microbes from the raw chicken spreading to other areas?

   _____

3. If someone ate the sandwich with the microbes on it, what might happen?

   _____

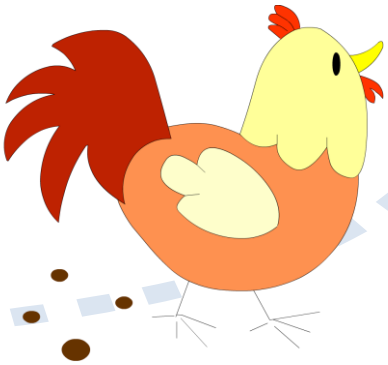
Circle 9 things that the students in this cookery class should not be doing and explain why?



Circle 9 things that the students in this cookery class should not be doing and explain why?

National Curriculum Links

Key Stage 2
Science
Working Scientifically (*Lower KS2 only*)
Living things and their habitats (*Upper KS2 only*)
PSHE
Core Theme 1: Health and Wellbeing
English
Reading and Comprehension
Estimated Teaching Time
50 minutes

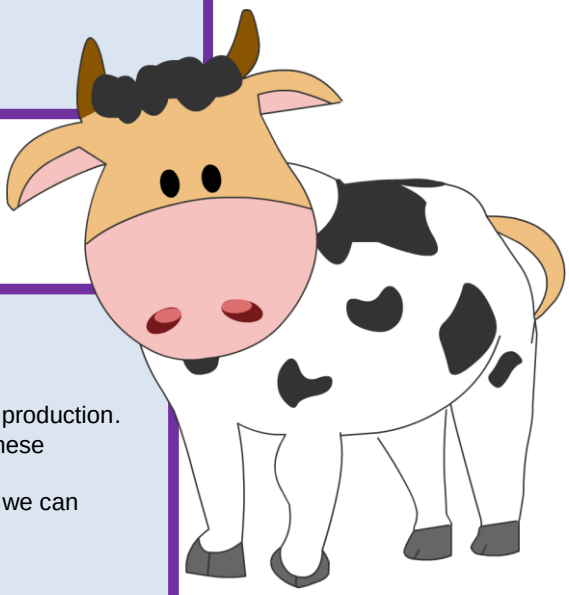


2.4 Spread of Infection Farm Hygiene

Section 2.4 covers the topic of the spread of infection and farm hygiene.

Students learn that the farm environment is home to both useful and harmful microbes.

Students learn through group discussion, 'social networking', and a farm journey board game, the risks and benefits of various farm microbes.



Learning Outcomes

All students will:

- understand that useful microbes on the farm help the farmer with food production.
- understand that harmful microbes can be found on the farm and that these microbes can spread to humans.
- understand that by washing our hands and following some basic rules we can reduce the chance of picking up an infection on the farm.

More able students will:

- understand where specific harmful microbes can be found on the farm.
- understand where specific useful microbes can be found on the farm and how they are used in food production.

2.4 Spread of Infection
Farm Hygiene

Key Words

Farm
Hygiene
E. coli
Salmonella
Campylobacter
Useful microbes
Rhizobia
Thermophiles
Lactobacilli

Materials Required

Per student group
- ☐ Copy of SW 2 - SW 8
- ☐ Farm Journey Game: board, counters, dice and cards

Per Class
- ☐ Copy of PowerPoint slides or SW 1 for each student

Available Web Resources

- PowerPoint slides for main activity
- Interactive 'Farm Fun' game on Junior website to reinforce message of this lesson
- A film clip on Junior website showing the recommended method of hand washing with soap

Alternative Suggestion

If PowerPoint is not suitable, PDFs of each slide can be downloaded and either copied on to acetates for an overhead or blown up for use as visual aids.

FARM TS 1

Background Information

The farm environment is a place of fun and education for people of all ages. It is essential however, to be aware of the microbes associated with the farm environment, some of which can be harmful to humans, to ensure that farm visits are enjoyable and safe. Farm animals, even those that appear clean and healthy, may carry microbes that are useful and harmless to the animal, but can make us very ill if they get inside our body. *Escherichia coli, Salmonella* and *Campylobacter* are examples of some of the bacteria that can be a cause of infection for all ages, but the symptoms can be particularly serious for young children. These bacteria are normally carried in the animal droppings and as such, may be present anywhere faeces can be found, for example on gates, fences, on the animals face, etc. N.B. it only takes a small number of these bacteria to cause an infection.

Symptoms of each microbial infection can vary but generally include rapid fluid loss from diarrhoea and vomiting, which can lead to death in very severe cases.

However, there are many more useful microbes on the farm than harmful microbes. These include *Lactobacilli* that ferment silage and turn milk into yogurt; thermophiles that break down decaying plant matter in compost; and *rhizobia* that change atmospheric nitrogen gas into ammonia in the soil. This lesson plan aims to teach students about useful and harmful microbes in the farm environment.

Students will learn some of the simple steps they can take to reduce the risk of picking up an infection on a visit to a farm. They will also learn more about how microbes can spread in different environments.

Some of these simple steps include:

- Washing hands with soap and water after contact with animals and before eating and drinking (alcohol gel or hand wipes will not remove these microbes effectively).
- Avoid kissing or putting your face close to the animal's face; and avoid putting your own hands near your face or in your mouth.
- Only eating in the designated picnic areas/ cafe facilities.
- Not eating anything whilst walking around the farm or anything that has dropped on the floor.
- Washing soiled footwear thoroughly and then washing your hands thoroughly with soap and water.

Advance Preparation

Copy SW 2 - SW 8 for each student group (4-5 students per group). Download PowerPoint slides or prepare SW 1 for each student/group
Prepare laminated board game for each group.

2.4 Spread of Infection
Farm Hygiene

Lesson Plan

Introduction

1. Begin the lesson by asking students to identify some of the risks when visiting a farm e.g. tripping on uneven ground, working farm machinery, etc. Then ask if they think there is anything on the farm that could make them ill, e.g. eating the animal food! End the discussion by asking if there could be any harmful microbes on the farm that could make them ill.
2. Explain that **some** farm animals (that appear otherwise clean and healthy) may have microbes living on them that can't be seen, and don't cause any harm to the animal, but that can make us ill if we pick them up.
3. Explain that these microbes normally live in animal droppings but that sometimes these droppings get on lots of different surfaces. Ask students to imagine a cow scratching its bottom on a fence, and then scratching its face at the same place on the fence. Where are all the harmful microbes from the droppings now? *On the cows bottom and face but also on the fence*. Explain that when we touch animals or places the animals have been we could pick up harmful microbes on our hands, and if these microbes got inside our body, they could cause vomiting and diarrhoea.
4. Tell the students that they are going to learn about some of the harmful microbes at farms and how they can easily protect themselves when they visit a farm and touch the animals. Also tell them that they are going to learn about some useful microbes that can be found on the farm, and how these help in food production.

Main Activity

1. Present the students with each of the animal images (PowerPoint slides or PDFs can be downloaded from the website **www.e-bug.eu**).
2. For each animal, ask students to answer the question and discuss (teaching points are detailed in TS 4).
3. Ask the students where on the farm they think there may be microbes that are useful to humans.
4. Ask the class if they have any ideas what these harmful and useful microbes on the farm might be called. Give students SW 1 – SW 6.
5. Ask the students to discuss the risks and benefits of the different microbes, and whether they would want to make the microbe their 'friends'. Discuss anything they noticed in the profiles that could help prevent the harmful microbes from spreading to people.

Secondary Activity

This 'fun on the farm' game will highlight how to prevent the spread of infection on a farm.

1. Group the students into teams of around 6 and give each group a board, counters, dice and pack of cards.
2. The students play the game by rolling the die and moving their counter along the board. If they land on a harmful microbe or useful microbe, the player to their left must pick up a card and ask the question on that card. The used card is then put to the bottom of the pack and the next player rolls. The winner is the player that gets to the end of the board first.

This game can also be played before a school trip to a farm. The scenarios can be linked to what the students will be doing, such as a tractor ride, or played as described above before the farm tour starts.

2.4 Spread of Infection
Farm Hygiene

Lesson Plan

Plenary (after classroom activity OR farm visit)

1. Discuss with students the importance of what they have learnt

   It is important to be aware of harmful microbes that animals may carry and maintain good hygiene in order to protect yourself from becoming ill.

   It is also important to remember that there are many more useful microbes on the farm that help farmers produce food for us every day.

2. Ask the class to pick out some things that they can do to protect themselves if they visit a farm. For example:

   a. *Wash their hands with soap and water after touching the animals and before eating and drinking anything*

   b. *Only eat in the designated picnic/ cafe area*

   c. *Do not eat anything that has fallen on the floor*

3. Use this discussion to reinforce the main key health messages:

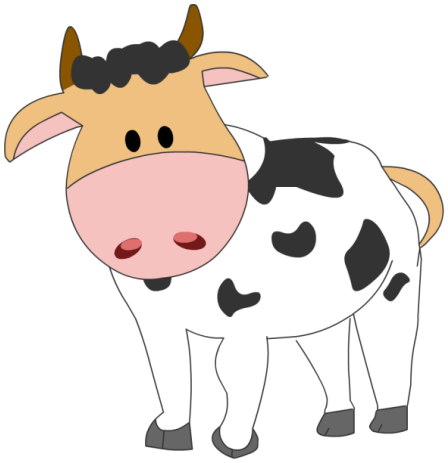
   - *Farm animals can carry harmful microbes such as Salmonella, E. coli and Campylobacter that can make us unwell.*
   - *Washing hands with soap and water is very important, especially after touching animals and before eating and drinking.*
   - *Animals should not be kissed or touched near the mouth, rear end or feet; and children should avoid touching their faces or mouths whilst on the farm.*
   - *If children do get ill after visiting a farm, parents should contact their GP and they should remain off school for two days after the sickness and diarrhoea symptoms end, to reduce the spread of infection amongst their peers.*

Extension Activity

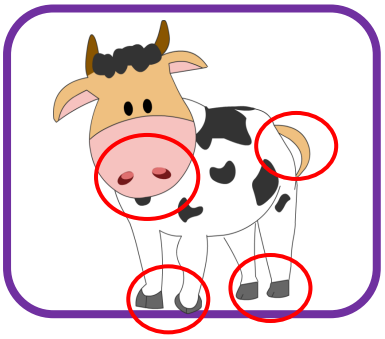
Visit the junior student section of the e-Bug website, **www.e-bug.eu**, to access the 'Farm Fun' interactive learning activity. This interactive animation allows students to spot things that the young visitors are doing wrong on the farm, and explains why each action may lead to harm.

FASCINATING FACT

Microbes can stay alive on your hands for up to three hours. Remember to wash your hands after visiting a farm so the microbes do not come home with you.



Teaching Points

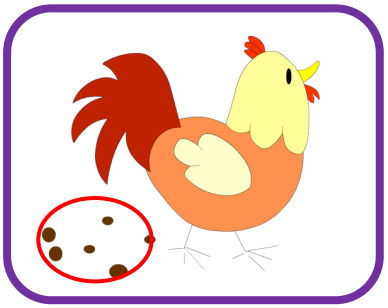


Where on the cow might you find lots of harmful microbes?

Microbes tend to be concentrated in certain areas, such as the mouth, rear end, tail and feet, and students should avoid touching animals in these places, as they are more likely to become infected if they do. E. coli lives in the gut of the animal, where it helps the animal digest food, and is therefore more likely to be concentrated in areas on the faecal-oral route and on the ground where droppings have been. Ask the students where they think the best place on the animal would be to stroke or pat (the answer should be the flank, neck or back).

Where on the farm might these goats spread any microbes they carry?

The goats can spread harmful microbes on any ground/ areas on the farm that they walk on, any fences that they touch, feeding equipment they eat from, or any humans or other animals that they have contact with. And remember that animals carry microbes that they need to keep them healthy, but if these microbes pass to humans they can make us unwell (for example E. coli in the animals gut helps the animal to digest food but if we ingest them they can give us diarrhoea). So we should wash our hands after contact with any animal on the farm, including farm pets like dogs and cats.

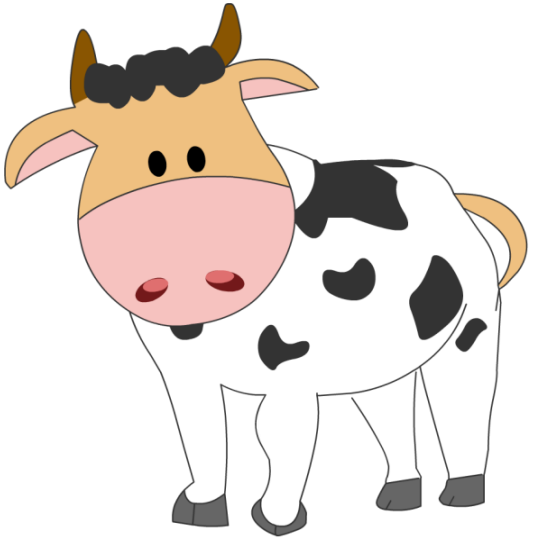


Why must you be careful to wash your hands after holding this chicken?

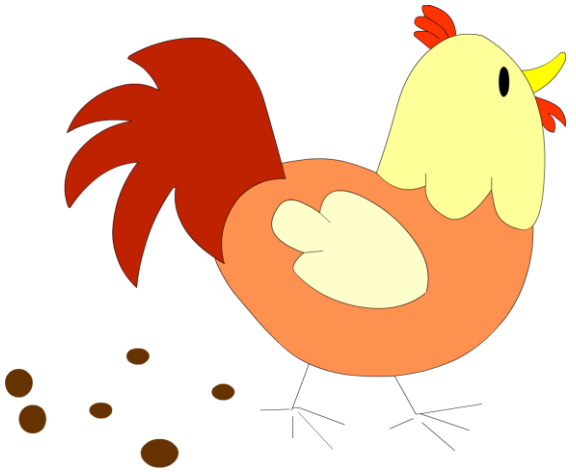
Chickens are fun to hold and make good pets, but chicken droppings can carry harmful microbes. You should avoid stepping in the droppings if possible and make sure to wash your hands thoroughly with soap and running water after contact with the chickens.

Harry caught a tummy bug after visiting a farm – do you know why?

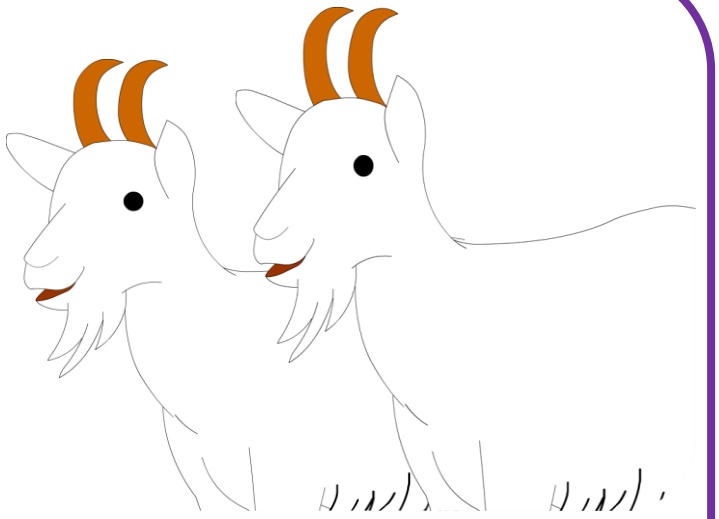
There are lots of useful and harmful microbes on animals and on surfaces around the farm, and a few of these microbes don't harm the animals but can make us ill! It is important to wash your hands properly to remove any harmful microbes which may be present after contact with animals, and before you eat or drink anything. If you do become ill you should stay off school, drink lots of water and inform your GP that you have been on a farm visit.



Where on the cow might you find lots of harmful microbes?



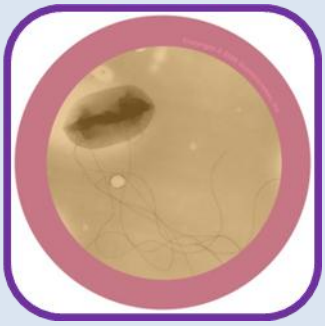
Why should you be careful to wash your hands after holding this chicken?



Where on the farm might these goats spread any microbes that they carry?

Harry caught a tummy bug after visiting a farm – do you know why?

FARM SW 1



I'm Naughty unlike my good *E. coli* cousins... they can be helpful to humans but I'd much prefer to make humans ill!

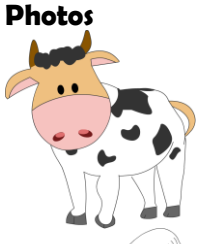
Friends

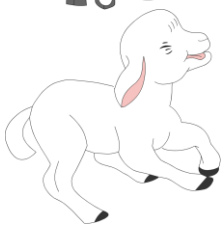
C. difficile

H. pylori

Shigella

Photos





Profile

Escherichia coli 0157 (Esk-Er-Ic-E-A)

Nicknames: *E. coli*

Address: 1st Bend, Your Gut, The Human Body, N05E 2T0E

Alternative Address: 1 Goats Tongue, Cows Back Lane, Farm Hill, W00L 1EE

Likes: Making people sick (haha!), Animal droppings – Yum! I love to turn the human gut into a wild rapid ride that ends with a poo skydive down the loo... good times! Also, alcohol rub and hand wipes are my favourite, people think they are being so clever trying to wipe me away – little do they know that these things just won't cut it. I'm stronger than that you know!

Dislikes: Antibiotics... Urgh! And drinking lots of water (it makes my life harder, sigh.) I also HATE soap and water, I have to cling on to the skin SO much harder than if people just used water to rinse their hands.

The Wall

Steve the Sheep *E. coli*, I've been missing you! Ever since you left me to go off on holiday to that human body! Hope you are having fun causing trouble in their tummy! Baa x

Norovirus Hey, just saw an advertisement for the *Convention of Vomiting and Diarrhoea* this year... we will be able to learn new ways of making people sick! Hooray! See you there, N.

Doctor Alan *E. coli*, you have been banished from my patients bodies, thanks to my clever suggestion that they should drink lots of H_2O and stay away from other people until they get rid of you. Also the hand washing with soap worked a treat! Better luck next time!

Add as Friend?

Yes **No**

Profile

Salmonella (Sam-on-ella)

Job: I'm a proud member of the *Salmonella* Army – there are over 2500 different types of us!

Address: Stomach Hollow, The Human Body, V0M 1T5

Alternative Address: 2 Chicken Eggs, Nest Box, Field Green, 1CL UCK

Likes: Me and my *Salmonella* army pals like nothing more than to have a good old party down at the farm... they sure know how to make us welcome! But I also like to travel... I LOVE hot countries! So if you're planning on going anywhere soon you could pick me up whilst you're there!

Dislikes: Any people who wash their hands with soap... spoil my holidays won't you!

My main aim in life is to settle down – but that never seems to happen! I can't help it if I'm always causing food poisoning, can I?!

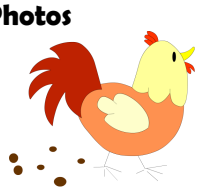
Friends

C. difficile

H. pylori

Shigella

Photos



The Wall

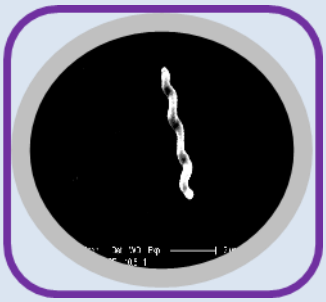
Travel Operator Bob This is a quick message to say thank you for travelling overseas with us! With your help, together we are really reaching every corner of the globe! Next time I hope you bring your friends!

Daisy Duck *Salmonella*, will you just leave my eggs alone!! Everyone's stopped buying them since you came along and I really need the money – I've got my eye on a new pond... and you're ruining my plans!!!

Doctor Alan Oh I see – animals' guts aren't enough for you, you even want to conquer beansprouts to satisfy your infectious cravings! Don't worry, I'm preparing to ensure all my patients wash and cook all of their raw food carefully to spite you!

Add as Friend?

Yes **No**



Profile

Campylobacter (Cam-pie-low-back-ter)

My speciality is causing bloody diarrhoea and painful stomach cramps... oh yeah, there's always fun when I'm around!

Address: Round Stomach Lane, The Human Body, PA1N FUL

Alternative Address: 1 Under Cooked, Poultry Lane, Market Farm, M3AT RAW

Likes: Playing gut twister! Although, even if I do say so myself, I'm pretty good at cramping up your insides! I also like chicken and unpasteurised milk... they are pretty cool places to hang. Got any raw meat in your fridge? I'm not fussy, if it is sitting around, I'll make it my home.

Dislikes: Well cooked meat and high oven temperatures... they are the enemy!

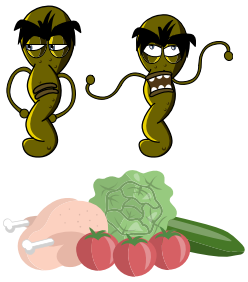
Friends

C. difficile

H. pylori

Shigella

Photos



The Wall

Patient Amy You are horrible *Campylobacter*, you've made me SO ill! I wish I had never made friends with you!

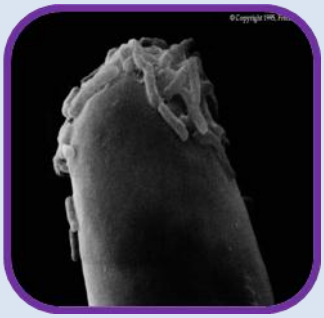
Kevin the Chicken Hi mate, just you go careful and wear sun screen when you visit that kitchen this week – you might die if the temperature in that oven is too high!

Doctor Alan *Campylobacter*... I'm on to you! I know you hide around and can spread to other people even after my patients start feeling better. But you better watch out... I've been warning them about the benefits of washing hands with soap and water!

Add as Friend?

Yes **No**

FARM SW 4



Group

Rhizobia (Rye-zo-bee-a)

Nicknames: Nitrogen fixing bacteria

Address: Roots Range, Legume Lane, Under Earth Village, N1TR OG3N

Likes: We are 'stay at home' kind of microbes, once we find a nice spot on a root, we hang out there all day and night! Not that we are lazy though – we pay our way by filling the soil with loads of ammonia that plants need to grow, using natural gas that is in the air!! Sounds like magic, but it's all about the tricks of the trade... and it keeps us with a roof over our heads!

Dislikes: Too much oxygen – I know it sounds silly to you humans but we just don't like it, it messes up our important work.

Rhizobia are great at one thing – changing nitrogen gas into a healthy snack for plants. But we don't do this alone; we live inside bean, clover and pea plants that help us with our difficult job!

Friends

L. acidophilus

S. cerevisiae

Penicillium

Photos

The Wall

Clive the Clover Hey, how you doing down there? There's a load of seeds on their way that are being really fussy, so we need to work extra hard to make the soil just right for them! We can't do this alone, you and me need to work together to get this right!

Farmer David Hi guys, thought you might like to know – I just won an award for my fantastic cereal crop at the town hall. I just wanted to say, I couldn't have done it without you – thanks very much!

Subscribe to group?

Yes **No**

FARM SW 5

Group Thermophiles (Therm-oh-fi-alls)

Nicknames: a big group of heat lovers!

Address: Peat Bog, Compost Bin, Round Barn Yard, TOAS T1E

Alternative Address: Cereal Lane, Over Soil Spread, Field Green, 1MEA DOW

Likes: We LOVE a good old pile of plant clippings – mix in some cut grass and soil and that makes a fabulous meal! To be a member of the thermophile gang, you can be a bacterium or a fungus – it's all about working in high temperatures! Decaying plants are our specialty – we break them down and recycle them right back into yummy yummy nutrients, all in the comfort of tropical heat!

Dislikes: You know we like heat – but we hate the cold! And when we say cold we mean 20ºC - at those temperatures the bacteria among us won't even get out of their nice protective endospores! Brrr!

We are thermophiles because we love the heat! Take a trip to the middle of some compost and you will find it is lovely and warm – which is perfect for us – it just makes us work harder!

Friends

L. acidophilus

S. cerevisiae

Penicillium

Photos

The Wall

Sally Strawberry Hi thermophiles, thanks for my tasty dinner that you created in the compost kitchen, it was fantastic! I'll be asking Farmer David for some more next week, so keep going! X

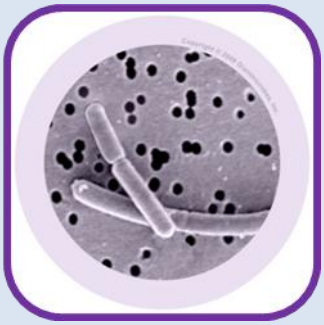
Lactobacillius Dear all, I hope you will be coming to my party next week – it's a field party to celebrate another year of great food production on the farm. I just hope it doesn't get gate crashed – I don't want any nasty bacteria to come!

Eco Eddie Congratulations thermophiles, you have been nominated for an eco-award for all your recycling efforts. By turning all that plant waste into nutrients for the farm, you really help the ecosystem. Well done!

Subscribe to group?

Yes **No**

FARM SW 6



Group *Lactobacilli* (Lac-Toe-Ba-Sil-i)

Nicknames: Probiotic bacteria

Address: Swimming Inn, Cow's Milk Pond, Dairyfresh Farm,
F3R M3NT

Alternative Address: 1. Useful Microbe, Small Intestine Corner, Tummy Place, PPL5 GUT

Likes: Our favourite food is lactose – man that milk sugar is hard to beat!! It gives us bags of energy, and we know it makes everyone happy when the result of our fermentation is a lovely smooth yogurt fit for a king! Also, some of us are great at making silage – fermented grass that cows and sheep can eat all year round... they love it!

Dislikes: Nasty microbes that are horrible to humans – what's up with that? Humans and *Lactobacilli* have always been bessie mates – we help each other out, right?!

We like a good boxing match when we are hanging out in the human gut, so watch out all you harmful bacteria – we fight for the good health of humans! Ding Ding, round one coming up!

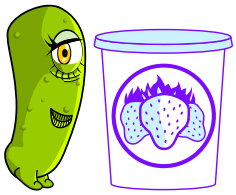
Friends

L. acidophilus

S. cerevisiae

Penicillium

Photos



The Wall

Society for Dairy Products Dear *Lactobacilli* members, we are holding a lesson on the importance of bacterial cultures to the food supply, and were hoping you could do a presentation? You really are some of the best at this sort of thing! Please get back to us soon.

Patient Amy Thanks so much all you friendly *Lactobacilli*, after *Campylobacter* came to stay, you really helped me get back on my feet and feel healthy again. Love Amy x

Dorothy the Cow Keep it up *Lactobacilli*! Because of all your help, my milk is really popular and is selling out fast! Soon I'll be able to afford that holiday to the beach I've always wanted... I can't wait to feel the sand beneath my hooves!

Subscribe to group?

Yes **No**

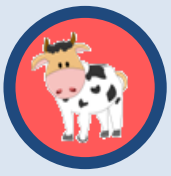
FARM SW 7

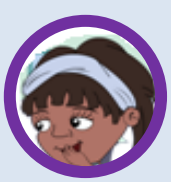
Fun on the Farm!

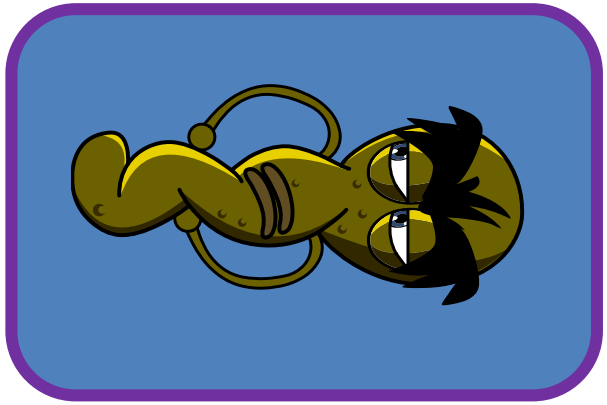
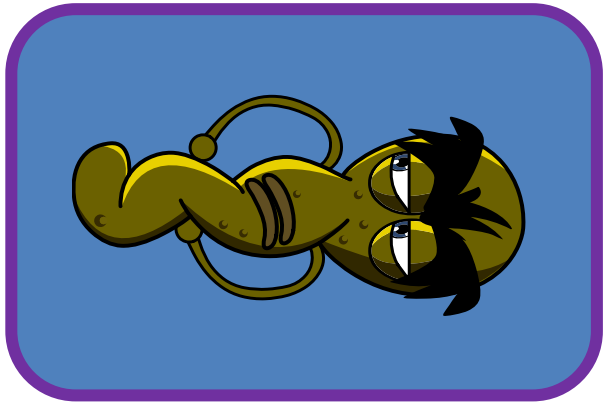
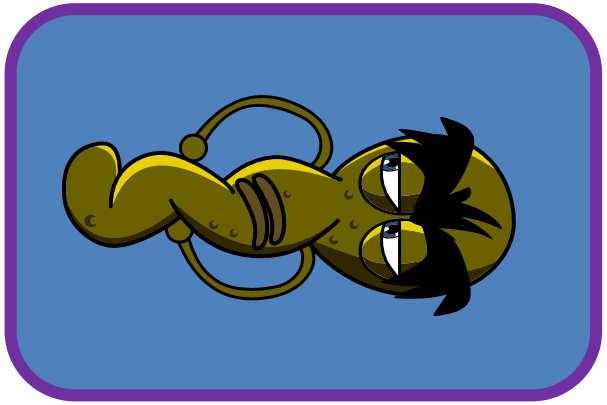
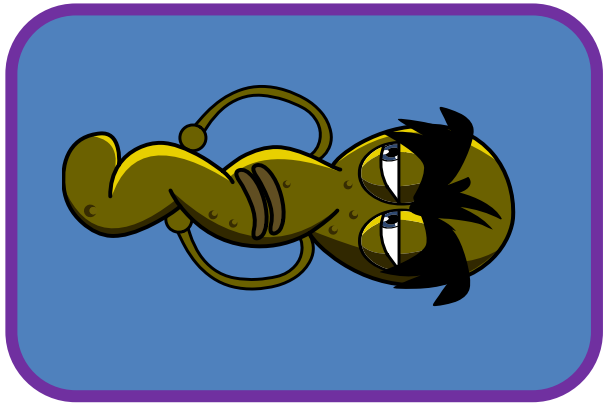
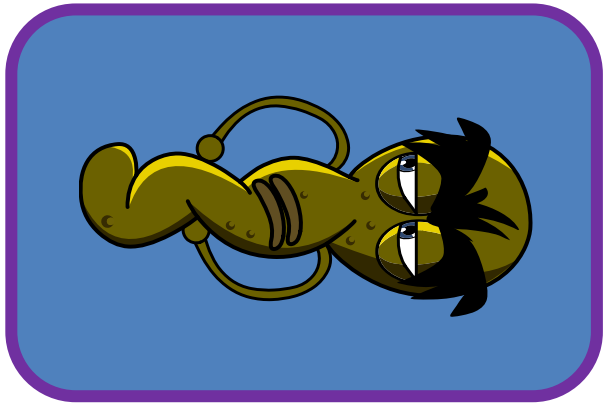
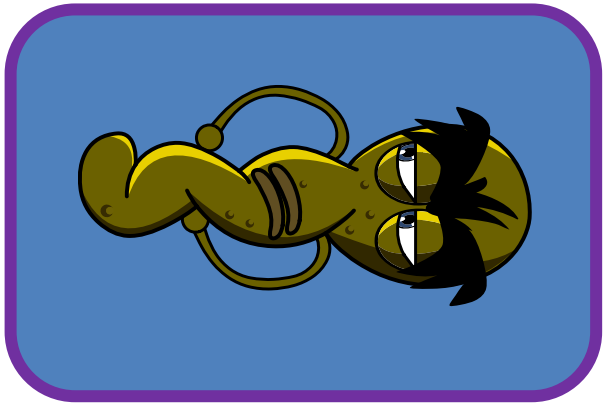
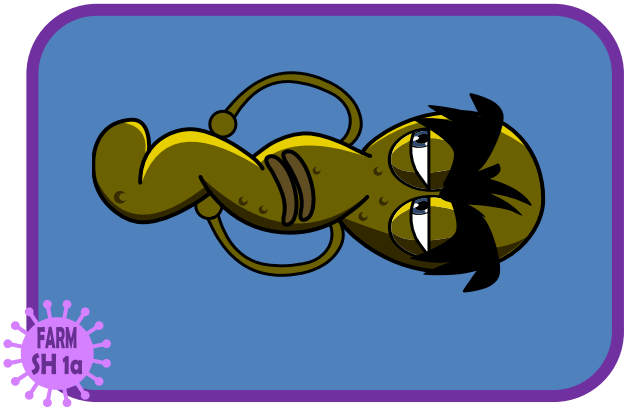
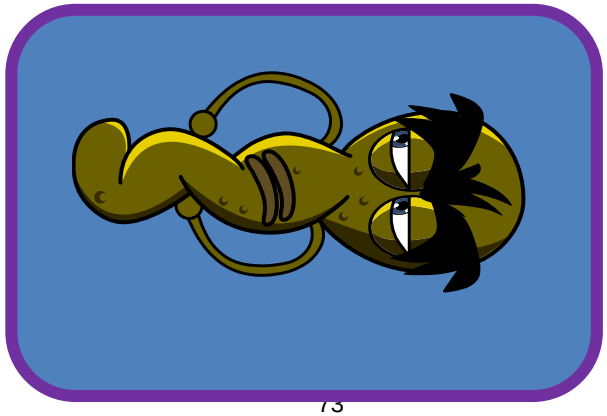
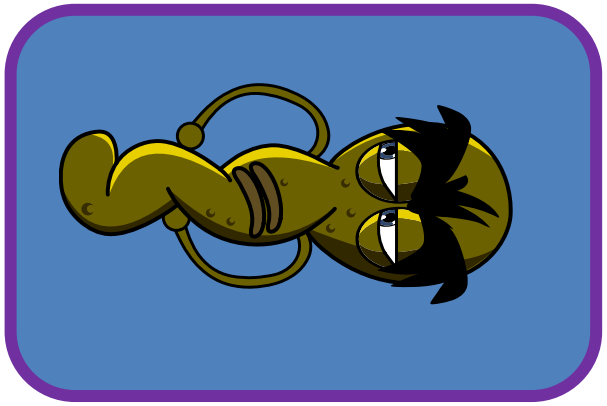
The Rules

1. Roll the die to see which player goes first – highest roll starts!
2. Take turns in a clockwise order to roll the die and move along the board.
3. If you land on a microbe, the person to your left must pick up a card from the pack and ask you the question.
4. Whoever gets to the end of the board first wins!

Select your counter





FARM SH 1a

Move back 3 spaces

But stay where you are if you can answer the question

Why should you not eat sweets in the animal pen?

Harmful microbes can be passed to your mouth when you eat, which can make you unwell

Swap places with the person in last place

But stay where you are if you can answer the question

Why should we wash our hands after playing with animals?

Animals carry harmful microbes that can make you unwell. You can pick these microbes up when you touch them.

Swap places with the person behind you

But stay where you are if you can answer the question

Why should we only eat food where the farmer tells us?

The farmer will tell you to eat in an area where you can wash your hands and where animals aren't allowed, so there will be less chance of picking up harmful microbes.

Move back 5 spaces

But stay where you are if you can answer the question

Why might there be harmful microbes on fences?

Animals carry harmful microbes on their body and can pass these microbes on to the fence when they walk past the fence. scratch their behind on it or lick or slobber on it.

Move back 4 spaces

But stay where you are if you can answer the question

There are only harmful microbes on the farm. Is this true or false?

False – there are lots of useful microbes on the farm that help the farmer produce food for us to eat.

Move back 1 space for every wrong answer

Name 3 places on the farm where there might be harmful microbes?

Three from: On an animal's body, in the animal's pen, in animal's poo, on a fence, on the ground where animals walk

Move back to space number 2

But stay where you are if you can answer the question

Can you name 1 harmful microbe that you might find on the farm?

Either: *E. Coli*, Salmonella, Campylobacter

Move back 2 spaces

But stay where you are if you can answer the question

The teacher caught you sucking your thumb when you were playing with a pet calf. Why is this a bad thing to do?

Harmful microbes can be passed to your mouth when you suck your thumb, which can make you unwell.

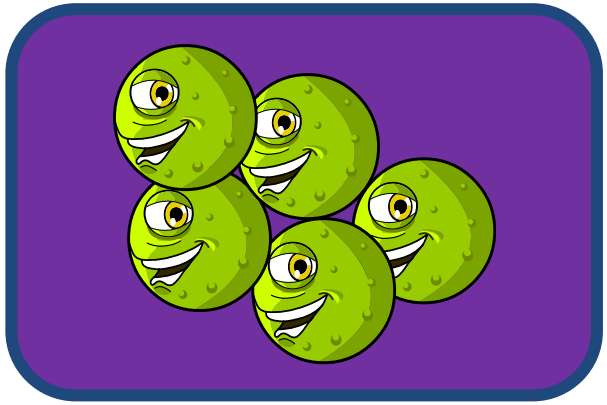
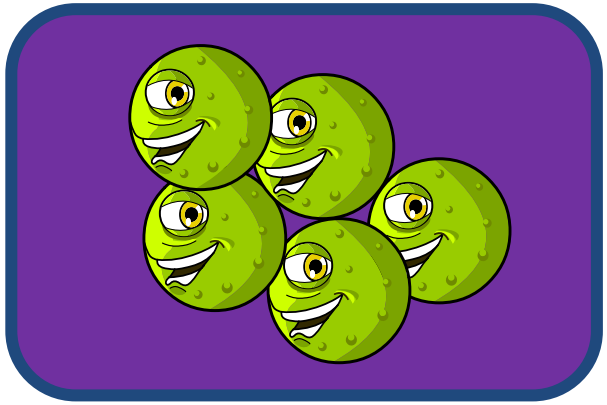
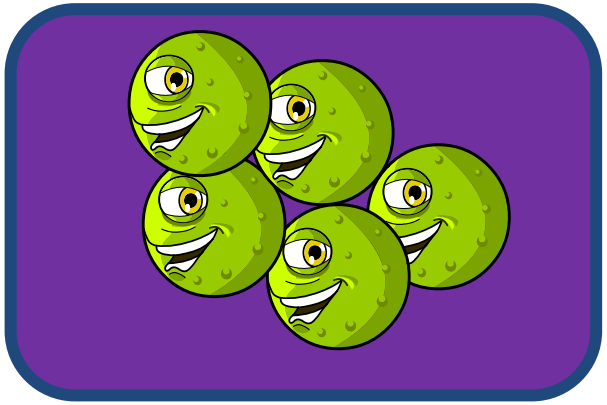
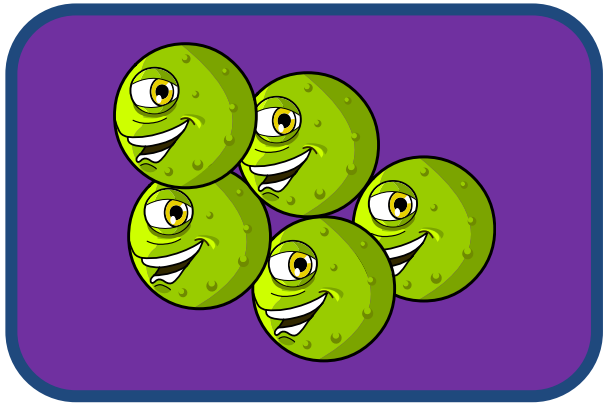
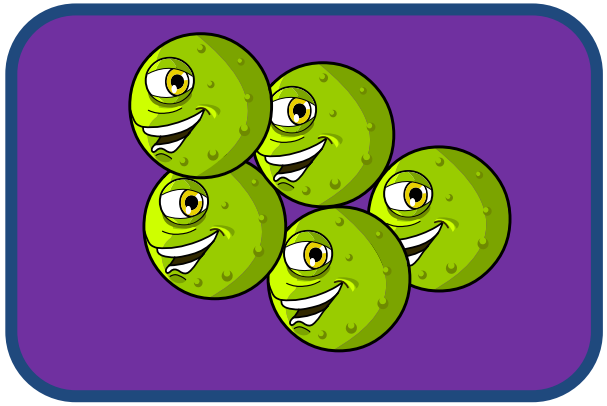
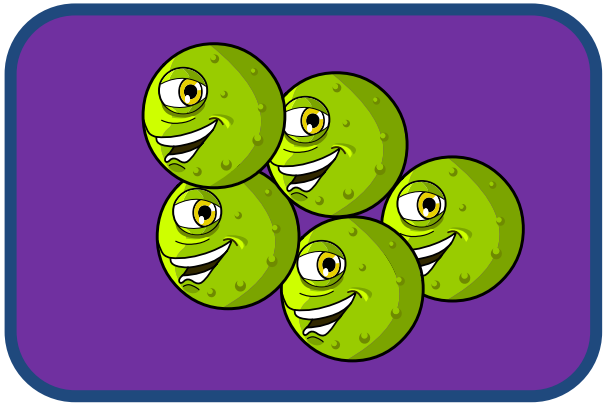
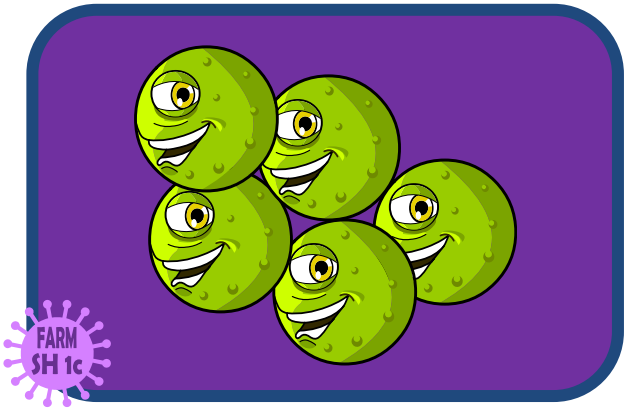
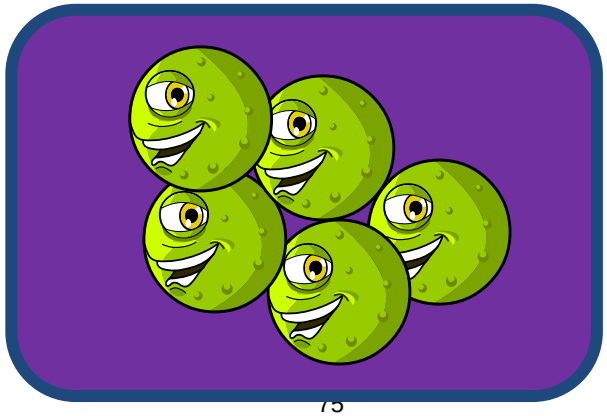
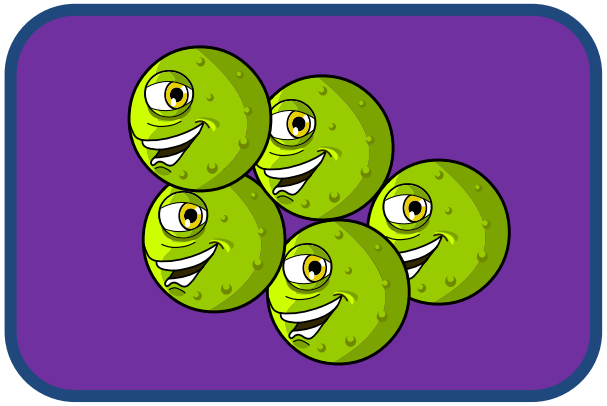
Move back 1 space

But stay where you are if you can answer the question

Using soap and water to wash your hands is better than using hand gel. Is this true or false?

True, because it removes more harmful microbes.

FARM SH 1b

You washed away some harmful microbes when you washed your hands after playing with the animals.

Move on 3 spaces

You saw an animal scratching it's backside on a fence and stayed away from it because it might be covered in harmful microbes

Move on 5 spaces

You helped that farmer show that he uses useful microbes to make silage

Swap places with the person in the lead

The farmer thought that you were very clever because you knew that there were some useful microbes on the farm that help make crops grow

Move to on 4 spaces

You helped some smaller children wash their hands before they had their lunch

Move on 4 spaces

If you can name 1 place on the farm where there are useful microbes

Swap places with the person in front of you

One from: Compost bin, in the soil, in the dairy shed, in the silage tank, in the farm kitchen, root nodules

You rinsed off your wellie boots before you left the farm washing away any microbes that might be on them

Move on 1 space

If you can tell why we should wash our hands with soap and water and not just hand gel or wet wipes

Move on 8 spaces

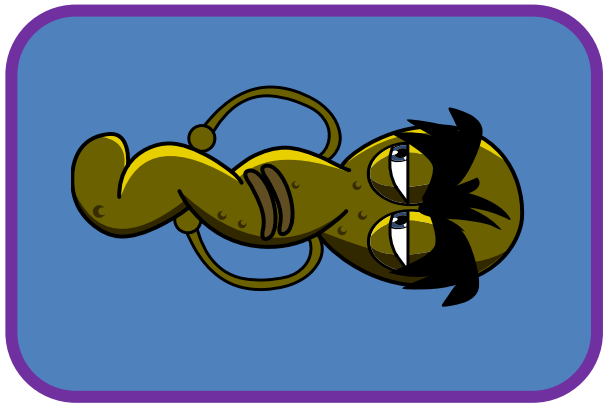
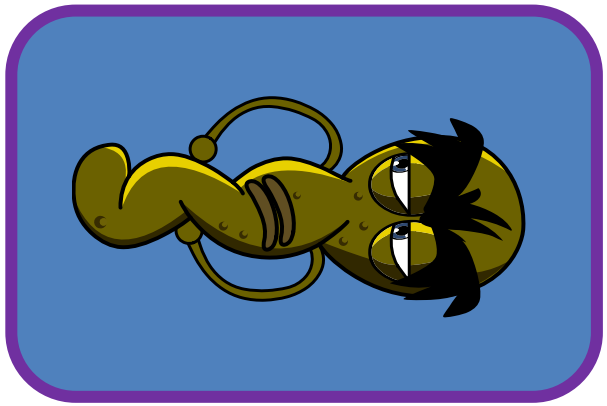
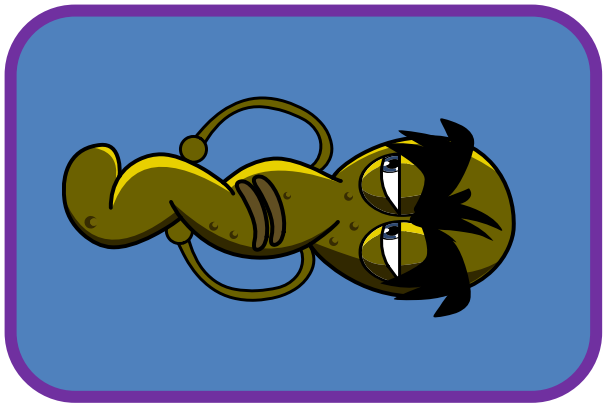
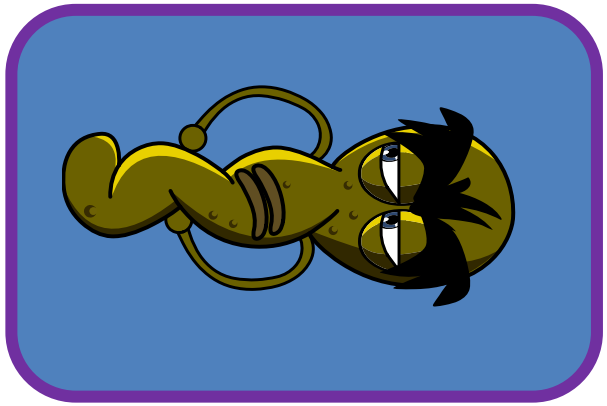
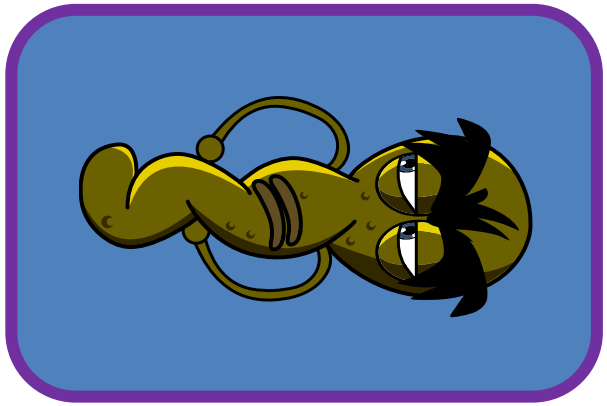
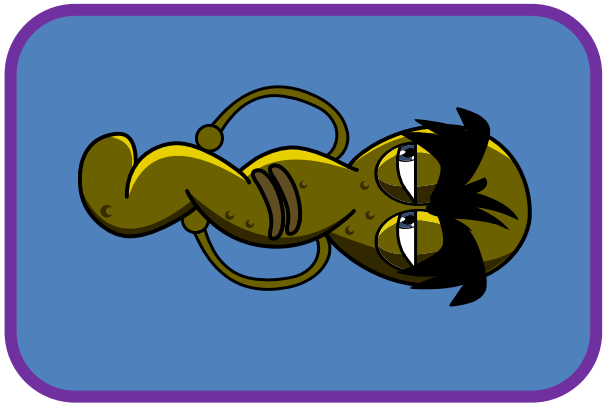
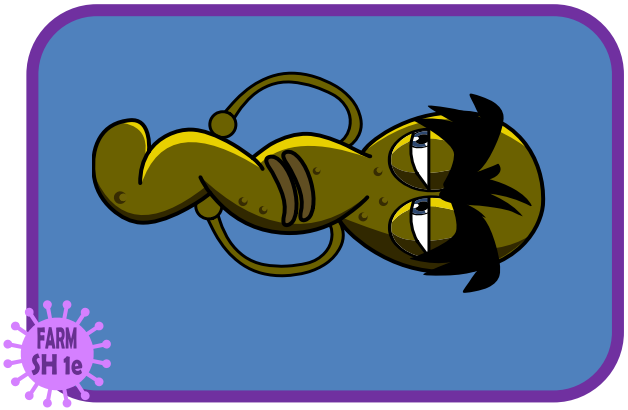
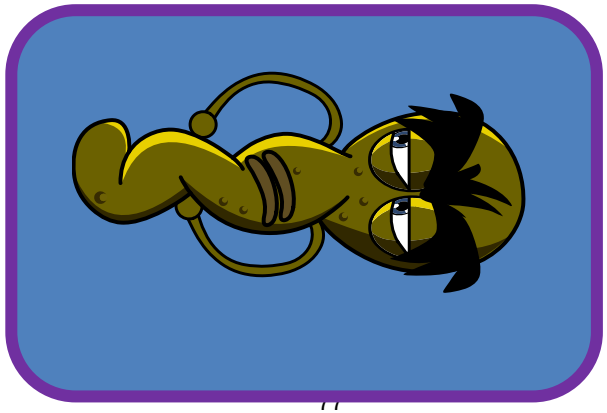
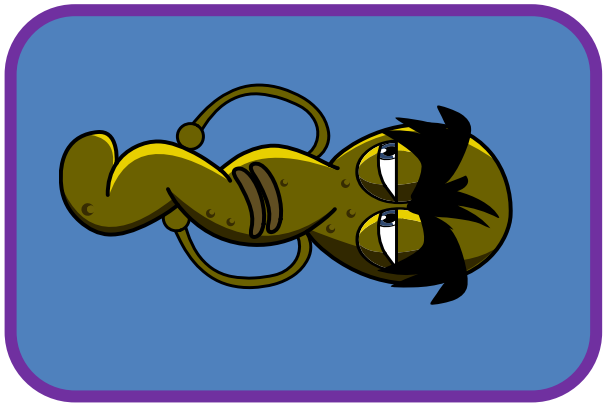
Soap breaks up the oils on our hands that microbes stick to, and water rinses them away. Hand gel does not remove microbes from the hands, so soap and water is better.

If you can name 3 places on the farm where there might be harmful microbes

Swap places with the person in the lead

Three from: On an animal's body, in the animal's pen, in animal's poo, on a fence, on the ground where animals walk

FARM SH 1d










FARM
SH 1e

Move back 3 spaces

But stay where you are if you can answer the question

What should you do if you have tummy ache a couple of days after visiting the farm?

Stay off school and drink lots of fluids, and ask your parent to let your GP know that you were on a farm visit.

Swap places with the person in last place

But stay where you are if you can answer the question

Can harmful microbes be found on pets that live at home?

Yes, pets can carry harmful microbes that can make you unwell, so wash your hands after playing with them.

Swap places with the person behind you

But stay where you are if you can answer the question

Give an example of a harmful microbe that you can find on the farm?

Either: *E. Coli*, Salmonella, Campylobacter

Move back 5 spaces

But stay where you are if you can answer the question

Can you still eat your sandwich if you drop it on the ground whilst on the farm?

No, harmful microbes could have transferred to the sandwich from the ground. If you eat it, it may make you unwell.

Move back 4 spaces

But stay where you are if you can answer the question

Why is it better to wear wellies rather than trainers whilst visiting the farm?

Wellies are easier to rinse off at the end of the visit, and have less crevices where microbes can stick and hide.

Move back 1 space for every wrong answer

Name three things that you should not do whilst in the animal pen?

Three from: eat, suck your thumb, lick your fingers, touch animal faeces, sit on the ground, kiss the animals, touch your face

Move back to space number 2

But stay where you are if you can answer the question

Where on an animal's body is there likely to be a lot of harmful microbes?

Either: feet, mouth, rear end, tail

Move back 2 spaces

But stay where you are if you can answer the question

You see an apple that has fallen from the apple tree into the cow field, and you feel hungry. Why should you not eat it?

No, harmful microbes could have transferred to the apple from the ground. If you eat it, it may make you unwell.

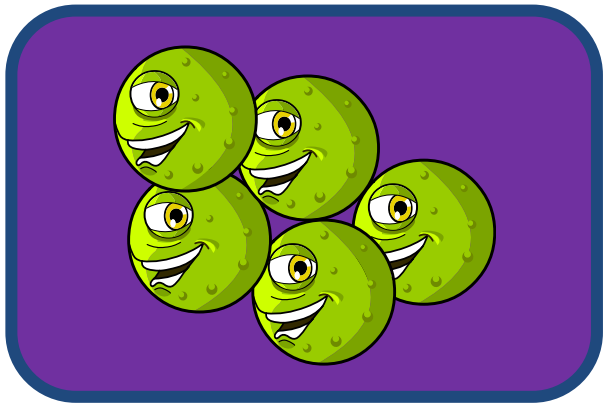
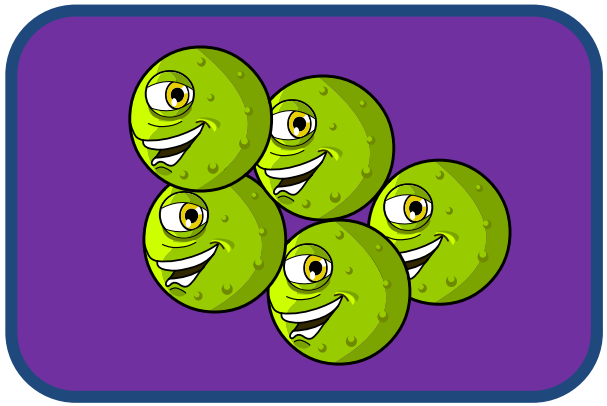
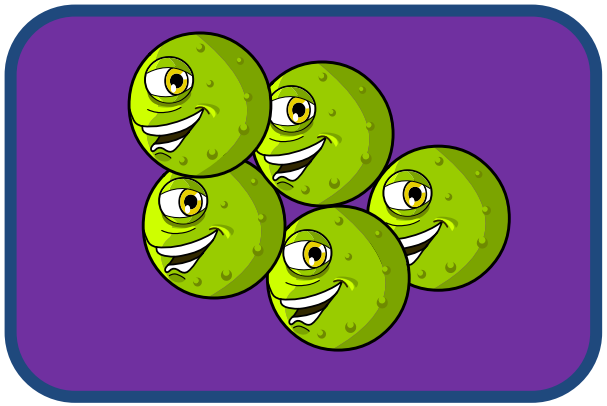
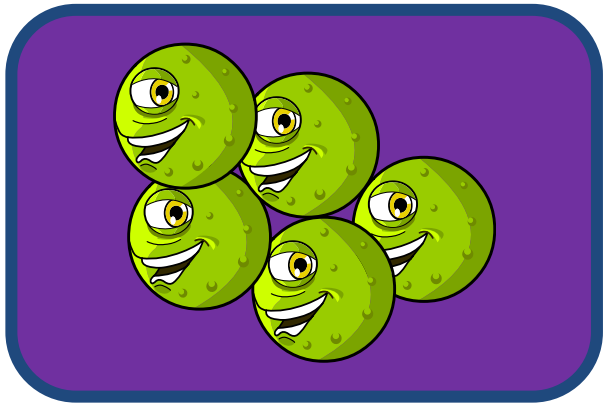
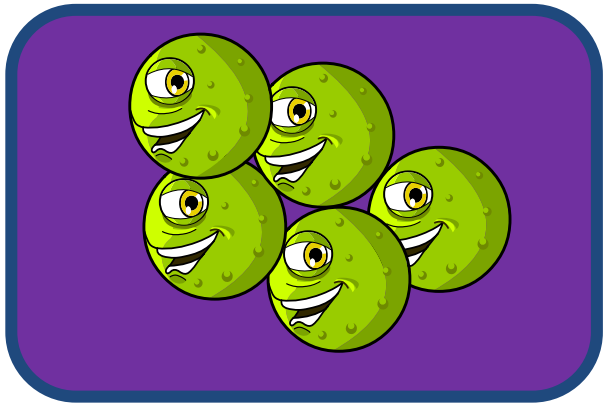
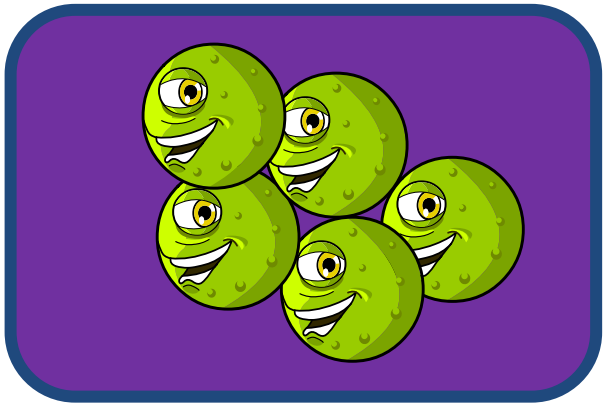
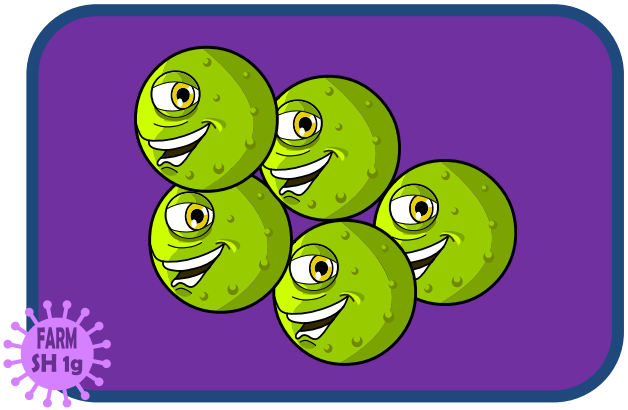
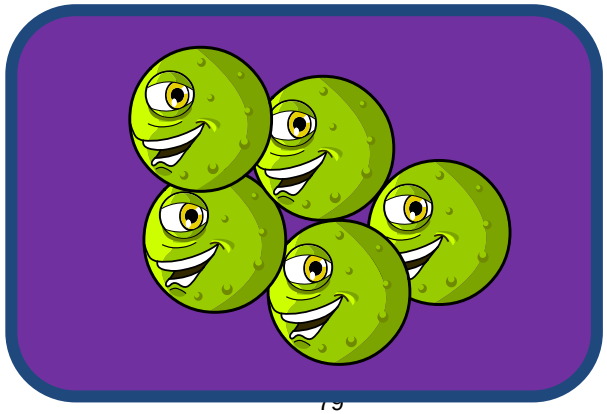
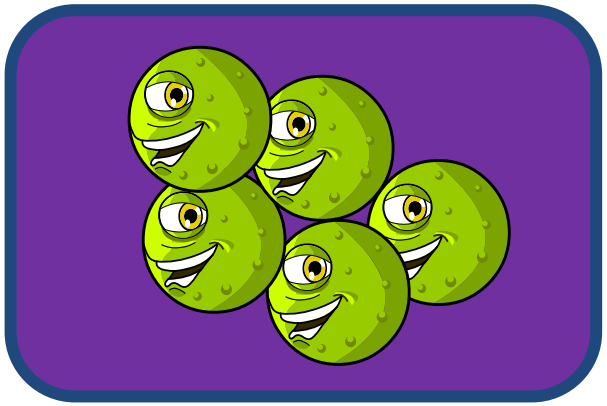
Move back 1 space

But stay where you are if you can answer the question

Which is better – washing hands under running water from an outside tap, or in a bowl of water?

Running water – because it removes more harmful microbes and the water is cleaner.

FARM SH 1f










FARM
SH 1g

You remembered to give your parents the information sheet from the farmer about what to do after the farm visit

Move on 3 spaces

You dropped a sweet on the ground and put it straight into the bin

Move on 5 spaces

You fell over and got muddy hands, so you washed them with soap and water before touching other people

Swap places with the person in the lead

You remembered to eat your lunch in the picnic area, and you washed your hands on the way

Move to the next even square

You remembered that animal poo can contain harmful microbes, so you avoided stepping in the cow pat!

Move on 4 spaces

There are more useful microbes than harmful microbes on the farm – true or false?

Swap places with the person in front of you

True – many of these microbes help the farmer to produce food for us.

You took off your shoes when you got home from the farm and left them in the porch so that an adult could clean them

Move on 1 space

If you can name a useful microbe that can be found on a farm

Move on 8 spaces

Either: Lactobacilli, Thermophiles, Rhizobia

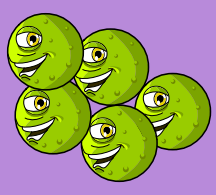
If you can name a type of food or drink that is made with the help of a useful microbe on the farm

Swap places with the person in the lead

Either: yogurt, milk, bread, cereal or any other crop or vegetable, fruit cider, beer

FUN ON THE FARM

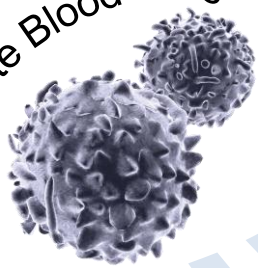
60	59	58	57	56	55	54	53	52	51
41	42	43	44	45	46	47	48	49	50
40	39	38	37	36	35	34	33	32	31
21	22	23	24	25	26	27	28	29	30
20	19	18	17	16	15	14	13	12	11
1	2	3	4	5	6	7	8	9	10



FUN ON THE FARM

BOARD GAME

White Blood Cells



National Curriculum Links

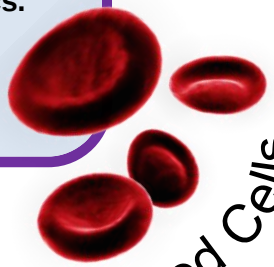
Key Stage 2
Science
Working Scientifically (*Lower KS2 only*)
Animals, including Humans (*Upper KS2 only*)
PSHE
Core Theme 1: Health and Wellbeing
English
Reading and Comprehension
Estimated Teaching Time
50 minutes

3.1 Prevention of Infection
The Body's Natural Defences

Section 3.1 covers the topic of disease prevention and the body's own natural defenses.

A detailed presentation and animations show how the body fights harmful microbes on a daily basis.

This section provides the basic knowledge requirements for further learning about vaccinations and antibiotics.



Red Blood Cells

Learning Outcomes

All students will:

- understand that the human body has many natural defences to fight infection.
- understand that our bodies have 3 main lines of natural defences.
- understand that sometimes the body needs help to fight infection.

3.1 Prevention of Infection
The Body's Natural Defences

Key Words

Antibodies
Antigen
Immune
Inflammation
Pathogen
Phagocytes
Phagocytosis
Plasma
White blood cells

Materials Required

☐ Download the presentation from www.e-bug.eu

Per student

☐ Copy of SH 1

Available Web Resources

- A MS PowerPoint presentation of The Body's Defence System, SH 1
- An animation illustrating how the immune system functions

FASCINATING FACT

Some fungal infections like athletes foot (tinea pedis) don't need to get through our barriers as they can grow on the skin! Our bodies can still out-smart them as we have the potential to fight the infection even though it's on the outside!

IMM TS 1

Background Information

Our body has adapted ways of keeping us free from infections caused by harmful microbes. Three of the ways our body does this are below:

1. Preventing entry

   Our skin is the first line of defence stopping many harmful microbes entering our body. If skin has cuts or wounds then the barrier is broken and microbes can enter.

   The mucus and cilia (tiny hairs) in our nose trap any microbes and stop them entering our lungs.

   The tears in our eyes produce enzymes (although this is a chemical, not a physical barrier) which kill bacteria.

   Our stomach produces acid that can kill harmful microbes we may eat (e.g. in contaminated foods) or swallow.

2. Non-specific defence

   If a microbe does get into our body then our immune system is called into action! The next line of defence is the use of WBCs. These cells are in our blood carrying out 'surveillance'. When microbes are detected, the white blood cells 'eat' the microbe and kill it. These WBCs are non-specific because they will literally try and engulf and kill anything, they are not fussy!

3. Specific defence

   These WBCs are specific in that they target microbes only. Each microbe has a specific shape or marker, called an **antigen**. When these WBCs come across an antigen they don't recognise they start to produce proteins called **antibodies**. The antibodies then attach to the antigens marking them for destruction by other WBCs. The antibody will ONLY attach to the specific antigen for which it was created. Antibodies are created rapidly by the WBCs and flow around the blood attaching themselves to the invading microbe or **pathogen**. When all the pathogens are destroyed the antibodies stay in the blood ready to fight the disease should it return. In this way, the body maintains a memory of the disease making you **immune** to diseases you have already had. If the pathogen attacks again the body is ready and quickly produces antibodies.

Advance Preparation

1. Copy SH 1 for each student.
2. Download the animation illustrating how the immune system works from www.e-bug.eu.

The Body's Defence System

You do not always need medicine to help fight infection. Did you know your body works hard every day to fight harmful microbes without you even knowing it! The body has three lines of defence to stop microbes causing disease.

First Line of Defence - Stops Microbes Entering the Body

1. The Skin: The skin stops microbes entering the body unless it is cut or damaged. Even when damaged the blood clots quickly sealing the cut with a scab stopping microbes getting in.

2. Nose and Lungs: Mucus and tiny hairs in the nose stop microbes from entering the lungs. The mucus is then removed by coughs, sneezes or even swallowed.

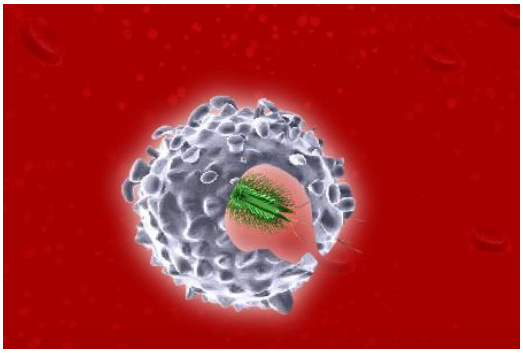
3. The Eyes: Tears produce a substance which kills bacteria on the surface of the eye.

4. Stomach: Our stomach produces acid. This acid can kill some microbes if they are found in contaminated food or we swallow them. But some clever microbes can survive this, like the microbes that cause food poisoning, e.g. *Salmonella*

Second Line of Defence - Non Specific White Blood Cells

The immune system has cells called white blood cells:

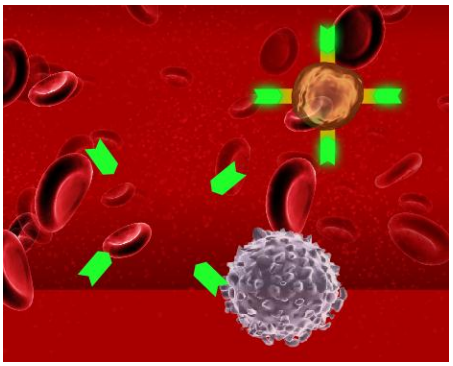
1. These usually pick up anything 'foreign' that gets through the first line of defence
2. They engulf microbes and digest them
3. They are known as non-specific because they will attack ANYTHING that is foreign to the body
4. They also trigger swelling and redness by sending more blood to the area



Third Line of Defence - Specific White Blood Cells

White blood cells develop 'memory'

1. All invading cells have distinctive markers called <u>antigens</u> on their surface
2. When specific white blood cells come across a foreign marker/antigen they produce antibodies which lock onto the invading cells marking them for destruction. These antibodies will ONLY target these specific markers/antigens and no others
3. Once the white blood cells know which antibodies to make, they produce them very quickly. These antibodies then either:
   a. Immediately start marking invading microbes for destruction
   b. Stay in the blood after the infection has gone so that they are ready to fight if the infection returns. This is why your body is <u>immune</u> to most diseases you have already had – it remembers how to make the antibodies quickly



IMM SH 1

National Curriculum Links

Key Stage 2
Science
Working Scientifically
PSHE
Core Theme 1: Health and Wellbeing
Core theme 3: Living in the wider world
English
Reading and Comprehension
Estimated Teaching Time
50 minutes

3.2 Prevention of Infection Vaccinations

Section 3.2, Vaccinations, explores how vaccines were discovered and who discovered them.

Included in this section is a student reading comprehension activity. Students are told a story about Edward Jenner and how he discovered vaccines. This story can either be given to student as individual handouts or read to the class by the teacher. 'Fill in the blanks' and 'answer questions' activities help reinforce the main points of the story.

The extension activity encourages students to recreate the story of Edward Jenner and his vaccine discovery. through fun role play.

Learning Outcomes

All students will:
- understand that vaccines help prevent a range of infections, including the flu.

More able students will:
- understand that there are not vaccines for all infection.

3.2 Prevention of Infection
Vaccinations

Key Words

Antibody
Antigen
Bacteria
Disease
Immune system
Immunise
Vaccination
Vaccine
Virus
White blood cell (WBC)

Materials Required Per Student

- ☐ Copy of SW 1
- ☐ Copy of SH 1
- ☐ A white board (not necessary)

Available Web Resources

- 'Vaccine Play' demonstration film.
- The story of Jenner in MS PowerPoint format.

FASCINATING FACT

The word vaccine comes from the Latin word vacca meaning cow, so named because the first vaccine was made from the milder cow pox disease.

Background Information

Our immune system generally fights any harmful microbes that may enter our bodies. When we take good care of ourselves (e.g. getting plenty of rest and eating a balanced diet) we help our immune system work properly to preventing infection.

Another means of helping our immune system is through **vaccinations**. Vaccines are used to prevent NOT treat infection. A **vaccine** is usually made from weak or inactive versions of the same microbes that make us ill. In some cases, the vaccines are made from organisms which are similar to, but not exactly, the microbes that make us ill.

When the vaccine is injected into the body the immune system attacks it as if harmful microbes were attacking the body. **White blood cells**, a part of our immune system, create lots of **antibodies** to attach to specific markers on the surface, called **antigens**, of the vaccine organisms. Because the vaccine is an extremely weakened version of the microbes, our immune system can kill all cells from the vaccine and it will not make you ill. By successfully eliminating all the vaccine, the immune system remembers how to combat those microbes. The next time microbes carrying the same markers/antigen enter the body the immune system is ready to fight it before it has a chance to make you ill. This means you develop immunity against diseases.

In some cases, the immune system needs reminding and this is why some vaccinations require booster jabs. Some microbes, like the flu, are tricky. They evolve so fast changing their markers/antigens. This means that the immune system can't remember how to fight them. For this reason, we have annual flu vaccinations.

Advance Preparation

1. Copy of SH 1 and SW 1 for each student

VAC TS 1

3.2 Prevention of Infection
Vaccinations

Lesson Plan

Introduction

1. Begin the lesson by explaining to the class that although there are many harmful microbes that can make us ill, in some cases, there are things we can do to prevent this happening.
2. Explain to the class that vaccinations are a harmless small amount of the microbe/disease markings/outer coat which teaches our body how to fight the bad microbe when or if we get attacked by the disease. Discuss with the class their experiences of vaccinations, which vaccinations they remember getting and when they got them.
3. Show the class images of the disease and bacteria/virus which they have been immunised against (Available at **www.e-bug.eu**). Emphasise to the class that in the 1700s these diseases were extremely common.
4. Highlight to the class that without their vaccinations, many of the class would not have survived past 5 years of age. Explain that things like whooping cough, polio and TB are now extremely rare due to vaccinations.
5. Remind students that some microbes change their outer coats like we change our clothes. Some microbes change their markings/coats so quickly that scientists cannot create vaccines for many infections or they have to make a new vaccine every year, like the flu vaccine.

Main Activity

1. Provide each student with a copy of **SW 1**.
2. Read the story of Edward Jenner (**SH 1**) to the class, either show the story to the class on the whiteboard or provide each student with a copy of **SH 1**. The class can then read along with the story.
3. After reading the story, ask the class to fill in the spaces on their worksheet.
4. Students should also answer the questions at the bottom of the worksheet.

Plenary

1. Check for understanding by asking students
   a. What are vaccines?
   Vaccines protect a person against a particular disease. They are dead or severely weakened versions of the microbe.
   b. When should vaccines be used?
   Vaccines should be administered before an illness occurs, vaccines are a preventative measure.
   c. Who discovered vaccines?
   Edward Jenner discovered vaccines in 1796.

Extension Activity

After reading the story of Edward Jenner, students should recreate the story into a play to present to the class. An example script can be found in **SH 2** which was written and performed by class 12 at Elmbridge Junior School. This play can be viewed at **www.e-bug.eu**.

VAC TS 2

Historic Heroes

Edward Jenner was born in 1749. As a young boy, Edward enjoyed science and nature, and spent hours on the banks of the River Severn looking for fossils. In 1770, at the age of twenty one, he began training as a doctor in London. Two years later Edward began to practise as a doctor in his home town of Berkeley, Gloucestershire.

During this time, people were terrified of a horrible disease called smallpox. People who got this disease got severe scarring from lesions and sometimes even died! As a doctor, Edward Jenner listened to what the country people said about smallpox. They believed that someone who caught a different mild infection called cowpox from their cows would not catch the much more serious smallpox.

Jenner carried out an experiment to see if the people were right. In 1796 a milk maid called Sarah Nelmes came to Jenner complaining of a cowpox rash on her hand that she caught from Blossom the cow. Jenner took some of the pus from the cowpox rash on Sarah's hand. He scratched some of the pus into the hand of an 8 year old boy called James Phipps, the son of his gardener. James fell ill with cowpox but soon recovered.

Jenner then took some pus from someone with the dangerous disease, smallpox, and scratched this into James' arm. James developed a scab but did not develop smallpox, Jenner's theory was right. Jenner's discovery came to be known as vaccination from the Latin word for a cow: vacca. Jenner went on to vaccinate all the local children with the cowpox to stop them from getting the more dangerous smallpox disease.

VAC SH 1

The discovery of vaccinations script

Scene 1 - by a river

Narrator	Edward Jenner was born in 1749. As a young boy Edward enjoyed science and nature, spending hours on the banks of the river Severn looking for fossils.
Jenner	What a lovely day to go looking for fossils on the bank of the river Severn. What could be more perfect!
Narrator	In 1770, at the age of 21, he began training as a doctor in London. Two years later Edward began to practice as a doctor in his home town of Berkeley, Gloucestershire. At this time smallpox and cowpox were a problem!

Scene 2 - Dr Jenner's office

Jenner	Oh come in come in, what seems to be the problem Mr and Mrs Smith?
Mrs Smith	Well Dr Jenner, my husband has got himself a cowpox rash. What can be done for him?
Mr Smith	Also doctor, a friend of mine died last year from smallpox. But he never had cowpox.
Jenner	Yes, do go on Mr Smith.
Mr Smith	Well, I know lots of other people who have had cowpox but then never got smallpox. Do you think this means I won't get it doctor?
Jenner	You know Mr Smith, you are not the first patient to say that to me. I have my suspicions that you are correct. I will investigate the matter.
Narrator	And the good doctor did just that. When milk maid Sarah Nelmes came to Dr Jenner with a cowpox rash he took the opportunity to experiment with the help of an 8 year old boy, James Phipps.

Scene 3 - Dr Jenner's office

Sarah	Doctor, I've got a cowpox rash on my hand.
Jenner	OK Miss Nelmes, let me take a look at that. Right young James, come here please and hold out your hand.
Sarah	What are you doing doctor?
Jenner	An experiment Miss Nelmes. I shall take some of the pus from your rash and scratch it into James' hand.
Narrator	James fell ill with cowpox but soon recovered. Dr Jenner was ready for part 2 of his experiment. It was now that the doctor scratched some pus from someone with smallpox into James' arm.
Jenner	James my boy, if all goes to plan your name will go down in medical history!
James	But what if it doesn't go to plan Dr Jenner?
Jenner	I won't lie to you James, you might well die!
James	(Gulps) Oh!
Narrator	But James didn't die. Jenner's theory was right and in time his discovery came to be known as vaccination. He then went on to vaccinate all the local children with cowpox to stop them from getting smallpox. Even today his work is still recognized and Gloucestershire Royal Hospital has a unit named after him.

The story of Edward Jenner

Reading Comprehension

Can you fill in the blanks in the story from the words in the box below?

Edward Jenner was born in _____, England. As a young boy Jenner's favorite subject was _____ and when he grew up he became a _____. At the time the people of England were terrified of a deadly disease called _____. Symptoms included severe _____ and many people died. Jenner noticed that milkmaids who caught the harmless infection _____, from their milking cows did not die from smallpox. Jenner took pus from the hand of a _____ who had cow pox and infected a boy called _____. The boy got infected with cowpox but soon recovered. Jenner then _____ James with smallpox. A _____ developed but the boy did not develop smallpox. Jenner was delighted that his idea was correct, he went on to _____ all the children in his town with cowpox to stop them getting smallpox.

Cowpox	**James Phipps**	**Smallpox**	**Gloucestershire**
Doctor	**Milk-maid**	**Science**	**Scarring**
Infected	**Scab**	**Vaccinate**	

A Historic Hero

Dr Edward Jenner is one of the most important people in scientific history. Without his discovery of vaccinations more than half your class would not be here today!

Understanding

Answer the following questions:

1. What was the name of the doctor who discovered vaccinations?

   _____

2. What was the name of the deadly disease at the time?

   _____

3. What was Jenner's idea to stop the deadly disease?

   _____

4. What happened to James after he was infected with the cowpox?

   _____

5. What happened to James after he was infected with the smallpox?

   _____

6. Why was it important for Jenner to test his idea on James before treating lots of children?

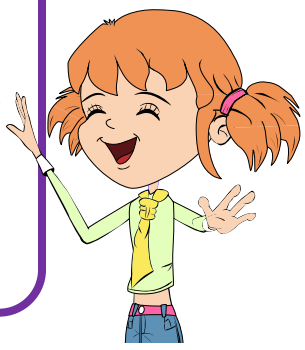
   _____

Did you know?

By the age of 9, each child may have had at least 9 injections to prevent 10 different dangerous infections.

Fascinating Fact

Vaccination comes from the Latin word for a cow – *vacca.*



VAC SW 1

Barts and The London School of Medicine and Dentistry

e-Bug

National Curriculum Links

Key Stage 2

Science

Animals, including humans

Working scientifically

PSHE

Core Theme 1- Health and Wellbeing

Estimated Teaching Time

50 minute sessions

3.3 Prevention of Infection Oral Hygiene

Section 3.3, Oral Hygiene explores how to prevent dental caries (tooth decay) by demonstrating the importance of limiting sugar intake and brushing teeth twice a day with fluoride toothpaste.

Students are introduced to how dental plaque develops on the teeth and how the bacteria within this plaque can cause dental decay.

Students will look at the sugar in their own diets and carry out an activity to identify and reproduce the amount of sugar contained in common drinks.

A video demonstration will introduce students to effective tooth brushing at home, and compare before and after tooth brushing routines.

Learning Outcomes

All students will:

- understand what dental plaque is and how it forms.
- understand which foods and drinks cause tooth decay.
- understand the consequences of tooth decay.
- understand how to brush teeth effectively.
- understand that limiting sugary foods & drinks can reduce tooth decay.

3.3 Prevention of Infection
Oral Hygiene

Key Words

Erupt (come through)
Exfoliate (fall out)
Bacteria
Plaque (clumps of microbes)
Disease
Caries (tooth decay)
Sugar
Acid
Enamel (tooth surface)
Dentine (second tooth layer)
Fluoride
Tooth Brushing

Materials Required

Per Student

- ☐ 3 Copies of SW 1
- ☐ 1 Copy of SW 2
- ☐ Pencil

Per Group

- ☐ Copy CW 1
- ☐ Copy CW 2
- ☐ Empty Drinks Bottles
- ☐ Tea Spoon
- ☐ Self-Sealing Bag
- ☐ Sugar
- ☐ Colouring Pens
- ☐ Scissors
- ☐ Glue
- ☐ Paper
- ☐ Blue and red stickers

Available Web Resources

- A PowerPoint presentation PP 1.
- A video demonstration of effective tooth brushing.

FASCINATING FACT

In Medieval times people used to visit the Barber about their teeth troubles. These Barber surgeons extracted teeth as well as cutting hair!

Background Information

Normally our first teeth come through (erupt) around 6 months until we have a full set of 20 baby (primary) teeth by the time we are 2 ½ years old. These primary teeth begin to get wobbly and fall out (exfoliate) usually when we reach 6 years old, and are replaced by the permanent (adult) teeth. By 12 years old we have 28 adult teeth, which if we look after, can last for the rest of our lives!

Some people will have 4 extra teeth at the back of their mouth called wisdom teeth. These erupt when we are about 18-20 years old, so some people can have 32 adult teeth in total.

Bacteria will develop on these teeth, clumping together to form a sticky substance called dental plaque. You will see this in your own mouth as a creamy line around your teeth or sometimes feel it as a furry layer with your tongue. Given the right environment, these bacteria can cause tooth decay (caries).

When we consume sugary foods and drinks, this counts as a sugar attack to the teeth. The bacteria in the plaque use the sugars and make acid as a by-product. Over time the acid begins to dissolve the mineral from the outer surface of our teeth (the enamel). As more enamel is dissolved by the acid, a hole (cavity) appears which can spread into the second layer of tooth (the dentine). As the decay process continues, the cavity continues to grow and can irritate the nerve inside the tooth causing pain!

If no dental treatment is given, the tooth decay (caries) can spread and the bacteria infect the nerve, which can lead to an abscess (lump on the gum) that is filled with pus. This can make you very poorly and the tooth will usually need to be removed (extracted).

Tooth decay can be prevented by limiting the number of times we eat foods and drinks with added sugar and tooth brushing twice a day with fluoride toothpaste.

Fluoride in toothpaste can help strengthen our teeth and slow down caries. For best effect, teeth need to be brushed twice a day. The most important time to brush teeth with fluoride toothpaste is before going to bed at night. To make it easy to remember it is best to add tooth brushing to a twice daily hygiene routine morning and night.

This module will guide educators through the different ways of preventing caries from forming, keeping the mouth happy and healthy.

Advance Preparation

1. Copy SW 1 and SW 2 for each student.
2. Set up PP 1 on projector.
3. Copy CW 1, and CW 2 for the class
2. Locate the video demonstration of tooth-brushing, available at www.e-bug.eu.

3.3 Prevention of Infection
Oral Hygiene

Lesson Plan

Preparation

The week before the lesson distribute the diet diary **SW1** and tooth brushing diary **SW2** alongside the weekly homework. Ask pupils to complete both worksheets, the diet diary for 3 days and the brushing diary for 1 week, and bring to the lesson.

If you cannot guarantee a good return of diaries consider completing them daily in class.
SW1: Ask pupils to write what they had to eat the previous night, that morning and what they have for lunch. Remind students to include any drinks or snacks that they have eaten.
SW2: Pupils should tick if they brushed their teeth that morning or the previous night

TIP!

Overview of the Lesson

- Begin the lesson by introducing to the pupils that tooth decay is a preventable disease, by using the background information section provided. Explain that they will learn what causes tooth decay and simple steps they can take to prevent it.
- Show the pupils the Power Point resource **PP1.** Use the questions within the presentation to promote discussion and gather what knowledge they already have.

- Complete Activity 1a – Healthy Diet
- Complete Activity 1b – Healthy Diet
- Complete Activity 2 – Healthy Oral Hygiene

- Key message - you can stop tooth decay by:
    1. Eating less sugary foods and drinks.
    2. Brushing teeth with a pea-sized amount of fluoride toothpaste last thing before bed and in the morning.

3.3 Prevention of Infection
Oral Hygiene

Lesson Plan

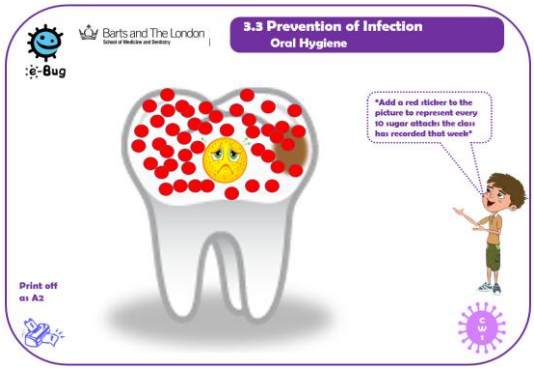
Activity 1 A – Healthy Diet

- Explain to pupils what a sugar attack is by referring back to examples from **PP1.**
- Ask pupils to highlight or underline sugar attacks on their diet diary **SW1** and add the sugar attacks up.
- Each child writes out their sugar attack total on a small sheet of paper without their name on it.
- These sheets of paper are collected and the totals are added up.
- In groups, using one red sticker to represent 10 sugar attacks, display the class total on **CW1.**

Example: If a class of 30 children each have a sugar attack total of 15 the Class total = 450, so 45 red stickers should be displayed on **CW1.**

Day:

Time	What did you eat?	What did you drink?
7am	Toast and jam	Orange juice
11am	Cereal bar	Milk
1pm	Fish fingers chips and beans	Can of coke
4pm	Packet of crisps	Orange squash
6pm	Spaghetti Bolognese	
7pm	Chocolate bar	



Instead of stickers you could make crosses with a felt tip to represent sugar attacks.

If you do not have the facility to print off A2 posters draw a circle on the largest size paper you have for pupils to plot their totals.

TIP!

Guidance for teachers

Each time we eat or drink foods with free sugars this is classified a **sugar attack**. Free sugars are those added by the cook, consumer or manufacturer including those sugars naturally present in honey, syrups and fruit juices, but excludes whole fruits and unrefined carbohydrates such as brown rice and whole wheat pasta. Sugar attacks should be kept to a minimum and limited to mealtimes to reduce the risk of tooth decay.

3.3 Prevention of Infection
Oral Hygiene

Lesson Plan

Activity 1 B – Healthy Diet

This activity is for groups of 2-3 students.

1. Provide each group with a different empty drink bottle from a popular brand (include flavoured and plain water and a range of soft and fizzy drinks), a teaspoon, a bag of sugar and a clear plastic bag (such as a sandwich bag).

2. Before they begin, each pupil should be asked to look at the nutritional information label and identify how much sugar is contained within each bottle. Teachers can help pupils locate the sugar content on the label, and check the amounts.

3. Pupils should be asked to fill each bag with the equivalent amount of sugar contained within each drink (1 teaspoon is approximately 4 grams).

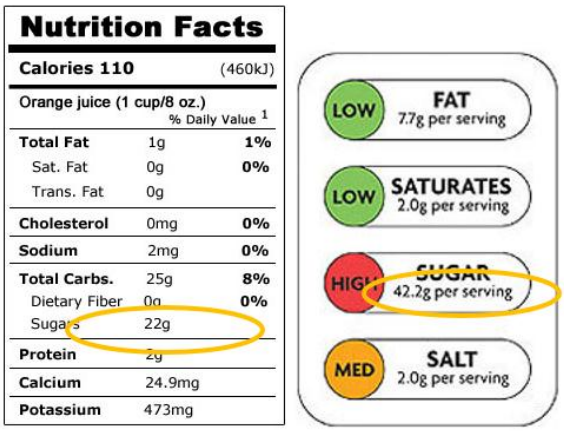
4. Once the activity is completed, each group can present their findings (drink name, amount of sugar in grams and number of teaspoons of sugar) to the rest of the class.

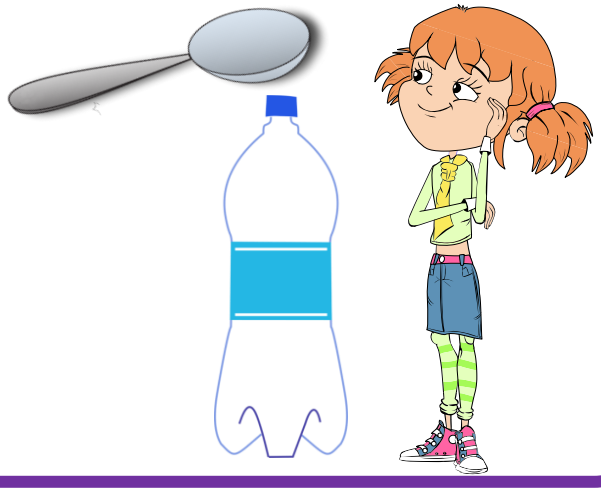
5. Ask the pupils to present and discuss their findings.

6. Pupils can collate the project and produce a 3D poster board for display within the classroom; containing drink bottles and sugar bags attached to the paper.

Guidance for teachers

Look at these examples of foods labels to help you locate the sugar content in drinks.





3.3 Prevention of Infection
Oral Hygiene

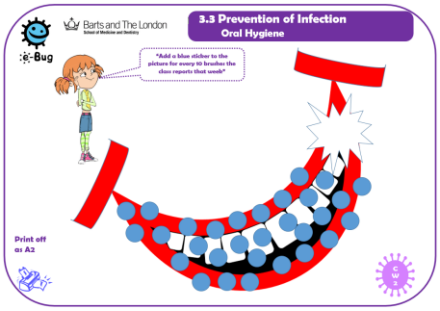
Lesson Plan

Activity 2 – Healthy Oral Hygiene

- Get pupils to add up their weekly total from their tooth brushing diaries **SW2.**
- Each child writes out their weekly total on a small sheet of paper without their name on it.
- These sheets of paper are collected and the totals are added up.
- Using one blue sticker to represent 10 brushing episodes, display the class total on **CW2**.

Example

If a class of 30 children each have a weekly brushing total of 10 the class total = 300 so 30 blue stickers should be displayed on **CW2.**



- Next play the tooth brushing video available at www.e-bug.eu.
- Discuss how their current oral hygiene may differ from the advice in the video, and what changes they can make to keep their teeth healthy.

Key oral hygiene messages:

- Brushing should begin as soon as the first tooth erupts (6-9 months of age).
- Brushing should be carried out by an adult until 7 years of age.
- A smear of fluoride toothpaste should be used up to the age of 3 years and over 3 years a small pea sized amount of fluoride toothpaste can be used.

Extension Activity

- In groups encourage pupils to practice tooth brushing technique on models.
- Each pupil should be timed how long they think it takes to clean the whole mouth effectively.
- See how long they took compared to the ideal 2 minutes.

Music can help demonstrate to pupils how long they need to brush for. Consider playing a pop song that lasts 2 minutes whilst they practice brushing again.

TIP!

Barts and The London School of Medicine and Dentistry

3.3 Prevention of Infection
Oral Hygiene

Lesson Plan

Plenary

Check for understanding by asking students

How do we get dental decay?
Bacteria in our mouths breakdown sugars we eat and use them to produce substances including acid and plaque. The plaque helps the bacteria clump together and stick to the teeth. If this is not brushed away regularly, the acid dissolves our teeth causing cavities (holes).

Which foods should we limit, and only have occasionally?
Foods and drinks containing sugar should be limited and only had occasionally. Snacking during the day and at bedtime on sugary foods and drinks (especially fizzy drinks!) should be avoided to prevent dental decay.

Is it OK to drink fizzy drinks that do not contain sugar?
Although these drinks (e.g. Diet Coke, Pepsi Max) do not contain sugar, the acid in these drinks can still dissolve our teeth away, making them smaller and sometimes painful. The best drinks are plain water and plain (non-flavoured) milk with no added sugar.

How often should we brush our teeth, and how?
It is essential to brush our teeth twice daily, at night and in the morning, as soon as they erupt (around 6-9 months of age), with a smear of toothpaste containing fluoride for under 3 years. Once aged 3 years old, we should use a pea-size amount of toothpaste containing fluoride.
*Tooth brushing should be supervised by an adult until 7 years of age. After brushing it is important to **spit but not rinse** (to leave a protective layer of fluoride on the surface of our teeth).*

What event occurs at around the age of 6 years?
At around age 6, the first permanent molar teeth (at the back of the mouth) erupt. These teeth can be mistaken for milk teeth and often missed when brushing. It is essential to brush these teeth effectively to prevent the onset of dental decay.

How can we remember to brush our teeth?
To remember to brush our teeth, it is best to add tooth brushing to a twice daily hygiene routine morning and night.

Distribute new **SW1** and **SW2** sheets to be completed by next lesson in order to compare to the previous diaries and assess for changes.

Follow up Activity

- Recap on the previous lessons key message:

  You can stop tooth decay!

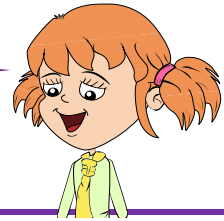
- What two things can we do to prevent tooth decay?
  1. Limit sugar intake
  2. Brush teeth twice a day with fluoride toothpaste.
- Get students to compare their diet and tooth brushing diaries, have there been any changes?
- Plot the new scores for **SW1** and **SW2** on the class chart and compare

  Look for less sugar attacks and more brushing
- Reinforce key diet and brushing messages

Barts and The London School of Medicine and Dentistry
ORAL TS 6

Diet Diary

Write down the day and record everything you have to eat or drink (however small) and note the time. Do this for 2 weekdays and one weekend day



Day:

Time	What did you eat?	What did you drink?

I went to bed at _____ (time)

Barts and The London School of Medicine and Dentistry
ORAL SW1

Brushing Diary

"Write the day of the week in the diary and tick each time you have brushed your teeth in the box for that day"

Day	Tick for every time you brush your teeth
Day 1	
Day 2	
Day 3	
Day 4	
Day 5	
Day 6	
Day 7	
Weekly total	

Barts and The London School of Medicine and Dentistry

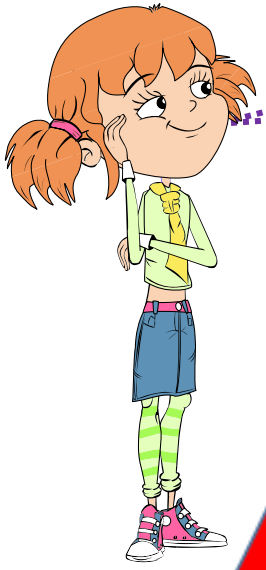
3.3 Prevention of Infection
Oral Hygiene

"Add a red sticker to the picture to represent every 10 sugar attacks the class has recorded that week"

Print off as A2

Barts and The London School of Medicine and Dentistry

3.3 Prevention of Infection
Oral Hygiene

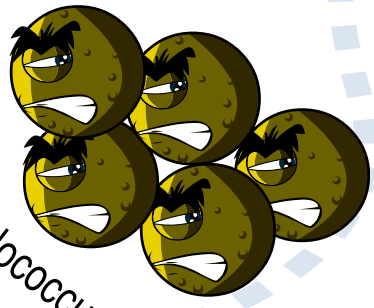


"Add a blue sticker to the picture for every 10 brushes the class reports that week"

Print off as A2

Barts and The London School of Medicine and Dentistry

ORAL CW2



National Curriculum Links

Key Stage 2
Science
Working Scientifically
Animals, including humans (*Upper KS2 only*)
PSHE
Core Theme 1: Health and Wellbeing
Core theme 3: Living in the wider world
English
Reading and Comprehension
Estimated Teaching Time
50 minutes

4. Treatment of Infection Antibiotic Use and Medicine

Section 4, Treatment of Infection, explores the use of antibiotics and medicine in treating various illnesses and diseases.

This is a student discussion activity. Students are exposed to a range of scenarios in Amy and Harry's school day. Students discuss the various comments made throughout the cartoon and decide whether or not they agree.

Learning Outcomes

All students will:

- understand that most common infections get better on their own through time, bed rest, liquid intake and healthy living.
- understand that if antibiotics are taken, it is important to finish the course.

4.1 Treatment of Infection
Antibiotic Use and Medicine

Key Words

Antibiotic
Disease
Illness
Immune system
Infection
Medicine
Natural barriers
Natural defence
Symptom
Vaccine

Materials Required

Per Student/Group

- ☐ A copy of SH 1
- ☐ A copy of SH 2
- ☐ A copy, whiteboard or overhead projector (optional) of SW 1

Available Web Resources

- Comic strip, SH 1 and SH 2, available in MS PowerPoint format.

FASCINATING FACT

In 1901, most people didn't live past 47 years old. Now most people live to the age of 77 years or longer thanks to modern medicines like antibiotics!

Background Information

The body has many **natural defences** to help fight against bad microbes that can cause infection. For example, the skin stops microbes entering the body, the nose has a sticky substance (mucous) which traps microbes if they are inhaled, tears contain substances which can kill bacteria and the stomach produces acid which can kill many microbes if ingested. Generally, by living a healthy life (eating a balanced diet, drinking plenty of water and getting lots of rest) these natural barriers help keep us healthy. However, in some cases, microbes can cross these barriers and enter our bodies.

The majority of the time the immune system defeats any harmful microbes entering the body, however in some cases the immune system needs help. **Antibiotics** are special medicines that kill harmful **bacteria**. Some antibiotics stop the bacteria reproducing and others kill the bacteria. Antibiotics treat diseases caused by bacteria, such as meningitis, tuberculosis and pneumonia. They do **not** harm viruses, so antibiotics cannot treat diseases such as colds and flu, which are caused by viruses.

Before antibiotics were discovered, harmful bacteria killed many people. Today however, most bacterial infections are easily treated with antibiotics - but the bacteria are fighting back! Through increased exposure to antibiotics, the bacteria are becoming resistant to them. This means that bacterial infections are once again becoming life threatening. We can help prevent this from happening through a number of ways:

- only use antibiotics prescribed by your doctor
- always finish the course once prescribed
- don't use antibiotics for simple coughs and colds

Antiviral and antifungal medications are also available; however it is important that these are administered by a doctor. Much of the over the counter medication available is to alleviate the symptoms of many infections, for example, pain killers or medication to reduce the temperature associated with fever.

Advance Preparation

Print/Photocopy SH 1, SH 2 and SW 1 for each student.

ATB TS 1

4.1 Treatment of Infection
Antibiotic Use and Medicine

Lesson Plan

Introduction

1. Begin the lesson by explaining to the students that they are going to learn how to treat current infections. Remind students that harmful microbes make us ill. Ask students about their own experiences of being ill, what was the illness, how did they feel and what treatment did they receive? Did they go to the doctor or did they get something from the chemist?
2. Tell students that before we get medicine we should try and let our bodies fight the harmful microbes. Explain that inside our bodies we have an immune system that fights harmful microbes. If we get plenty of sleep and eat properly we keep our immune system strong and it keeps fighting the harmful microbes.
3. Explain however, that sometimes, if a lot of harmful microbes get into the body, the immune system may need help. This is when we need medicine. Explain that different types of medicine are used to treat the symptoms of different infections e.g. cough remedies, painkillers, medicines to bring down temperatures, etc.
4. Highlight to students that **antibiotics** are special medicines that are used to treat only **bacterial** infections. Antibiotics make us better by stopping or killing the harmful bacteria that make us ill. Explain to students that different antibiotics affect different bacteria therefore we should not use other people's antibiotics because they might not work; we should only take antibiotics given to us by the doctor.
5. Explain that if we do get antibiotics from the doctor then it is important to finish the course. If not, we may not kill all the harmful bacteria and they could make us ill again or become resistant to the bacteria.
6. Students should know that many of the other medicines e.g. pain killers or cough mixtures are used to relieve the symptoms of infection such as headaches, fever, congestion, etc.

Main Activity

1. This activity can be carried out in small groups or as a classroom discussion. The task is presented like a cartoon story.
2. Each section of the cartoon has a situation with a decision that needs to be made. The words spoken by the decision maker are in italics to highlight them.
3. Show each box to the students (either all together **SH 1** and **SH 2,** or as individual boxes on the white board, or overhead projector from the website **www.e-bug.eu**) and discuss whether the decision maker has made the right or wrong choice.
4. Discussion points can be found in **TS 3**.

ATB TS 2

4.1 Treatment of Infection
Antibiotic Use and Medicine

Lesson Plan

Plenary

Check for understanding by asking the children the following questions

1. What is the cause of infections?
   The cause of infections are harmful microbes.
2. What are medicines?
   Medicines are any substance used in the treatment of disease or the symptoms of a disease.
3. What are antibiotics?
   Antibiotics are special medicines used to treat bacterial infections.
4. Why should we not use other people's antibiotics?
   Different antibiotics affect different bacteria so antibiotics prescribed for an ear infection might not work on an infected wound.
5. What might happen if we don't finish our antibiotics?
   Not finishing a course of antibiotics may result in the bacteria causing the infection to survive. These bacteria will have been exposed to the antibiotic treatment and learned how to fight the antibiotics the next time they are used i.e. they may become resistant to the antibiotic therapy.

Extension Activity

1. This activity can be carried out either individually or in groups of 2 – 4 students.
2. Provide students with **SW 1**.
3. Students should match the word on the left hand column with the definition on the right hand column.

4.1 Treatment of Infection
Antibiotic Use and Medicine

Discussion Points

Natasha should cover her mouth whilst coughing. Infection can easily spread from person to person through coughing and sneezing. A sneeze travels at approximately 100mph and at high force meaning that the microbes carried in a sneeze can travel very far and infect other people.

You should always wash your hands after going to the toilet. Many bad microbes that make you ill are found in toilets. Good personal hygiene is essential to a healthy lifestyle and can greatly reduce the spread of infection. Trials show that proper hand washing reduces absenteeism in schools, not just from tummy bugs but from coughs and colds too.

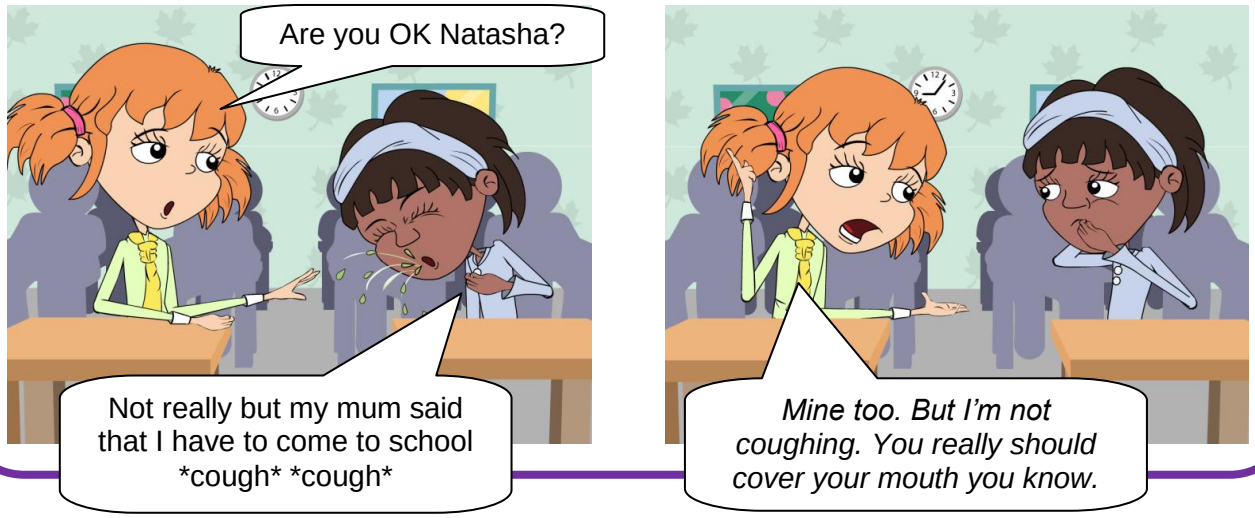
Amy should NOT use her sister's antibiotics. There are many different types of antibiotics which treat different bacterial infections. Doctor's prescribe specific antibiotics for specific illnesses and at a dose suitable for the patient. Taking someone else's antibiotics may mean your infection does not get better.

Mrs Warren should have washed Harry's cut knee to clean any dirt or microbes which may have been present. Antiseptic cream applied to deeper cuts can also help prevent infection. There is generally no need to cover smaller cuts and grazes with a plaster, fresh air will help the scabbing process.

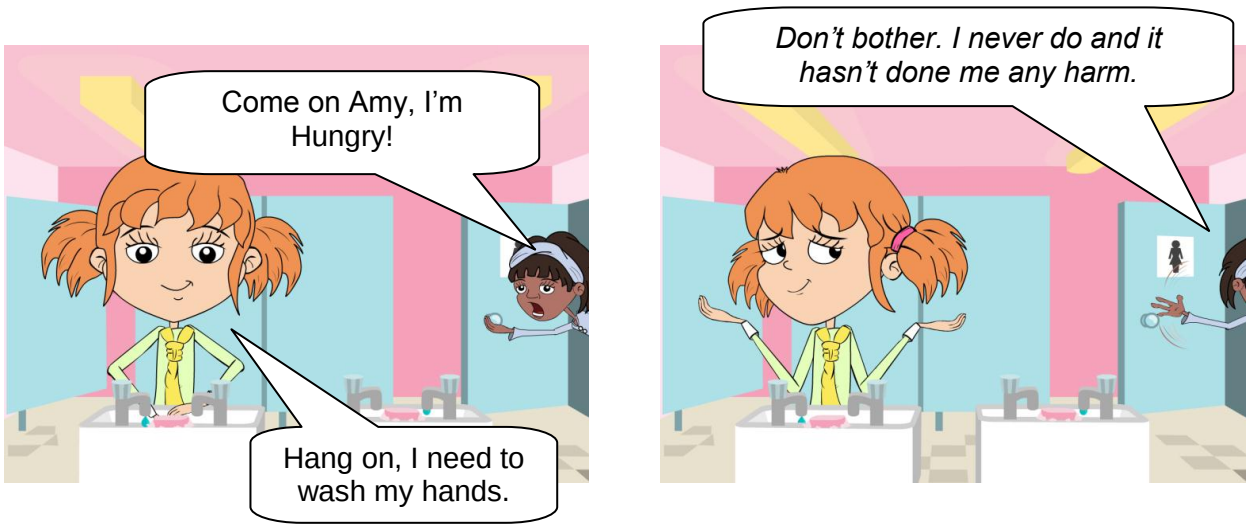
The doctor is right; antibiotics only work on bacterial infections. Coughs and colds are caused by viruses and in many cases the body's own natural defences will fight these infections. Other medicines from the chemists help with the symptoms of coughs and colds.

It is important for Harry to finish the course of antibiotics. Not finishing the course could result in the bacteria not being killed properly and becoming resistant to the antibiotic is the future.

1. **Amy went to school not feeling very well. She had a headache and a runny nose. When she arrived in the classroom she took a seat beside Natasha. She soon realised that Natasha was also not well.**

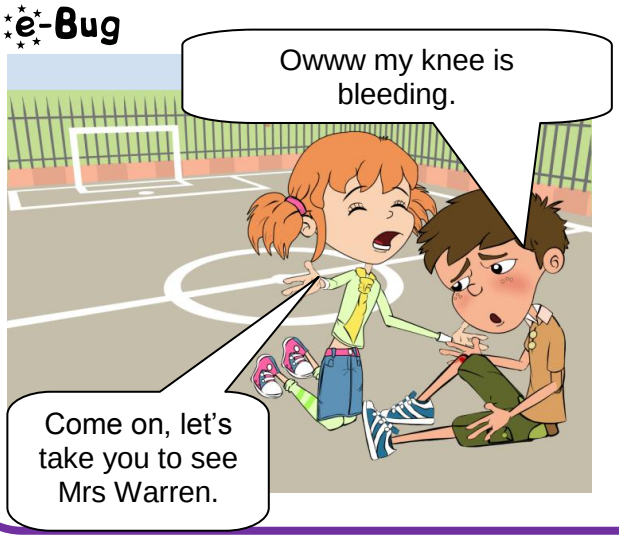


2. **At lunch time, Amy and Natasha went to the toilet. Natasha was hungry and in a hurry to have her lunch.**

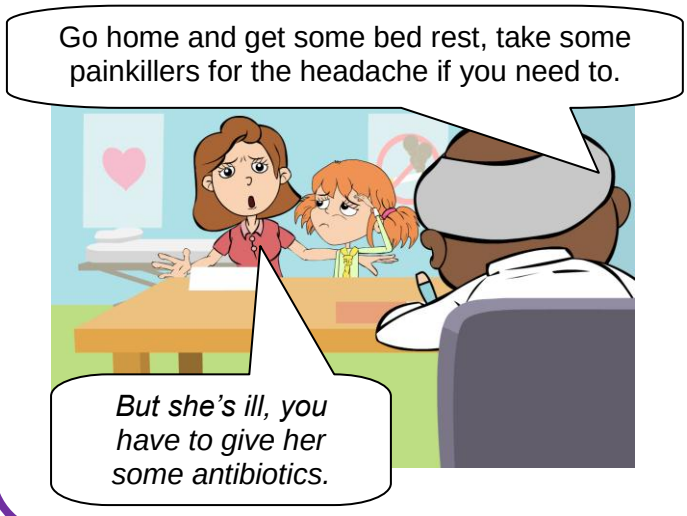


3. **During lunch Amy was talking to her friend Harry about her headache and runny nose.**

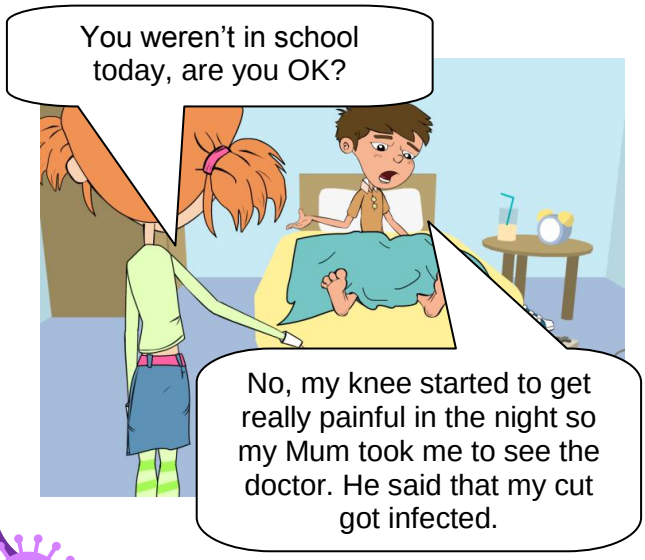
4. After they had eaten, the children went out to play. Harry fell over and cut his knee very deeply.



5. When Amy got home, her mother decided to take her to the doctor. He said that she had a bad cold.



6. Harry didn't come to school the next day so Amy called around to see him on her way home from school.



Word mix up!

e-Bug

- Antibiotic
- Bacteria
- Infection
- Medicine
- Painkiller
- Virus
- Symptom

THE SMALLEST OF THE MICROBES - USUALLY HARMFUL

A DRUG USED TO TREAT A DISEASE OR INJURY

A SIGN OF ILLNESS E.G. HEADACHE, DIARRHOEA AND FEVER

SPECIAL MEDICINE USED TO TREAT BACTERIAL INFECTIONS

A DISEASE CAUSED BY A MICROBE

VERY SMALL MICROBE THAT CAN BE HELPFUL OR HARMFUKL

A DRUG USED TO TAKE AWAY PAIN

ATB SW 1

Word Glossary

Acid	Substance with a pH less than 7 produced by bacteria in the mouth that can dissolve the surface of teeth.
Antibacterial soap	A soap that kills some bacteria. Antibacterial soaps are being increasingly marketed but they have no added value over soap in the school setting.
Antibiotic	A type of medicine which is used to destroy or prevent the growth of bacteria.
Antibody	A protein produced by white blood cells which binds to the microbe it recognises making the microbes easier to destroy by the white blood cells.
Antigen	A special marker or part of a microbe that when introduced into the body stimulates the production of an antibody by white blood cells.
Bacteria	Microscopic single celled microbe that can be beneficial or harmful to humans.
Bug	Another word for a microbe.
Caries	Another word for dental decay.
Cell	The smallest structural unit of an organism that is capable of working independently.
Colony	A group of microbes grown from a single parent cell.
Colonise	Ability to survive and grow on humans without necessarily causing harm.
Contagious	Able to be spread to others through direct or indirect contact.
Contamination	Impurity or uncleanness when an area or thing is covered with microbes.
Cross Contamination	Cross-contamination is the transfer of harmful microbes from one item of food to another via a non food surface such as human hands, equipment, or utensils. It may also be a direct transfer from a raw to a cooked food item.
Culture	The growth of microbes in a specially prepared growth medium.
Dentine	Hard substance under the top layer of teeth (enamel) which surrounds the pulp (nerve) in the centre.
Dermatophytes	A group of fungi that like to grow in or on the skin and scalp.
Disease	An illness that has a group of signs or symptoms.
Erupt	The process of a tooth moving from below the gum into the mouth.

Word Glossary

Exfoliate	When a baby tooth falls out naturally.
Experiment	A test carried out to observe whether or not an idea or theory is true.
Fermentation	A process by which microbes break down complex sugars into simple compounds such as carbon dioxide and alcohol.
Fluoride	An element which can protect teeth from tooth decay by strengthening the surface of teeth; can be found in toothpaste and mouthwashes.
Fungi	The largest of the microbes. Unlike bacteria or viruses, fungi are multi cellular.
Germs	Another word for harmful or pathogenic microbes.
Hygiene	Conditions and practices that serve to promote and preserve health and reduce spread of infection.
Illness	Poor health resulting from disease.
Immune system	The collection of organs, tissues, cells, and cell products such as antibodies that helps to remove microbes or substances from the body.
Immunise	Perform vaccinations or produce immunity by inoculation of a substance that is similar to part of the microbe you want to protect against.
Incubate	To maintain at the best temperature and conditions for growth and development.
Infection	A disease caused by a microbe.
Infectious	Capable of causing an infection. A person, animal or thing that can pass microbes on.
Inflammation	A protective attempt by the body to remove the microbe or unknown substance as well as initiate the healing process for the tissue.
Medicine	A substance, used to treat disease or injury.
Microbe	A shortened form of ‘micro-organism’.
Micro-organism	Living organisms that are too small to be seen with the naked eye.
Microscope	An optical instrument that uses a lens or a combination of lenses to produce magnified images of small objects, especially of objects too small to be seen by the unaided eye.
Natural Barrier	The body’s natural barriers to infection include the skin, sticky substances in the nose and nasal hair, various enzymes produced in the body and stomach acid.
Natural Defence	The way the body protects itself from illness such as a rise in body temperature during infection to make the body inhospitable to invading microbes and the creation of antibodies in response to microbial invasion.

Word Glossary

Pathogen	A microbe that can cause an illness.
Phagocytes	White blood cells which attack any foreign objects which enter the blood stream.
Phagocytosis	The method by which phagocytes engulf and digest unwanted microbes.
Plaque	A sticky yellow/white substance on teeth containing bacteria which builds up if we do not brush our teeth.
Plasma	The yellow coloured liquid of the blood in which the blood cells are suspended.
Prediction	An educated guess about future events.
Probiotic	Literally means 'for life'. Probiotics are bacteria that aid human digestion.
Results	The outcome or effect of an experiment.
Symptom	A sign of illness, e.g. headaches, fever and diarrhoea.
Tooth brushing	A technique to remove the plaque from teeth to prevent tooth decay
Toxin	A harmful substance produced by some harmful microbes.
Transfer	To move from one place to another. Spread of a microbe.
Transmission	Movement from one place to another.
Virus	The smallest of the microbes, viruses cannot survive on their own and need to live in the nucleus of other living organisms.
Vaccination	Inoculation with a vaccine in order to protect against a particular infection.
Vaccine	A weakened or killed microbe, such as a bacterium or virus, or of a portion of the microbe's structure that when injected into a person leads to antibody production against the microbe. The vaccine cannot cause infection itself.
White blood cell (WBC)	Cells found in the blood which help protect the body against infection and disease.

This project has been led by the Primary Care Unit, Public Health England with assistance from the following schools:

Junior Schools

Brimscombe Church of England Primary School, Gloucestershire
Clearwell Church of England Primary School, Gloucestershire
Cirencester Junior School, Gloucestershire
Elmbridge Junior School, Gloucestershire
Latymer Prep School, London
Mere School, Gloucestershire
Nailsworth Junior School, Gloucestershire
Powell's Junior School, Gloucestershire
Stow on the Wold Junior School, Gloucestershire
Swell Church of England Primary School, Gloucestershire
Siddington Church of England Primary School, Gloucestershire
Uplands Community Primary School, Stroud

Senior Schools

Barnwood Park Arts College, Gloucestershire
Bishops College, Gloucestershire
Chipping Sodbury School, Bristol
The Cotswold School, Gloucestershire
Deerpark School, Gloucestershire
Dene Magna School, Gloucestershire
Hayesfield School, Bath
Heywood Community School, Gloucestershire
Kingsfield School, Bristol
Lakers School, Gloucestershire
Ralph Allen School, Bath
Ribston Hall High School, Gloucestershire
The Ridings High School, Bristol
Smithycroft Secondary School, Glasgow
Thorntree Primary School, Glasgow
Trinity Catholic School, London

The resource has been produced in collaboration with the following bodies:

City University, London
International Scientific Forum on Home Hygiene
The Society for General Microbiology
The Department of Health
Barts and The London, School of Medicine and Dentistry, Queen Mary University of London

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Educating children in the areas of microbiology, hygiene and appropriate antibiotic use will stop antibiotic being 'worn out' in the future. Children will grow up knowing when antibiotic should and shouldn't be used.

This resource pack has information, suggested lesson plans and possible activities for you to use in your classroom to help you inspire and inform your pupils.

The resources cover topics in the National Curriculum for Science such as 'Working Scientifically', 'Living Things and Their Habitats' and 'Animals Including Humans'.

Additionally the resources complement the 'Reading and Comprehension' section of the National Curriculum for English.

This resource can be shared with PSHE teachers for use with 'Core Theme 1: Health and Wellbeing', part of the PSHE Association Programme of Study which is supported by the Department for Education.

These resources were first launched in 2009 with funding and collaboration from:

department for children, schools and families

CITY UNIVERSITY LONDON

IFH Home Hygiene & Health
The Portal Dedicated Exclusively to the Science and Practice of Home Hygiene

Partly funded by the Department of Health

DH Department of Health