Operated by
Public Health England

The British Society for Antimicrobial Chemotherapy

e-Bug

www.e-bug.eu

Science Show

Lesson plans, worksheets, posters and activities for Key Stage 1

An Educational Resource

Key Stage 1 / Science*

* certain sections may also link with the PSHE curriculum

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 5 topics with individual activities designed to fit into 50 minute classroom slots.

Each of these sections contain:

- 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

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.

Contents

Introduction

Introduction to the Science Show.....7

The e-Bug Science Show Stands & Lesson Plans

Microbe Mania 9

Horrid Hands 19

Super Sneezes 33

How Clean Is Your Kitchen?.....39

Antibiotic Awareness.....47

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The e-Bug Science Show and Key Stage 1 Resources

The e-Bug science show and corresponding Key Stage 1 resources covers the following topics: ***Introduction to microbes, hand hygiene, respiratory hygiene, food hygiene*** *and* ***antibiotics***. Each topic has a backing stand and interactive activity. Here you will find the learning objectives, materials required and instructions for each activity and topic.

Introduction to the Science Show

The e-Bug science show can be introduced to students by explaining about the different types of microbes. For the introduction described below, you will need to prepare a balloon filled with glitter.

1. Ask the students if they know what a microbe is and explain that there are 3 types of microbes: fungi, bacteria and viruses.
2. Fungi are the largest microbe and they can be useful or harmful. Give an example of useful and harmful fungi.
3. Bacteria are the middle size microbe and can also be useful or harmful. Again give examples of both useful and harmful bacteria.
4. Viruses are the smallest type of microbe and are mostly harmful. Some scientists can use viruses in their lab to help make new medicines, but generally all viruses are bad. Viruses cause colds and flu.
5. Remind the children the names of the microbes and their sizes. Explain that most microbes are too small to see with the naked eye and that it can be hard to understand their sizes.
6. Ask the children to image a fungus the size of the room they are in and ask how big they think bacteria would be. Show the children a balloon – this is how big the bacteria would be. Ask how big they think a virus would be. Pop the balloon and explain that a virus would be the size of a piece of glitter.
7. The children now spilt into their groups and rotate around the stands. Each stand takes approximately 7-10 minutes to complete, depending on how much time you have. It is useful for someone to time the stands and let everyone know when to rotate.

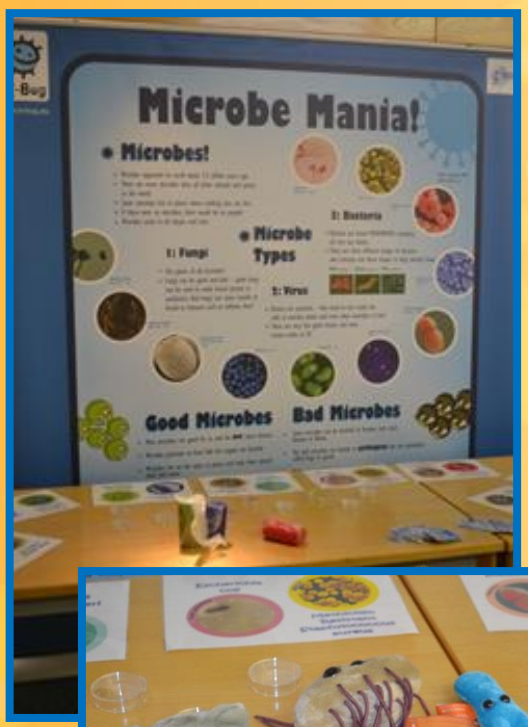
Microbe Mania

Learning Objectives

- There are three different types of microbes: fungi, bacteria and viruses
- Microbes are all different shapes and sizes
- Some are useful but some can be harmful
- Microbes are found everywhere
- Most microbes are too small to be seen with the naked eye

Materials

- Coloured play-dough
- Petri dishes
- Permanent black marker
- Placemats
- Laminated pictures of microbes (provided by the e-Bug UK team)
- Laminated information sheets on microbes Tablecloths
- Selotape
- Giant microbes (optional)



Set Up

1. Set up placemats with a small amount of playdough and a petri dish on each mat. Try to ration the playdough and don't leave lots of out for people to take their own, or you may run out.
2. Place laminated pictures of microbes around the table.

Please see the virtual Science Show video for an example of how this stand can be run: http://bsac.org.uk/science-fair//stands/microbemania/

Microbe Mania

Introduction

This activity aims to introduce children to different types of microbes and microbe shapes by allowing them to make a microbe out of playdough.

1. Remind the children, with the visual aid and information on the backing stand, that there are three different types of microbes (fungi, bacteria and viruses) and how these are different.
2. Giant microbes can be used to help demonstrate the different shapes of microbes.
3. Encourage children to take some playdough and to make a microbe in a Petri dish.
4. Explain they can make any microbe from the laminated pictures.
5. Point out common forms of microbes that they might have heard of on the laminated sheets to get them started.
6. Ask them which microbe they are making and tell them a bit about it e.g. is it a fungi, bacteria or virus and it is useful or harmful (refer to the information sheets provided).
7. When they have finished, write what they have made on the petri dish with the permanent black marker for them to take home.
8. Add a few pieces of selotape around the edge of the petri dish to secure the lid.

Microbe Mania!

Microbes!

- Microbes appeared on earth about 3.5 billion years ago.
- There are more microbes than all other animals and plants in the world.
- Some microbes live in places where nothing else can live.
- If there were no microbes, there would be no people!
- Microbes come in all shapes and sizes

Salmonella typhi (typhoid fever) – Bacteria

MRSA – Bacteria

Photos copyright 2008 Giantmicrobes, inc.

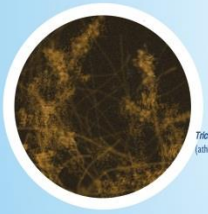
Streptococcus (sore throat) – Bacteria

Microbe Types

1: Fungi

- The giants of all microbes!
- Fungi can be good and bad – good fungi can be used to make bread (yeast) or antibiotics. Bad fungi can cause mould on bread or diseases such as athletes foot!

Stachtbotrys chartarum (toxic mould) – Fungi

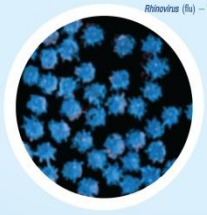


Trichophyton mentaphytons (athlete's foot) – Fungi

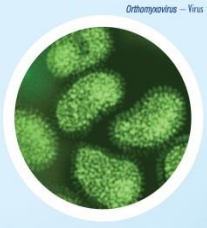
Saccharomyces cerevisiae (bread and brewers yeast) – Fungi

2: Virus

- Viruses are parasites - they need to live inside the cells of animals, plants and even other microbes to live!
- There are very few good viruses and most viruses make us ill!



Rhinovirus (flu) – Virus



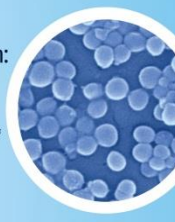
Orthomyxovirus – Virus

Epstein barr (kissing disease) - Virus

3: Bacteria

- Bacteria are found EVERYWHERE including all over our bodies.
- There are three different shapes of bacteria and scientists use these shapes to help identify them:

Balls (Staphylococcus) Sprirals (Campylobacter) Rods (Lactobacillus)



Staphylococcus aureus (wound infections) – Bacteria

Streptococcus pneumoniae (pneumonia) – Bacteria

Good Microbes

- Most microbes are good for us and do **not** cause disease.
- Microbes generate at least half the oxygen we breathe.
- Microbes live on the roots of plants and help them absorb food and water.
- Microbes are responsible for creating foods such as wine, cheese, vinegar, yogurt, and chocolate!

Bad Microbes

- Some microbes can be harmful to humans and cause disease or illness.
- The bad microbes are known as **pathogens** but are sometimes called bugs or germs.
- Pathogens spread by close contact, coughs, sneezes, food water and animals.
- Disease causing microbes that spread from person to person are known as infectious.
- Bad microbes love it when you, your home, school or environment is unhygienic or dirty.
- Remember, microbes multiply very fast so it only takes one bad microbe to get inside your body and make you sick!
- Many of our everyday illnesses are caused by viruses e.g. ear ache, colds, flu, most coughs and sore throats!

e-Bug

BSAC British Society for Antimicrobial Chemotherapy

DH Department of Health

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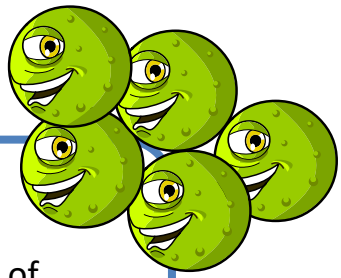
Microbe Mania Fact Sheet

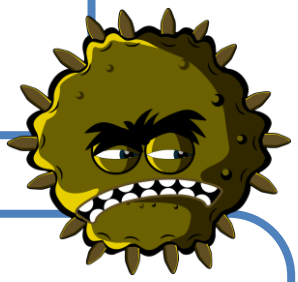


What is a microbe?

Microbes are also called germs or bugs. There are three types of microbes: bacteria, viruses and fungi. Some microbes can make us ill, but most are very useful to us.

Where are microbes found and what do they look like?

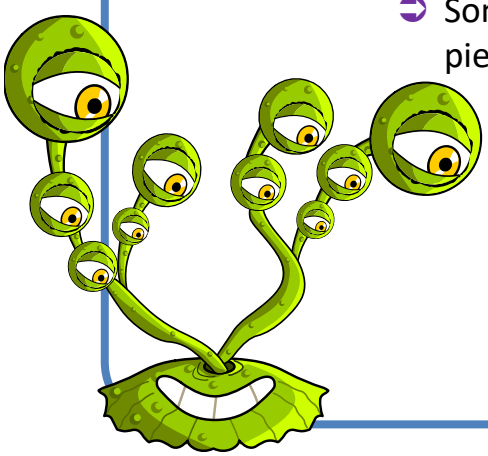
Microbes are found everywhere! They come in all shapes and sizes. See some pictures of microbes on our Microbe Mania poster.



Did you know?

Surprise your friends and family with these fun facts!

- There are more microbes on the planet than any other type of living thing
- Microbes are the oldest form of life on Earth. They've been here for 4 billion years.
- Microbes are found everywhere on Earth, even inside volcanoes!
- Some microbes can glow in the dark! People once used glowing pieces of fungus growing on wood to light their way.
- Humans would not be able to live without microbes. Some microbes produce oxygen which we need to breathe and others help plants to grow which we eat!

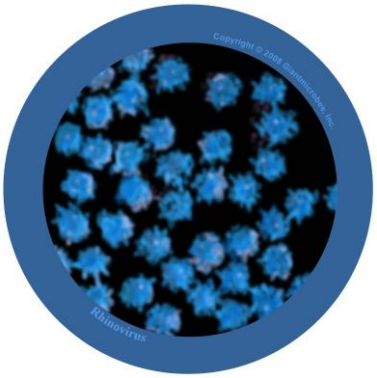


Microbe Mania
Make your own Microbes

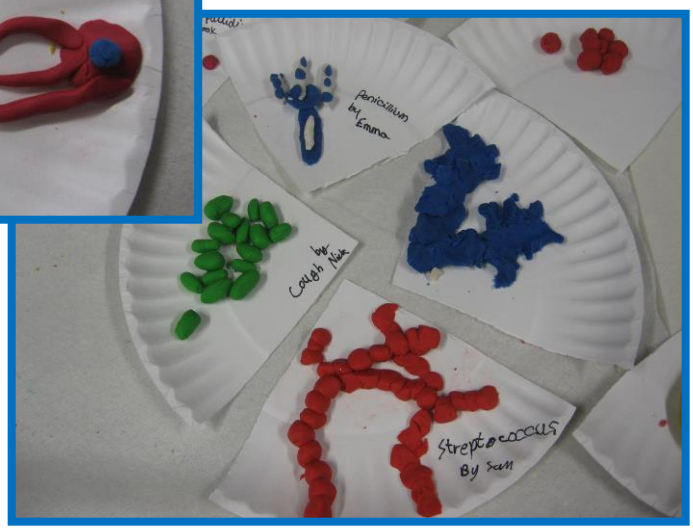
Use play dough to create your own microbes!

Decide what type of microbe you have made: fungi, bacteria or virus, and whether it is a good or bad microbe

For ideas, download pictures of microbes from www.e-bug.eu. Ask an adult to help you make your own play dough, using the recipe below.



Photos copyright 2008 Giantmicrobes, inc.



Microbe Mania
Home-made play dough receipe

For Parents and Teachers

Play dough is a soft, pliable material that can keep children occupied making microbes for hours! Play dough can be purchased but it may be more 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 and easily sculpted making it an ideal material for this activity.

Ingredients

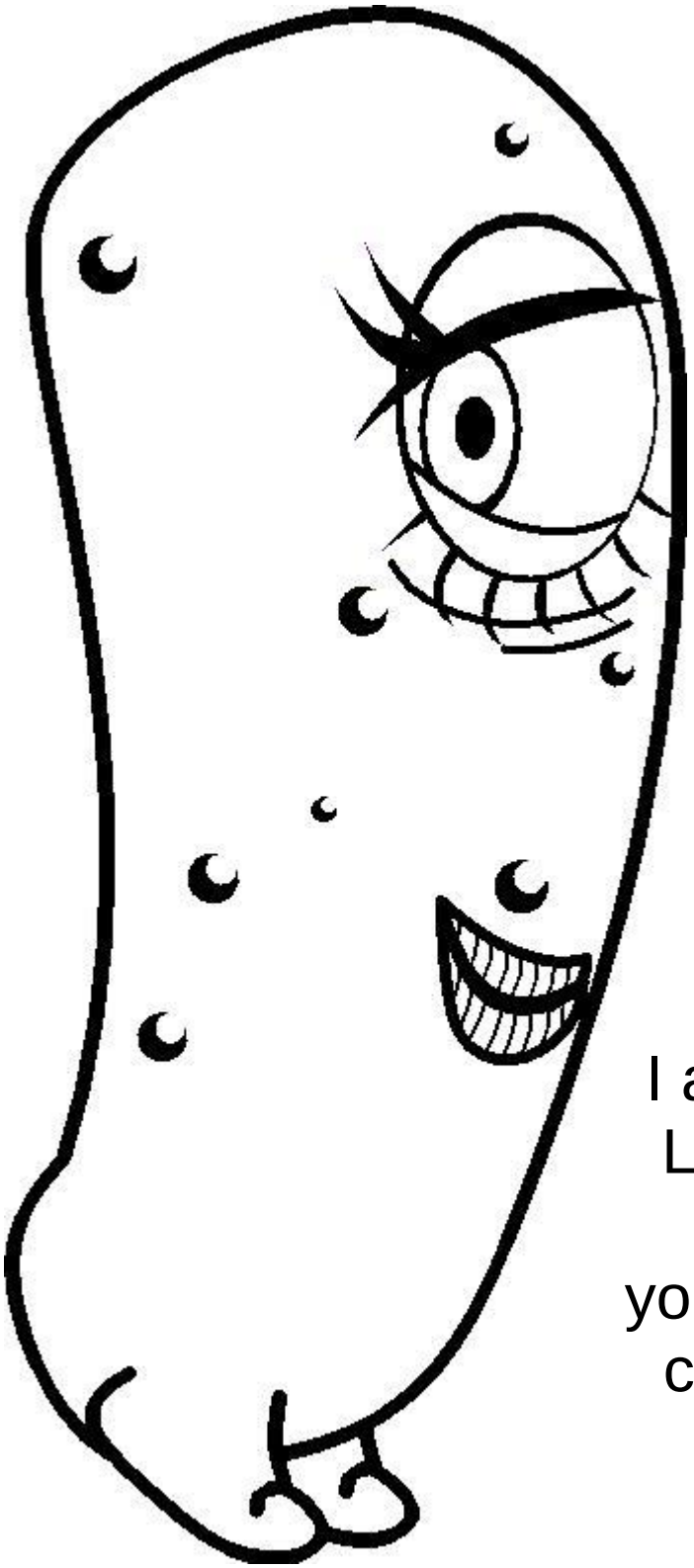
- 1 cup of plain flour
- 1 cup of water
- 1/2 cup of salt
- 2 teaspoons of cream of tartar
- 1 tablespoon of vegetable oil
- Food colouring

Method

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

   Alternatively, **microwave** the mixture on a high setting for 4 minutes, **stirring** every 30 seconds
5. **Allow** to cool before use
6. **Store** in a plastic bag or wrapped in cling film to stop the play dough drying out

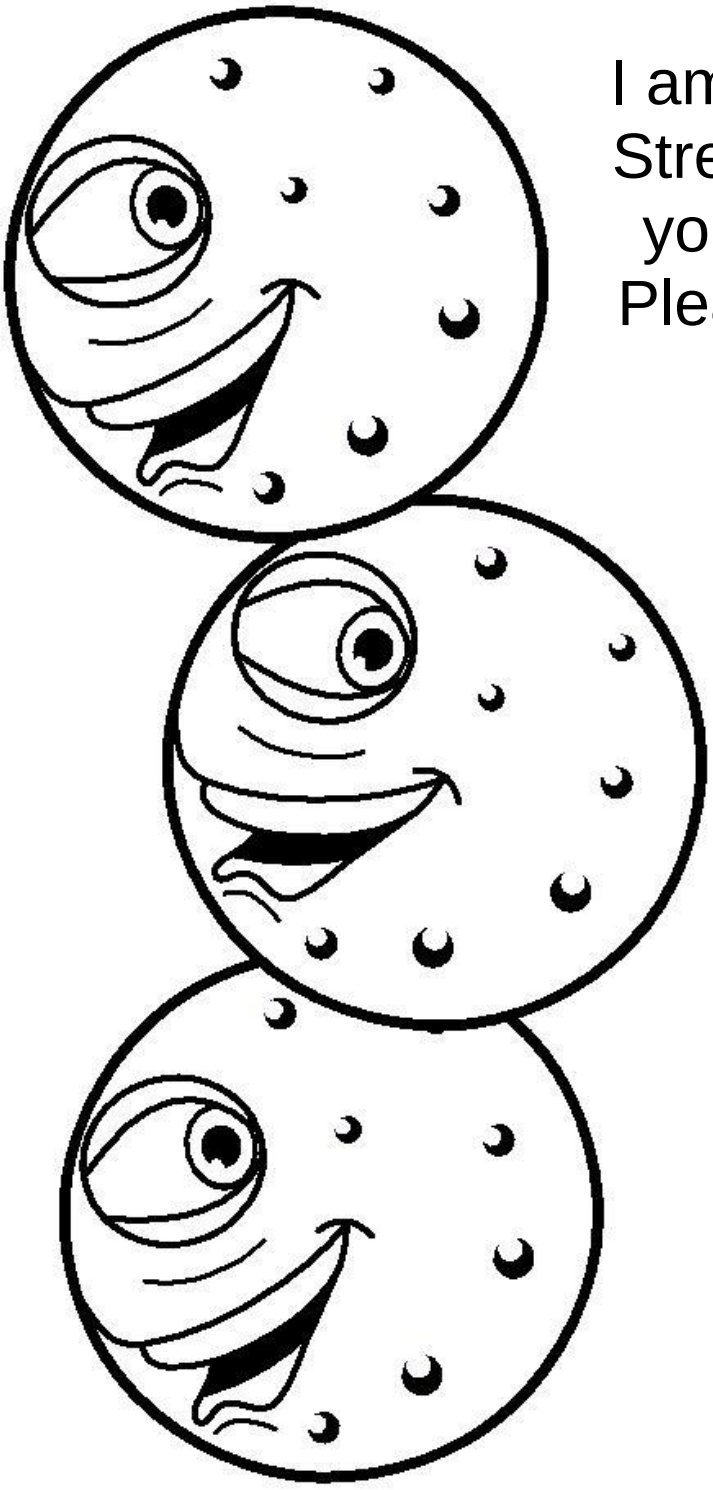
Lucy Lactobacillus



I am a friendly Lactobacillus found in yoghurt. Please colour me in!

Sally Strep

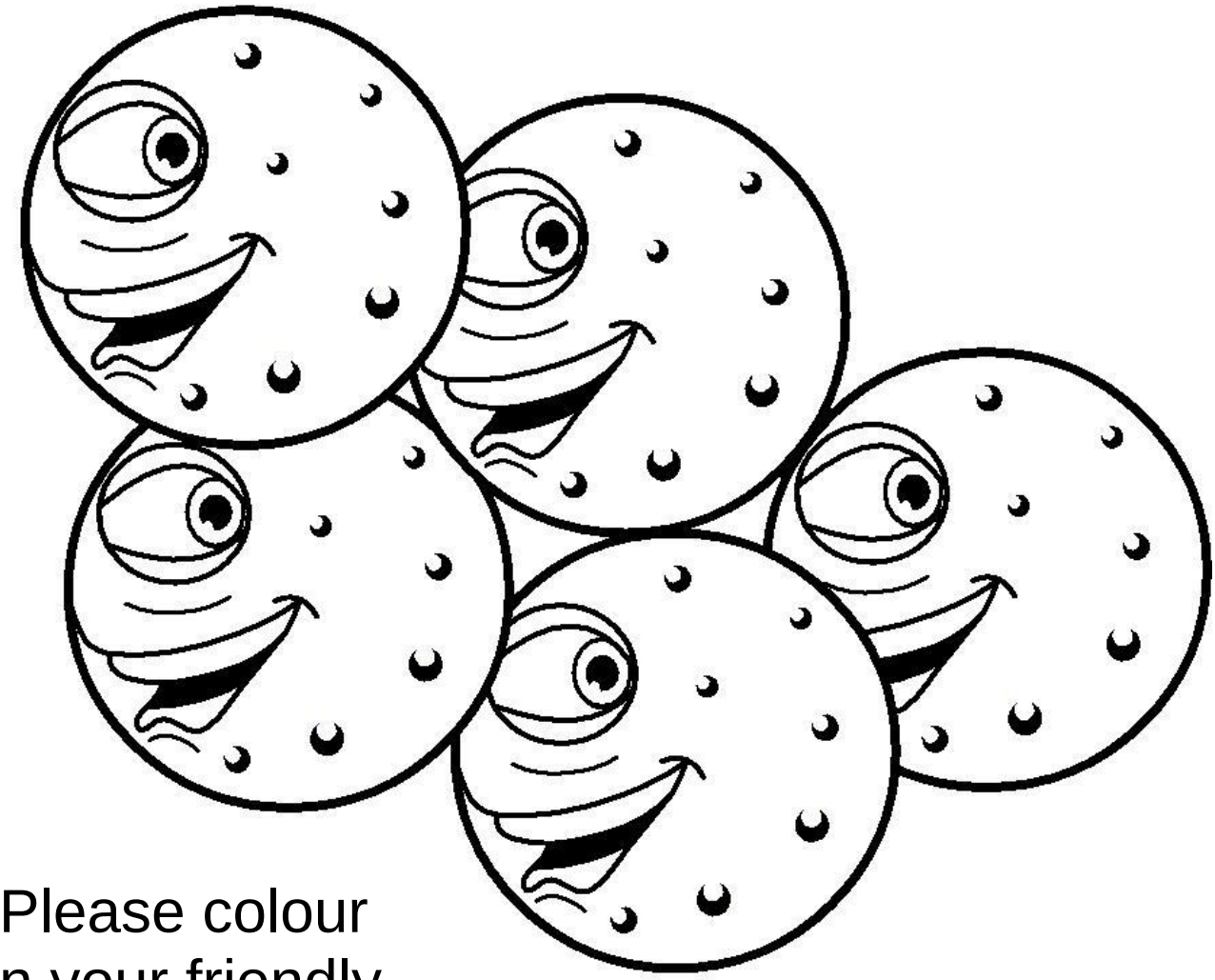
(Streptococcus)



I am a friendly Strep found in your mouth. Please colour me in!

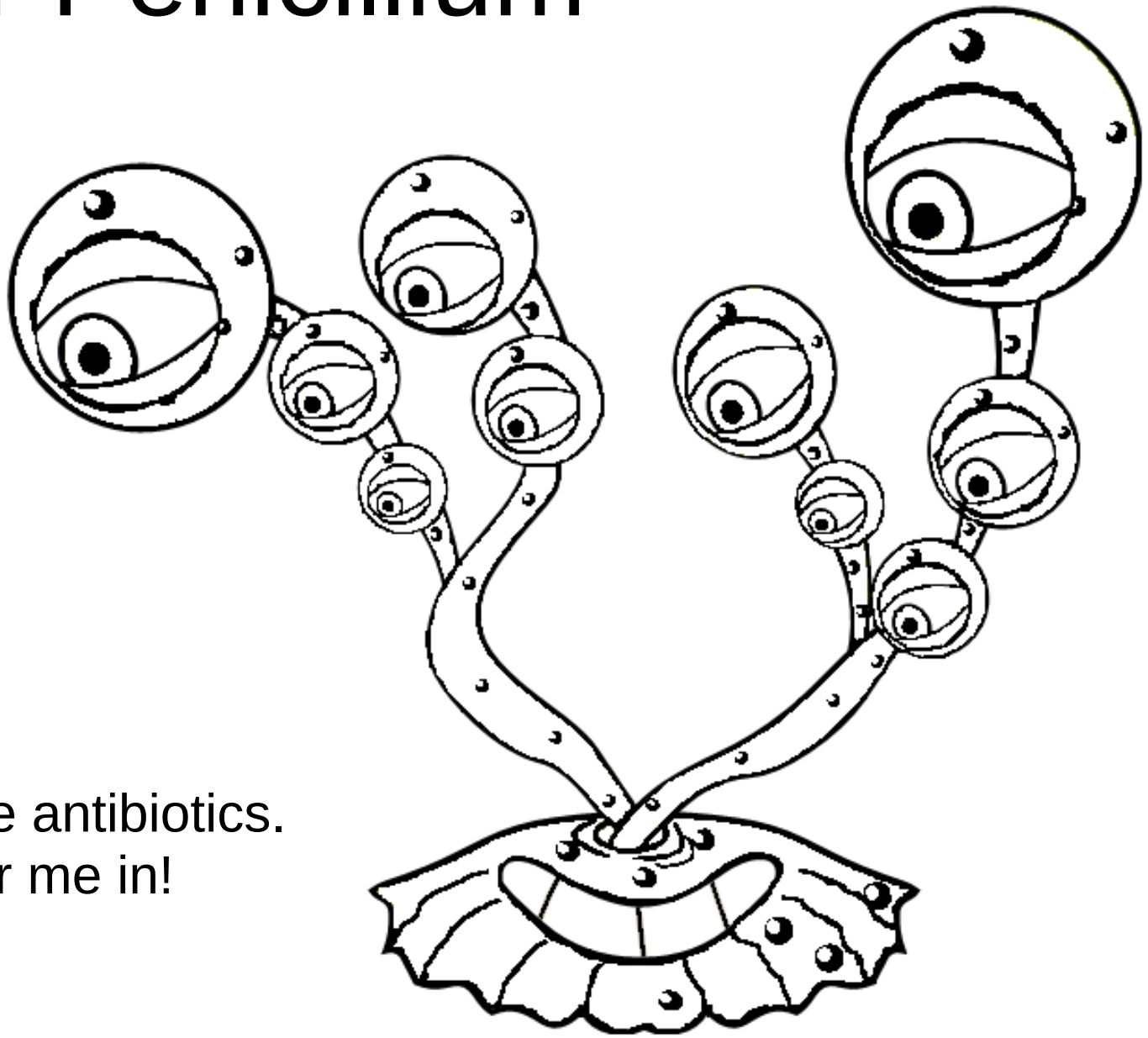
Simon Staph

(Staphylococcus)



Please colour in your friendly Staphs. We are found on your skin!

Peter Penicillium



I am used to make antibiotics.
Please colour me in!

Horrid Hands

Learning Objectives

- Microbes can spread through touch
- We pick up microbes from the things we touch and can spread these to other people
- Washing hands can help remove microbes
- Washing hands is one of the best ways to prevent the spread of microbes
- Washing hands with soap and water is better than washing hands with water alone

Activity 1 : Materials

- 2 washing up bowls
- Water
- A box containing GloGerm gel and a UV light
- Kitchen roll
- Bin liners
- Hand soap

Set Up

1. Shake the GloGerm gel bottle to mix the contents, or the demonstration may not work
2. Fill the washing up bowls with water
3. The water should be changed every 2-3 groups and should not get too murky.

Please see the virtual Science Show video for an example of how this stand can be run:
http://bsac.org.uk/science-fair//stands/horriblehands/

Horrid Hands

Instructions

This activity demonstrates what happens if we don't wash our hands and how germs can be spread. The concept is to pretend that the participants have just got their hands dirty i.e. by sneezing in them or preparing a meal, and then to observe how the germs will spread.

1. Explain to the students that microbes are everywhere and they get on to our hands from the things that we touch. We then pass these on to other people. Washing our hands is the best way to remove these microbes.
2. Explain when we should wash our hands – before and after preparing food, after using the toilet, after touching animals and after coughing or sneezing.
3. Ask the students to line up one behind the other like a queue. If there are more than 5 students, form 2 queues so that there are no more than 5 students per queue.
4. Squeeze a little GloGerm gel into the student at the front of the line's hands and ask them to rub in the 'pretend microbes'.
5. The person in the front should then turn around and shake hands with the person behind them, and so on, until they have all shaken hands with the person behind them in the queue.
6. Use the UV light to show the students how the germs got passed down the line – point out how dirty their hands are and how the germs spread because they didn't wash their hands. The person at the back of the queue should still have germs on their hands.
7. Ask participants to rinse their hands in the washing up bowls as they would usually and give kitchen roll to each person to dry their hands.
8. The UV light can be used again to see how many germs remain.
9. Demonstrate the proper way to wash handswith soap and ask them to follow your movements: do the six step technique – palm to palm, back of the hands, in between the fingers, back of the fingers, the thumbs, tips of the fingers (illustrated on the backing stand).

Horrid Hands

Activity 2 : Materials

- Small plastic bowls
- Water
- Washing up liquid
- Pepper
- Cocktail sticks

Set Up

1. Set up a few bowls of water with pepper sprinkled on the surface, a few plain bowls of water, and another bowl with washing up liquid in.

Instructions

This activity aims to show why washing with soap and water is better than using water alone. Demonstrators should help children with cocktail sticks to ensure safety. The bowls must be rinsed after each group for this to work.

1. Tell participants that the surface of the water in the bowls represents their hands, and that the pepper represents harmful microbes that need to be washed away.
2. Dip the end of a cocktail stick into the plain bowl of water and then into the pepper water. Gently swirl the cocktail stick around and explain that using water to wash your hands only moves the microbes around.
3. Dip the cocktail stick into the bowl of washing up liquid and then into the pepper water.
4. The pepper 'microbes' will move towards the edges of the bowl as the soap hits the surface of the water.
5. Tell the students that this shows why using soap when you wash your hands is important, because it breaks up the oils on the surface of your hands that microbes stick to and then they can be rinsed away under running water.
6. Rinse the pepper water bowls, dry with kitchen towels and reset between groups.

Horrid Hands

See how by washing your hands thoroughly, the bacteria is removed.

Bacteria on a hand after using the toilet and before washing hands.

Bacteria on a hand after handling raw meat.

Bacteria on a hand after touching an old dishcloth.

Bacteria on a hand after handling a raw chicken.

Notice how people often miss their thumbs when washing hands.

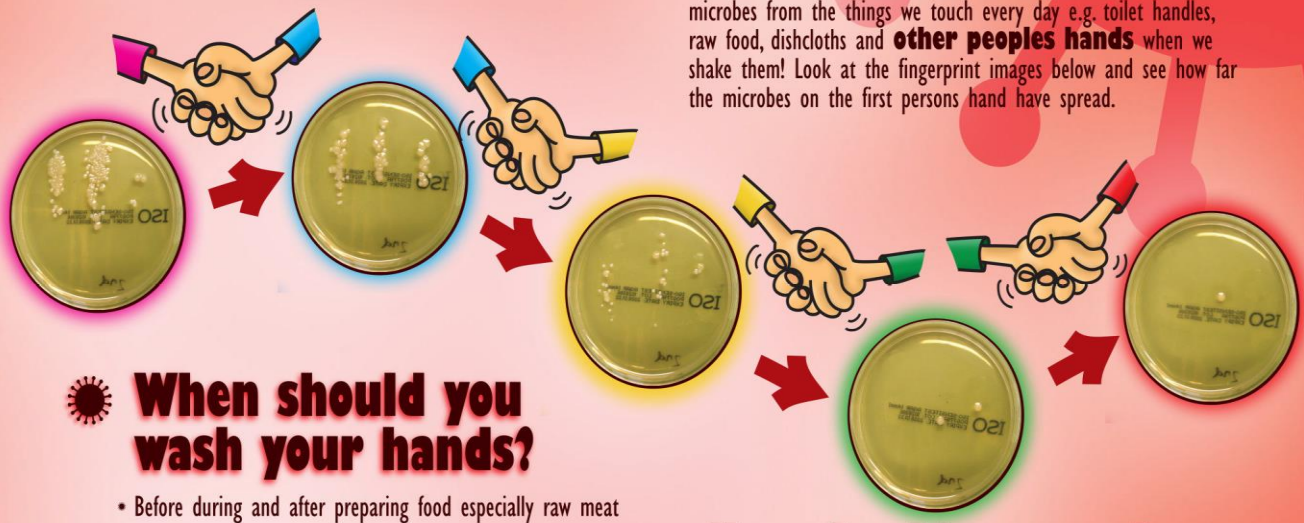
Images © Food and Drink Federation (foodlink - www.foodlink.org.uk).

Microbes spread easily through coughs and sneezes, food and water, animals and touch. Every day thousands of microbes get onto our hands from the things we touch and we transfer these microbes onto other places or people.

Washing your hands is the best tactic to stop the spread of any harmful microbes and preventing people getting ill. Although washing hands in water alone, or in cold water eliminates visible dirt, soap is required to break up the oil on the surface of the hands that can trap microbes.

What's in a hand shake?

Most microbes on our hands are harmless or even good for our skin. Sometimes however, we can pick up potentially harmful microbes from the things we touch every day e.g. toilet handles, raw food, dishcloths and **other peoples hands** when we shake them! Look at the fingerprint images below and see how far the microbes on the first persons hand have spread.



When should you wash your hands?

- Before during and after preparing food especially raw meat
- After using the toilet.
- After exposure to animals or animal waste.
- After coughing, sneezing or blowing your nose.
- If you're ill or have been around ill people.

How should you wash your hands?

How we wash our hands is just as important as when we wash them, especially when it comes to eliminating harmful microbes. We don't need any special cleaners or cleaning equipment – just soap and water.

Palm to palm | The back of the hands | Inbetween the fingers

The back of the fingers | The thumbs | The tips of the fingers.

Why wash your hands?

- To remove germs from your hands and environment.
- To reduce the occurrence of infections for yourself and others.
- To help prevent the spread of infection

Facts on hand hygiene

- In 1847, Dr Ignaz Semmelweiz demonstrated that that hand washing could prevent infection.
- According to CDC, the single most important thing we can do to keep from getting sick and spreading illness to others is to clean our hands.
- Nearly 22 million school days are lost due to the common cold alone.
- Some viruses and bacteria can live from 20 minutes up to 2 hours or more on surfaces like cafeteria tables, doorknobs, and desks.
- Proper hand hygiene demonstrated by 'people in charge' has been shown to positively influence others' compliance by up to 70%.

e-Bug

BSAC

DH Department of Health

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Horrid Hands Fact Sheet

What makes our hands dirty?

We get microbes on our hands from everything that we touch like door handles, school desks, the floor or our pets. We also get microbes on our hands when we hold hands, pick our nose or sneeze into our hands!

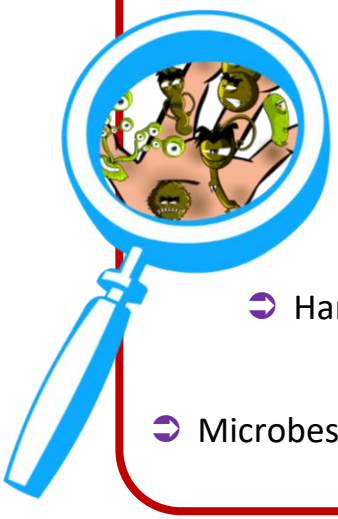
Why should we wash our hands?

We wash our hands to get rid of bad microbes that might make us ill. It is important that we wash our hands after using the toilet, before eating or cooking, after stroking animals or after coughing or sneezing.

Did you know?

Surprise your friends and family with these fun facts!

- Most microbes on our hands are under our finger nails!
- Nearly everyone says they wash their hands after using the toilet, but more than half don't! Just think what may be on their hands!
  - Most toilet handles have 400 times more microbes than the toilet seat.
- There are more microbes on one person's hand than people on the planet.
- Hand-washing is the best way to stop microbes spreading.
- Microbes can stay alive on our hands for up to three hours!



Horrid Hands
Why do we use soap to wash our hands?

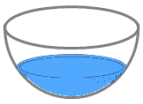
To find this out, you will need:

Ingredients

- 1 Bowl (a cereal bowl will be fine)
- Some water
- A sprinkle of black pepper or other spice
- Some hand soap or washing up liquid
- A Towel
- A Pen
- A Notebook
- A Camera (optional)

Method

1. **Fill the bowl with water, but not right to the top.**



2. **Sprinkle some black pepper or spice onto the surface of the water. It should float on top.**

3. **Dip your finger into the centre of the water and watch what happens to the pepper. Take a photo to record what has happened.**

4. **Dry your hand, and then dip your finger into the soap.**

5. **Dip your soapy finger into the water. Watch what happens to the pepper. Take a photo to record what has happened.**

Now answer this question:

What happened with and without the soap?

Horrid Hands
Why do we use soap to wash our hands?

From your results, can you answer the question: "Why do we use soap to wash our hands?"

Explanation

The experiment with and without soap should have been different.
When the soap was on your finger the pepper should have moved towards the edges of the bowl. This is because the soap removes the oils on your hands and the oil pushes the pepper towards the edge of the bowl.

Microbes like to stick to the oils on your hands, which is why we wash our hands with soap. Without soap, the oils are not removed, and microbes find it easier to stick!

Horrid Hands

Quiz

1. Gather together your friends or family
2. Someone will need to be the quizmaster and read the questions!
3. Teams/players must hold up one of the cards with their answer
4. The one with the most correct answers wins!

True

False

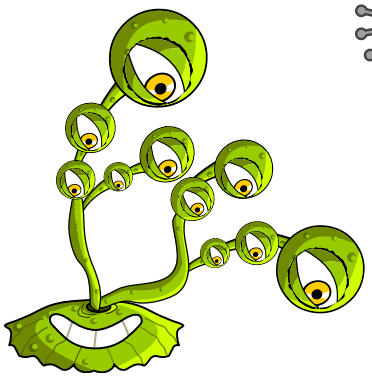
Quiz 1

1. We should only wash our hands once a day

2. We should never use soap to wash our hands

3. All the microbes on our hands are good for us

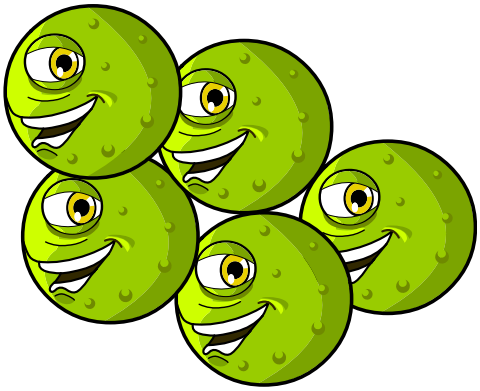
4. Soap can remove more microbes than washing with water alone



5. We should wash our hands after sneezing into them

6. Microbes can spread from person to person when we touch things

Quiz 2

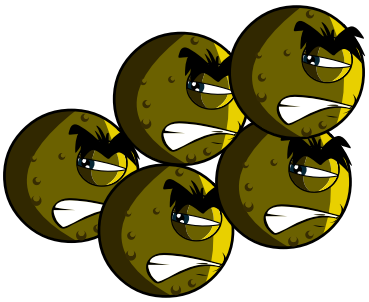


1. You can pick up microbes from door handles

2. Washing our hands often can help stop us getting ill

3. There is no need to wash your hands before visiting friends or family in hospital

4. Microbes can hide in the oil of our skin to avoid being washed away



5. You should always wash between your fingers

6. All microbes on our hands are bad for us

7. There is no need to wash your hands often because microbes cannot live more than 5 minutes on many surfaces

Horrid Hands
Answers - Quiz 1

1. **We should only wash our hands once a day** **FALSE**

We pick up microbes from the things that we touch, so we should wash our hands often.

2. **We should never use soap to wash our hands** **FALSE**

Soap helps to remove bad microbes from our hands so we should always use soap to wash our hands.

3. **All the microbes on our hands are good for us** **FALSE**

Microbes on our hands are both good and bad.

4. **Soap can remove more microbes than washing with water alone** **TRUE**

Soap removes the oil on our hands, which washes away microbes. This removes more microbes than washing with water alone.

5. **We should wash our hands after sneezing into them** **TRUE**

Sneezes contain bad microbes which can spread onto our hands when we sneeze.

6. **Microbes can spread from person to person when we touch things** **TRUE**

Microbes are found on our hands and when we touch things, we can spread these microbes on to other people.

Horrid Hands
Answers - Quiz 2

1. **You can pick up microbes from door handles** **TRUE**

   We pick up microbes from the things that we touch such as door handles, school desks or the floor.

2. **Washing our hands often can help stop us getting ill** **TRUE**

   Washing our hands is the best way to remove bad microbes from our hands that could make us ill.

3. **There is no need to wash your hands before visiting friends or family in hospital** **FALSE**

   We should was our hands before visiting people in hospital so that we don't take bad microbes into the hospital that could make people ill.

4. **Microbes can hide in the oil of our skin to avoid being washed away** **TRUE**

   Microbes stick to the oil on our skin. This is why we should use soap to wash our hands, as it removes the oil and washes away the microbes.

5. **You should always wash between your fingers** **TRUE**

   Microbes are found between our fingers!

6. **All microbes on our hands are bad for us** **FALSE**

   Microbes on our hands are both good and bad.

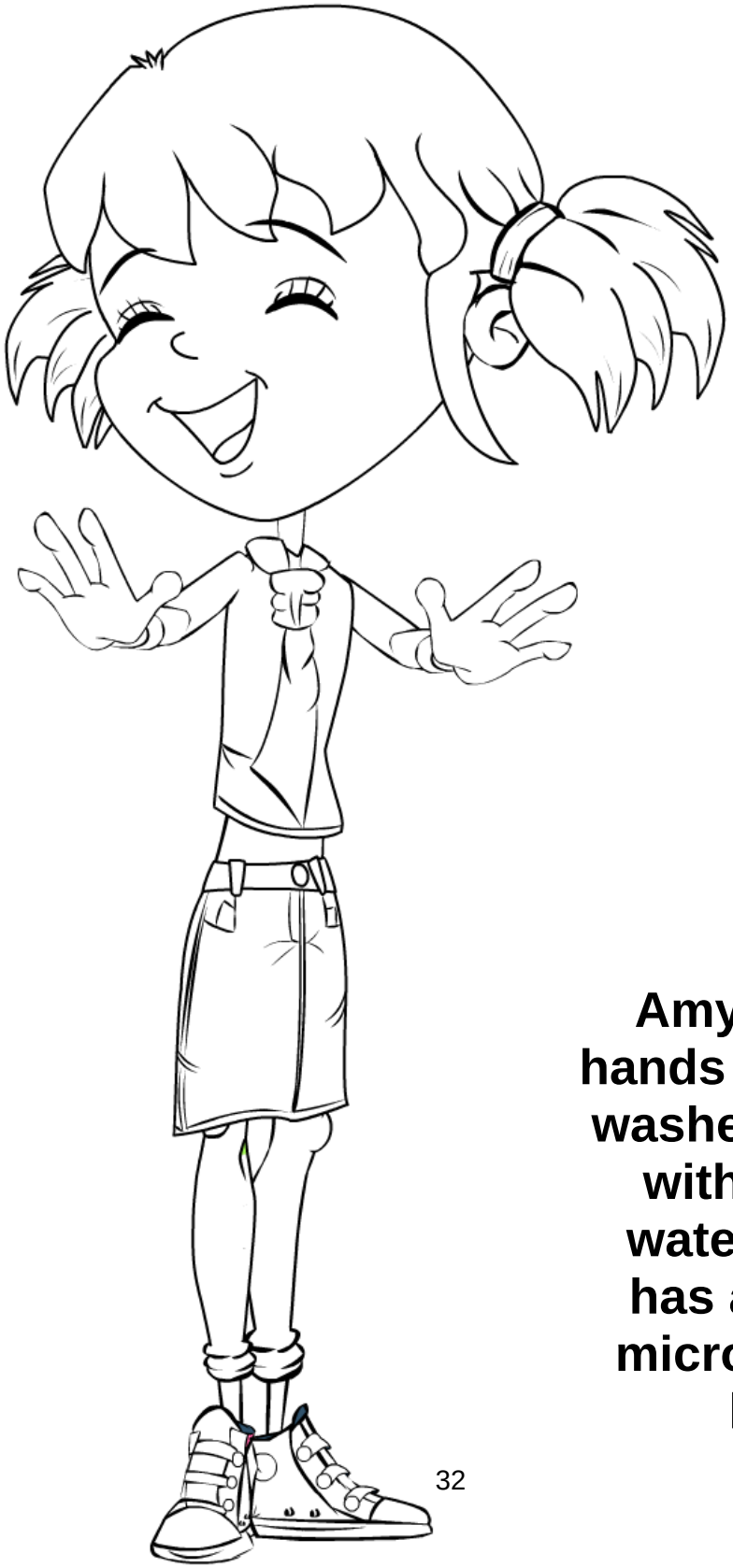
7. **There is no need to wash your hands often because microbes cannot live more than 5 minutes on many surfaces** **FALSE**

   We should wash our hands often as microbes can live for up to 2 hours on some surfaces.

Colour in Harry and make his hands look dirty!

Harry has dirty hands with lots of microbes because he has not washed his hands with water and soap

Colour in Amy to show she has clean hands!



Amy has clean hands because she washed her hands with soap and water. She only has a few good microbes on her hands.

Super Sneezes

Learning Objectives

- There can be harmful microbes in your sneezes
- Microbes can travel through the air
- Microbes can spread to other people through your sneezes
- Sneezes can spread germs a long way
- If you sneeze into your hand you should always wash your hand afterwards
- Sneezing into a tissue is the best way to stop the spread of colds and flu germs

Materials

- 'Snot gun' – Spray gun
- Plastic face mask
- Green food colouring
- Wallpaper lining (or equivalent)
- Disposable Gloves (non latex)
- Kitchen roll or tissues
- Bin liner
- Jar of 'snot'
- Snot recipe (provided by the e-Bug UK team)

Set Up

1. Set up the sneezing runway by placing white wallpaper along a table. Two tables may be pushed together to create a longer runway.
2. Fill the spray gun with water and add green food colouring.
3. Prepare a jar of 'snot' using the recipe

Please see the virtual Science Show video for an example of how this stand can be run:
http://bsac.org.uk/science-fair//stands/giantsneezes/

Super Sneezes

Instructions

This activity centres on the 'sneezing runway' which runs the length of the designated space. The activity demonstrates the importance of covering coughs and sneezes with a tissue to prevent the spread of microbes.

1. Ask the students if anyone knows why we sneeze. Explain that it helps our body get rid of microbes.
2. Ask if anyone knows what is in a sneeze. Show the children the jar of snot and explain that we produce 2 pints of snot every day.
3. Then ask how far they think a sneeze travels, this is 2-3 meters or the length of a double-decker bus, so if someone at the back of the bus sneezed, all those germs could hit the bus driver in the back of the head!
4. Hook the spray gun into the face mask and ask a volunteer to pull the trigger on the count of 3, whilst everyone joins in to say 'achoo!'.
5. Point out that the germs have spread everywhere, right to the end of the runway.
6. Ask what they would naturally do if they felt a sneeze coming on - put a hand over their mouth.
7. Demonstrate this by giving a glove to another volunteer and ask them to 'catch' the sneeze in their hand whilst a different volunteer sprays the gun and everyone shouts 'achoo!'
8. Show the glove to everyone and say how the harmful germs are now on your hand and could be passed to other people.
9. Dispose of the glove and do the demonstration again but covering the 'nose' with a tissue, asking for new volunteers if possible
10. Show how the tissue has captured all the germs and you can throw them away.

Giant Sneezes

What's in a Sneeze?

What is a Sneeze?

Sneezing is a way in which our body tries to get rid of all the bad bugs and dust. The bugs 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.

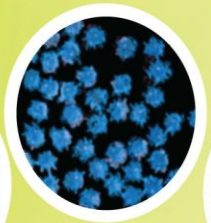
To Sneeze or not to Sneeze

A sneeze can spread germs 2-3 meters or over 5ft at a speed of 100 miles per hour!

The sneeze contains a lot of horrible stuff, like water vapour, water droplets, and snot from your nose. This moisture and snot may be full of microorganisms, and some of those may be unhealthy ones. These bad microbes can be passed on to someone else through sneezing so it is very important to cover your coughs and sneezes. Remember that if you cover your mouth and nose with your hand you can still spread the flu germs to someone when you touch them! It's best to use a tissue or to sneeze on your sleeve.

Photos Copyright 2008 Giantmicrobes, Inc.

Streptococcus (sore throat) – Bacteria



Rhinovirus (flu) – Virus

Orthomyxovirus – Virus

How can our nose stop us getting ill?

We breathe in more than 20,000 litres of air a day mostly through our nose.

This air contains oxygen, nitrogen, dust and pollutants as well as lots of microbes. Some of these microbes may be harmful if they come from a cough or sneeze from someone around us. Coughs, colds and the flu are caused by bad virus microbes. As we breathe in through our nose, many of these microbes and other irritants get trapped in our snot and nose hair but some can make it into our throats and multiply making us ill.

Sneezing FACTS!

- The world record for sneezing was held by Donna Griffiths of Worstershire who sneezed for 978days in a row.
- Some cultures think that sneezing is a sign of good luck – others think it's a sign of death.
- You cannot sneeze without closing your eyes.
- Its illegal to burp or sneeze in a church in Nebraska , USA.
- You produce 2 pints of snot every day and most of this you swallow without thinking.
- Some doctors use the colour of your snot to tell if you are ill.
- There are more than 200 cold viruses but only a few types of flu.
- Antibiotics will NOT cure the flu.

Sneezing FICTION!

In the old days, people were very worried about sneezing - here are some of the things they believed:

- Your eyes will pop out if you keep them open when you sneeze.
- Your heart stopped when you sneezed.
- You can catch a cold by going out with wet hair.
- Your soul leaves your body when you sneeze.

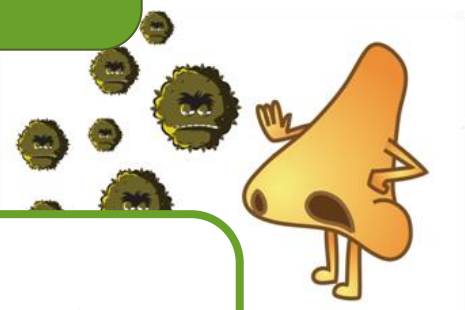
e-Bug

BSAC

DH Department of Health

Contact Primary Care Unit
cliodna.mcnulty@phe.gov.uk / vicki.young@phe.gov.uk
0300 422 5062 www.e-bug.eu

Super Sneezes Fact Sheet



Why do we sneeze?

Sneezing is a way in which our body tries to get rid of bad microbes. Germs and dust get stuck in our nose hair and so we sneeze to blow them away.

What is in a sneeze?

Sneezes contain snot and bad microbes. That is why it's important to cover our sneezes with our hands or a tissue, so we don't pass the bad microbes onto someone else.

Did you know?

Surprise your friends and family with these fun facts!

- Sneezes can travel at a speed of 100 miles per hour!

- Sneezes can spread microbes 2-3 meters.
- The longest sneezing spree was 978 days, a record set by Donna Griffiths of Worcestershire, England.
- It is impossible to sneeze without closing your eyes.
- It is illegal to burp or sneeze in a church in Nebraska, USA.

Super Sneezes
Super Slimy Snot

Make your own snot!

Sticky, slimy snot in our nose traps microbes. This helps to stop bad microbes getting into our body and making us ill. Ask an adult to help you make your own snot using the recipe below.

To make your own snot, you will need:

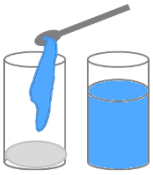
Ingredients

- PVA Glue
- Borax powder (this can be bought in the supermarket near the washing powder).
- Green food colouring (you will find this in the baking aisle of the supermarket)
- Water
- 2 disposable cups, labelled A and B
- A plastic spoon or stirrer
- A tablespoon
- Rubber gloves

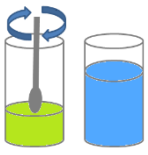
Method

1. **Put the gloves on. Fill cup A with water, and ask an adult to add a spoonful of borax powder to the cup. Stir to mix the powder and water.**

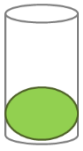
2. **In cup B, add about an inch of PVA glue to the bottom of the cup, and mix with about three tablespoons of water. Stir to mix.**



3. **Add a few drops of green colouring to cup B and stir to mix.**



4. **Finally, add a tablespoon of the Borax solution (from cup A) to cup B, and watch the green slimy snot form! After about 30 seconds you can play with it!**



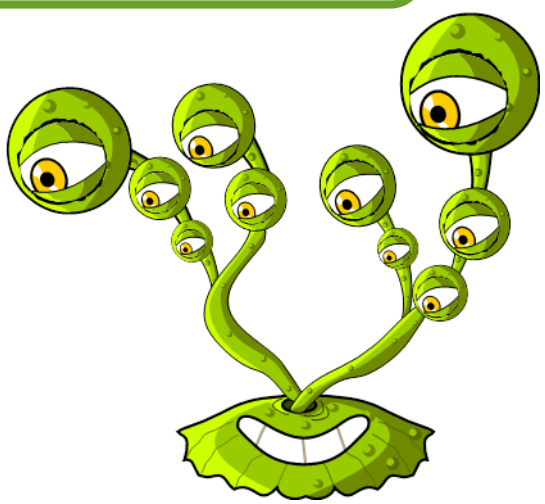
You can play with the snot, but do not eat it!
Wash your hands when you have finished playing with the snot.
It will last a few days if you keep it wrapped up in cling film.

Super Sneezes Wordsearch

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

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

SNOT	BUGS	VIRUS
COUGH	COLD	SNEEZE
FLU	BACTERIA	GERMS



How clean is your kitchen?

Learning Objectives

- There can be harmful microbes found on raw food, especially raw meat
- The best way to destroy harmful microbes on meat is to cook thoroughly
- Always wash your hands after touching raw meat
- Raw meat should be kept on the bottom shelf of the fridge
- Do not use the same chopping board and knife to chop raw and cooked meat
- Meat and vegetables should be chopped on different chopping boards

Materials

- Toy ovens
- Plastic chopping boards
- Plastic food including demonstration meats
- Plastic knives
- Paper plates
- White play dough for chicken fillets
- A box containing GlowGerm powder and a UV light.
- Table cloths

Set Up

1. Prepare chicken fillets from playdough and cover in GlowGerm powder
2. Set out the food, chopping boards and toy ovens

Please see the virtual Science Show video for an example of how this stand can be run:
http://bsac.org.uk/science-fair//stands/kitchen/

How clean is your kitchen?

Instructions

In this experiment the participants make a chicken dinner and then the UV light is used to show how germs have spread around the kitchen area. Try to make sure children have access to chopping boards, plates, plastic food and microwaves and encourage them to ask questions.

1. Invite the children to prepare a chicken dinner using the play dough chicken fillet. Ask them to cut up the chicken with a plastic knife.
2. Encourage the children to cook the chicken in the oven and select other foods to go in the dinner.
3. Afterwards ask them what they forgot to do whilst making their food - wash their hands.
4. Point out that they should have used different chopping boards for cutting up the chicken and preparing the raw ingredients – in a professional kitchen they use different coloured chopping boards for different groups of food.
5. Say you can see where the germs from the chicken fillet have spread using the special 'microbe detector' UV light.
6. Float the UV light over their hands and kitchen equipment to show where the bad germs have spread and be very energetic and horrified.
7. Explain what types of bad bacteria (e.g. Salmonella, Campylobacter, *E. coli*) can be found in raw meat and the importance of hand washing whilst cooking and before eating a meal. Use the different types of plastic meats to help explain.
8. Ask them if they think that harmful microbes can be found on other types of food as well. Explain that harmful microbes can be found on other foods too, so for instance it is important to wash vegetables and fruit well before eating.

How Clean is Your Kitchen?

The GOOD

Microbes are found everywhere and many of these are harmless or even good for us. Some microbes are used in the food industry.

- The yeast *Saccharomyces cerevisiae* is used to make bread and beer.
- *Rhizobacteria* are soil bacteria that help plants absorb food and water from the ground to help them grow.
- *Lactobacilli* are bacteria are used in yogurt and cheese making.
- Without these microbes, we would not be able to survive.

The BAD

Unfortunately, there are some microbes which are found on food - mainly raw meats, which can be harmful to us. These microbes are generally found in the gut of the animal and do not cause them any harm but when they find their way into our gut, they can make us really ill!

- *Salmonella*, *E.coli* and *Campylobacter* are commonly found on raw meats and can cause diarrhoea and vomiting in humans and sometimes even death
- The most common cause of viral food borne illness is due to the norovirus. This virus is usually spread through faecally contaminated water or food and can spread from person to person very easily!

The UGLY

There are many microbes that do not cause us any harm but which cause food spoilage. These are generally mold or bacteria.

- The fungus *Rhizopus stolonifer* causes bread mould.
- *Pseudomonas* bacteria 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 like to grow in warm and damp places where they can live and multiply but they hate places that are too warm or too cold. This is why we keep our food in the fridge and cook our meat well before we eat it.

Did you know?

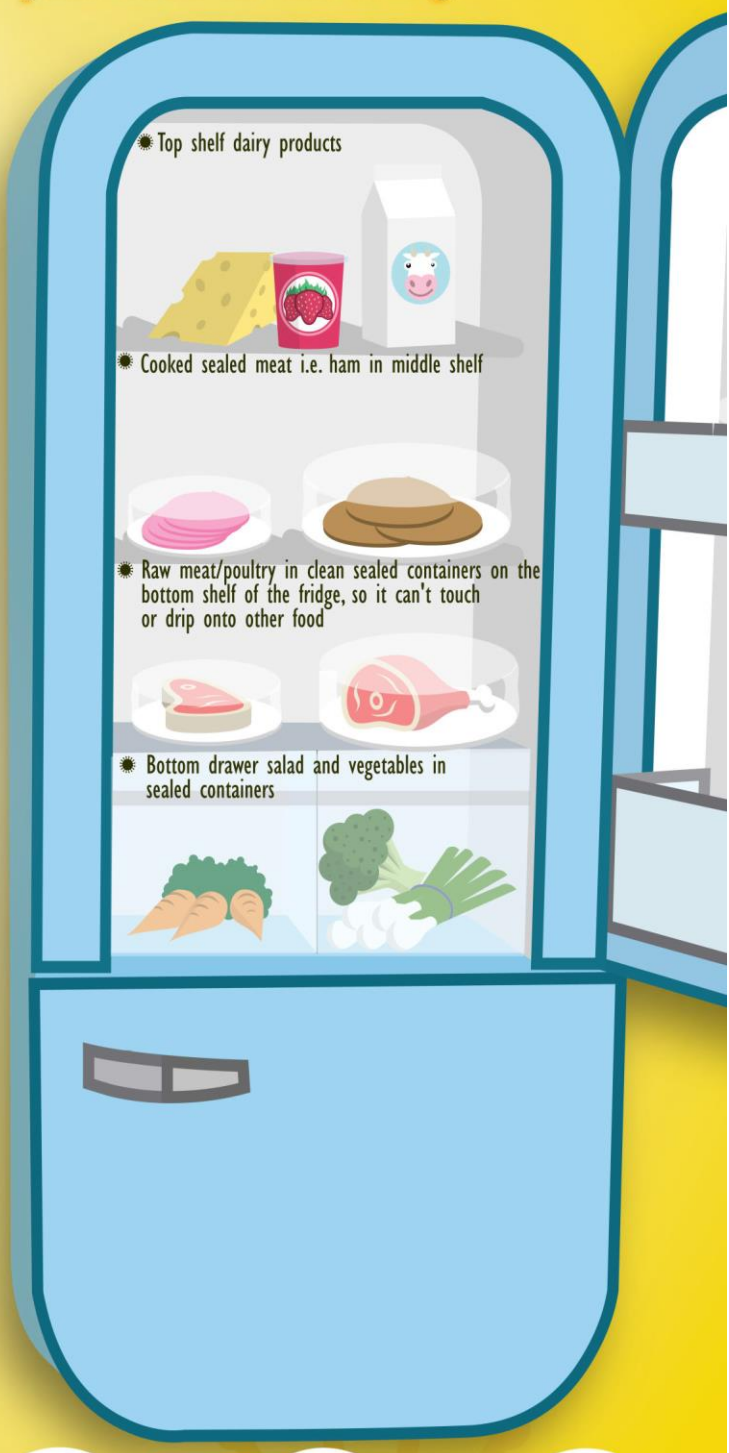
Chefs use different coloured chopping boards for different food groups to prevent microbes spreading from one food to another.

- Raw meat
- Raw fish
- Cooked meat
- Salad and fruit
- Vegetables
- Dairy

Top tips on food safety

- Plastic chopping boards are much easier to clean than wooden ones!
- Always wash hands after handling raw meats.
- Wash all fruit and vegetables before eating.
- Always cook raw meat well before eating.
- Refrigerate all leftover cooked food and eat within 3-4 days.
- Never refreeze food.

Do you know the best way to store your food in the fridge?



Lactobacillus

E-Coli

Salmonella typhimurium

Contact Primary Care Unit
cliodna.mcnulty@phe.gov.uk / vicki.young@phe.gov.uk
0300 422 5062 www.e-bug.eu

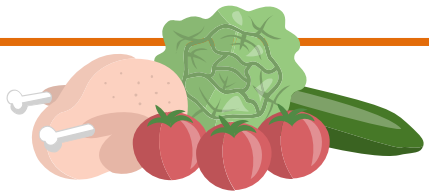
How clean is your kitchen? Fact Sheet

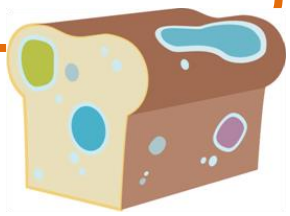
Where are microbes found in your kitchen?

Bad microbes are found on some foods such as raw meat. These microbes on raw meat can make us very ill. Microbes called fungi can also grow on bread and cause mould.

Why is it important to keep our kitchens clean?

It is important to keep our kitchens clean so that we don't get ill from bad microbes that are found on some foods. We should keep food in the fridge to stop microbes growing, and also wash our hands after touching meat.

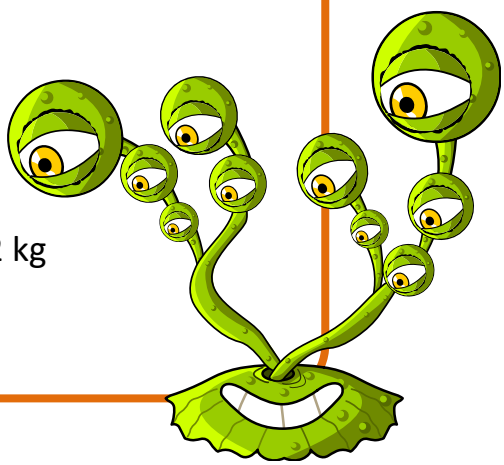




Did you know?

Surprise your friends and family with these fun facts!

- The dirtiest spots in the kitchen are dishcloths, cutting boards and sponges. The floor is often cleaner than the sink!
- Some microbes are used to make food. Yeast is used to make bread and beer, and bacteria are used to make yoghurt and cheese.
- People have been enjoying food and drink made from microbes for at least 25,000 years.
- Did you know that the human gut is home to 1-2 kg of bacteria – that's as much as a bag of sugar!



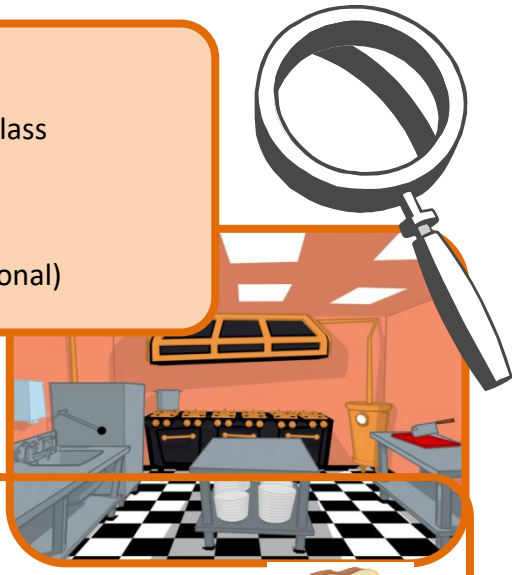
How clean is your kitchen?
Kitchen Investigator

Where in the kitchen do most microbes live?

This is a fun experiment to find out where all the microbes are hiding in your kitchen. But remember, not all microbes are harmful, most of the microbes you will find are completely harmless to us. Have fun playing microbe detective!

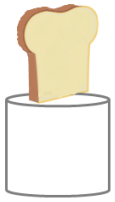
Ingredients

- 4 Slices of Bread
- 4 Small sealable plastic bags (sandwich bags are fine)
- A Sprinkle of water
- A Magnifying Glass
- A Marker Pen
- A Notebook
- A Camera (optional)



Method

1. Take **1** slice of fresh **bread** and put into a plastic bag. Seal the bag and **label** as **control and clean**.



2. Add a **sprinkling of water** to the rest of the **bread** slices. Be careful and try not to soak the bread.

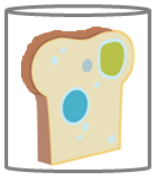
3. Take **1 slice** of bread from **step 2** and carefully **rub** it across your **kitchen floor**; try not to break up the bread. Put it into a bag, seal it and **label** the bag **floor**.

4. **Repeat step 3** but for different kitchen surfaces, e.g. a shelf in the fridge or the kitchen sink until all the bread is used. Each time **seal** the **bag** and **label** with the surface name.

How clean is your kitchen?
Kitchen Investigator

Where in the kitchen do most microbes live?

Place all the bags in a **cupboard**, and leave them for at least **1 week**. Take notes and photos of any changes you see to the bread every day. **Never** open the bags.

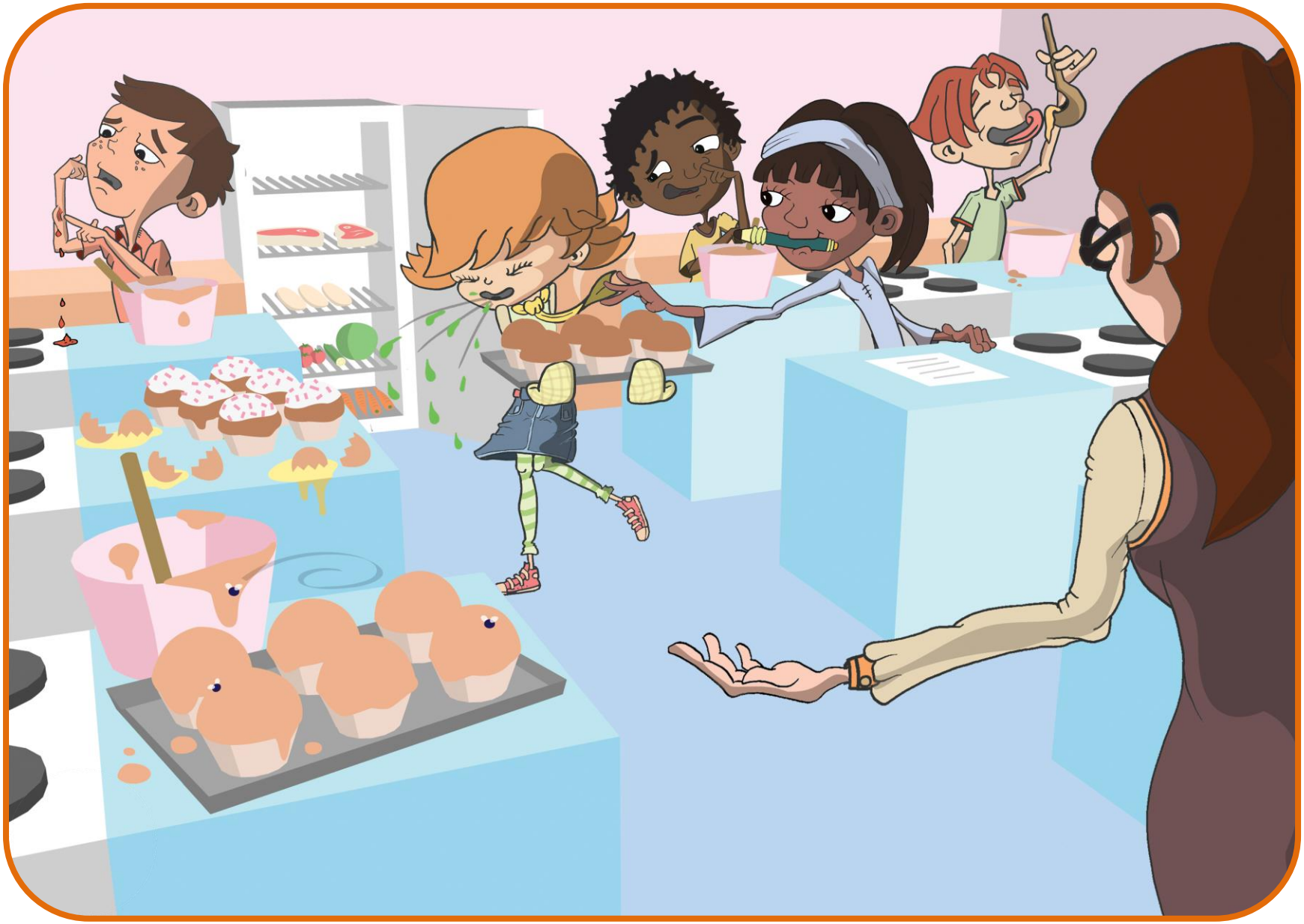


What happened to the bread?

Fewer microbes should have grown on the control piece of bread because it was not sprinkled with water.

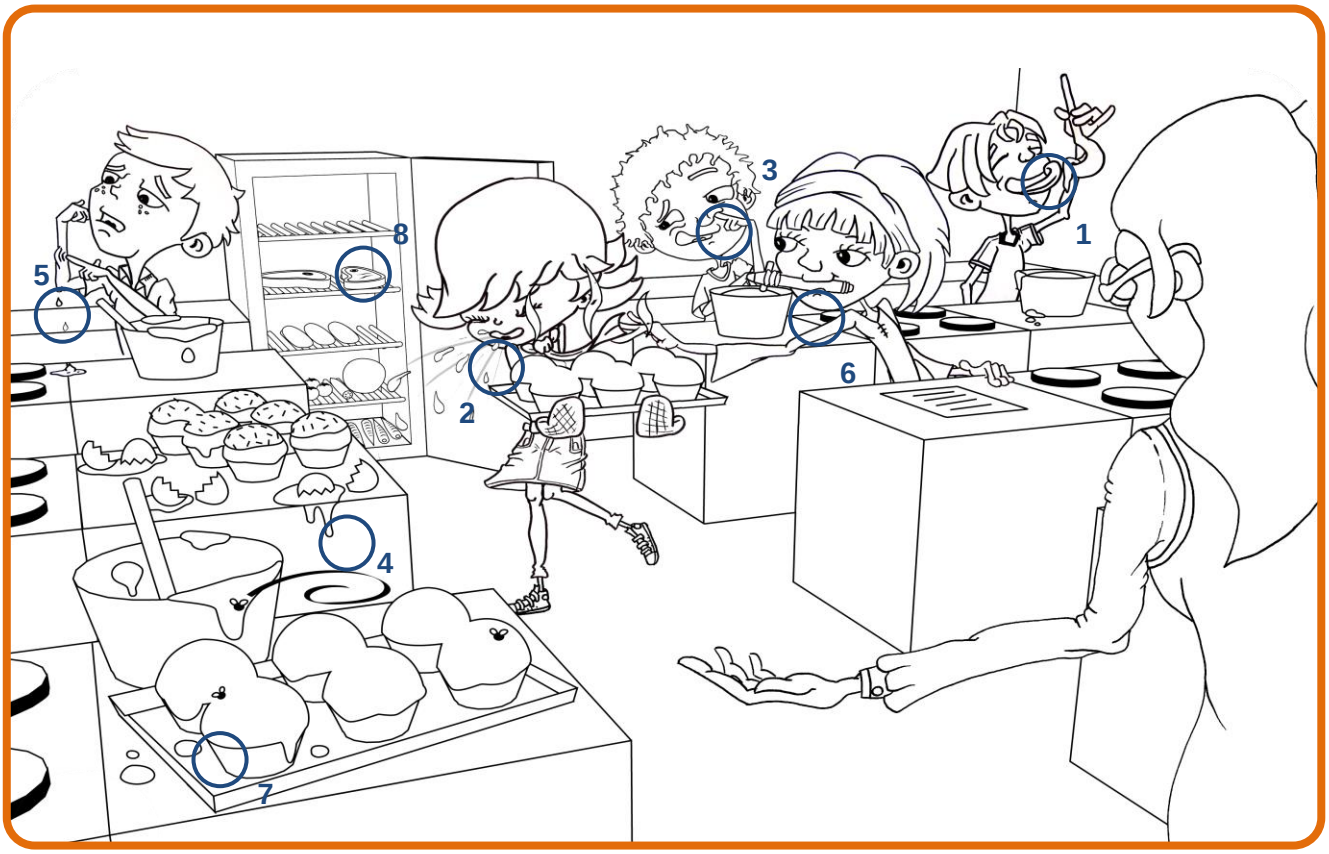
On the other slices you should see lots of different types of microbes, like fungi and bacteria, growing on the bread. This shows that different areas of the kitchen have different numbers and types of microbes living on them.

Can you circle 8 things that the students in this cookery class should not be doing and answer why?



How clean is your kitchen?
Kitchen Investigator

Answer Sheet



1. Licking the spoon can spread any microbes from your mouth into the food mixture and microbes in the raw food into your mouth.
2. Using a tissue to cover your mouth when coughing or sneezing helps stop the spread of microbes.
3. 'Snot' picked from your nose contains many microbes which can be spread onto our food and to other people by our hands.
4. Raw eggs may contain harmful bacteria, which may make us ill if we eat them.
5. All cuts should be covered when cooking to stop microbes spreading to food.
6. The pencil may have come into contact with microbes around the room and putting it in your mouth can spread these microbes to your body.
7. Flies may carry harmful microbes from one place to another.
8. Raw meat should be kept in the bottom of the fridge in a box or wrapped in cling film.

Antibiotic Awareness

Introduction

- Antibiotics are special medicines that only work on bacteria
- You should only take antibiotics prescribed by your doctor, and you should always take the whole course of antibiotics
- Never take anyone else's antibiotics
- Antibiotics do not work on viral infections like most coughs, colds and flu
- Bacteria are becoming resistant to antibiotics
- We can help prevent more bacteria from becoming resistant to antibiotics by following the rules stated above

Materials

- Plastic pipettes
- Vinegar
- Phenol red indicator
- Test tubes
- Test tube holder
- Water
- Giant microbes (optional)

Set Up

1. Prepare test tubes by filling a third full with water and adding a drop of indicator. This will turn the water red. Prepare enough tubes for the whole day.
2. Dilute vinegar in bowl with water.
3. Test the experiment to see how many drops of vinegar are required to turn the solution in the test tube yellow. Ideally this should be around 7.
4. Keep the yellow solution to show the children.

Please see the virtual Science Show video for an example of how this stand can be run:
http://bsac.org.uk/science-fair//stands/antibioticawareness/

Antibiotic Awareness

Instructions

Unlike the other activities this is a demonstration due to safety reasons, so make sure that children will be able to see what you are doing. Throughout this demonstration it may be useful to hold up a giant microbe teddy to illustrate your point, so collect a few for the stand – MRSA, Penicillium, Rhinovirus and Sore throat and hold them up when you refer to antibiotic resistant bacteria, antibiotics, colds, and bacterial infection respectively.

1. Tell the children that we are going to learn about special medicines called antibiotics. Ask if anybody knows what an antibiotic is and if anyone has ever had them. Explain that antibiotics kill bacteria and make us feel better if we have a bacterial infection.
2. Remind the children that antibiotics don't work against viruses. Use examples such as colds and flu.
3. Explain that it is very important for us to finish our full dose of antibiotics, and that this experiment will show us why.
4. Show the children the test tube containing the yellow solution and say that it represents a person's body, and the colour yellow means that the person is completely healthy with no bacterial infection.
5. Hold up one of the test tubes that were pre-prepared with the red solution and say that whenever we see the colour red, we know that bacteria are present in the person's body, making them unwell.
6. Ask the group whether they think that antibiotics can make the ill person better – if they say yes encourage them and remind them that antibiotics should help because this is a bacterial infection.
7. Say that the doctor has prescribed a course of *7* antibiotics for the person to take (*adjust to your test from the morning*).
8. Start to add drops of the dilute vinegar using a pipette and ask the children to count with you – you can include days of the week and time of day too.
9. Halfway through the dosage show the children that some of the solution has turned yellow – say that this shows that the person is feeling better.

Antibiotic Awareness

Instructions contd

10. Then mix the solution with a pipette (it will stay red) and say that even though the person is feeling better, the solution is still red showing the bacteria are still there, so they must keep taking their antibiotics until they are completely healthy.
11. Finish adding the dose and mix to make the solution yellow.
12. Tell the children that because they finished the whole course of antibiotics, the person is completely healthy.
13. Explain that if the person didn't finish the whole course of antibiotics, the bacteria could have come back stronger. Ask if anyone has heard of superbugs or MRSA. Explain that bacteria can become resistant to antibiotics.

Antibiotic Awareness

Antibiotics have been rated as the 2nd most important medicinal advancement this century. Some microbes can cause serious and sometimes fatal diseases. Most of the time our immune system defeats these harmful microbes but sometimes it needs help. Antibiotics are special medicines used by doctors to kill harmful bacteria.

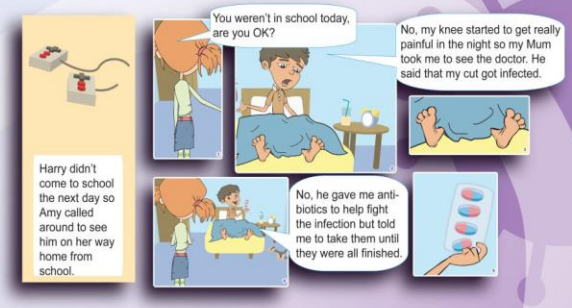
In 1901, the average life expectancy in the United Kingdom was 47 years. By the year 2000 it had risen to 77 years thanks to modern medicinal advancements!

The discovery of Penicillin – the first antibiotic!

- Millions of people all over the world are alive and well because of *Penicillin* and other antibiotics like it.
- The first antibiotic was discovered by **Alexander Fleming** by accident in 1928
- He was a messy scientist and one day he noticed that mould had grown on some of his plates.
- He saw that the bacteria couldn't grow near the mould, something had killed the bacteria!
- Fleming called the bacteria-killing chemical ***Penicillin.***
- By 1934 Fleming just couldn't get enough penicillin out of the mould to use it so he gave up and went on to something different!
- In 1938, **Howard Florey** and **Ernst Chain** decided to look at *Penicillin.* They also struggled to get enough *Penicillin.* to treat people with. Their first patient started to get better – but the *Penicillin.* ran out and he died!
- Florey and Chain took their mould to the United States and some of the big US chemical companies helped them make *Penicillin.* on a big scale.
- *Penicillin.* was used to save many of the soldiers in World War II – and millions more people afterwards - from infectious diseases.

Antibiotic Resistance

- *Penicillin* is the most ground-breaking discovery in the history of medicine but overuse and improper use has allowed many harmful bacteria to be able to fight back!
- These harmful bacteria are winning the battle against antibiotics and the development of new medicines has reached almost a standstill.
- One third of developed antibiotics now don't work against many bacteria.
- The first microbe to fight back and become resistant to antibiotics was *Staphylococcus aureus*. MRSA (Methicillin Resistant *Staphylococcus aureus*) is still a serious problem in our hospitals.



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 in the future (becoming a superbug).

What would you do?

You should NEVER use other people's antibiotics. There are many different types of antibiotic which treat different bacterial infections. Someone else's antibiotic might not be able to work on your infection.

The doctor is right; antibiotics only work on bacterial infections. Coughs and colds are caused by viruses and in many cases your body's own natural defences will fight these infections.

e-Bug

BSAC

DH Department of Health

Contact Primary Care Unit
cliodna.mcnulty@phe.gov.uk / vicki.young@phe.gov.uk
0300 422 5062 www.e-bug.eu

Antibiotics
Worn out wonder drugs?

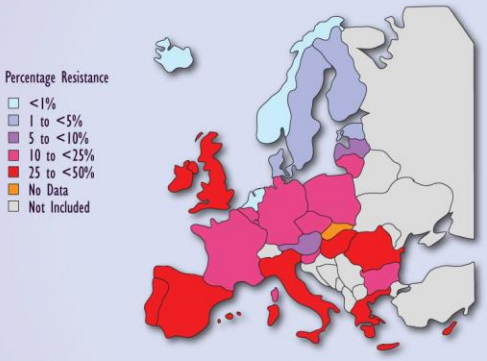
Diseases caused by microbes are the second highest cause of death in the world, so our ability to treat microbial infections is **very** important! Bacteria are a type of microbe that can cause some of these infections. Antibiotics are special life-saving medicines that are used to kill bacteria. Many people take antibiotics for granted, rather than seeing them as amazing medicines that we can't do without!

The race between antibiotics and bacteria... Ready, Set, Go!

What is antibiotic resistance?

Some antibiotics don't work anymore because the bacteria they are designed to destroy learn how to fight back and become resistant to the antibiotic. By overusing or misusing antibiotics we help bacteria to win the race against antibiotics. Infections caused by these antibiotic resistant bacteria are very hard, sometimes impossible, to treat. This can be very dangerous, especially for people who have other health problems.

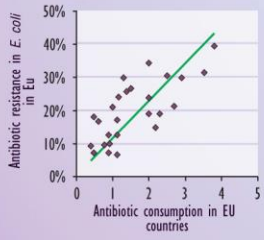
MRSA (meticillin-resistant *Staphylococcus aureus*) is an example of a resistant bacterium. This map shows where levels of MRSA were highest in Europe in 2009



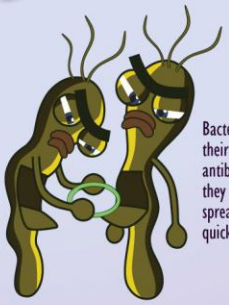
Fact... not fiction!

- Overuse can weaken the immune system by killing off the friendly bacteria we need to stay healthy
- Doctors give antibiotics to patients before surgery and cancer treatment to make it safe
- Farmers give antibiotics to animals to stop them getting sick and help them grow big and strong
- BUT the downside of using antibiotics a lot is that they can end up in sewage and the environment, which means that more disease-causing microbes might be exposed to them
- In the four years between 1983-1987, 16 new antibiotics were discovered, but only 2-4 new antibiotics have been discovered between 2008-2011

Why is it important?



It has been shown that as we increase our use of antibiotics, antibiotic resistance in bacteria increases. If this continues we may run out of antibiotics.



Bacteria can share their resistance to antibiotics and they multiply and spread very quickly!

Can't we just make new antibiotics?

If bacteria are learning to fight back (becoming resistant) against antibiotics, shouldn't we be making new antibiotics to replace the old ones? In fact there is very little research being carried out to find new antibiotics – WHY?

- It can take a drug company **10 years** from the time of discovery to make an antibiotic available for us to use
- The development process can cost over **£800 million**
- It only takes bacteria **3 months** to become resistant to a new antibiotic once we start to use it to treat infections!

This means that it is costing more and more to find and develop new antibiotics that work against the resistant bacteria and therefore fewer drug companies invest in research.

Overuse

Using antibiotics when they are not necessary, e.g. when you have a cold or the flu

Misuse

- Taking other peoples antibiotics.
- Not finishing your course of antibiotics.
- Using 'old' stored antibiotics

THINK!

Have you ever overused or misused antibiotics?

e-Bug

BSAC

DH Department of Health

Contact Primary Care Unit
cliodna.mcnulty@phe.gov.uk / vicki.young@phe.gov.uk
0300 422 5062 www.e-bug.eu

Antibiotic Awareness Fact Sheet

What are antibiotics?

Antibiotics are special medicines that kill bacteria. They do not kill viruses such as cold and flu. When you have been ill with an infection you might have been given a banana antibiotic by your doctor.

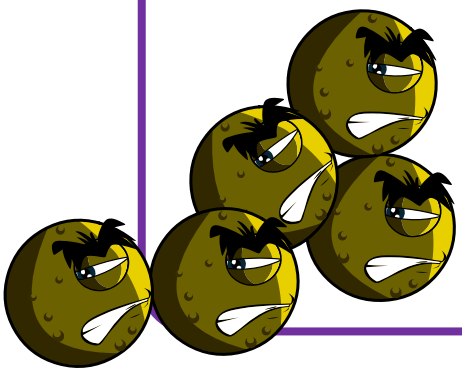
Why is it important to take antibiotics correctly?

We should always take antibiotics just as our doctor tells us. If we don't, the bacteria might not be killed and they may learn to stop the antibiotics working.

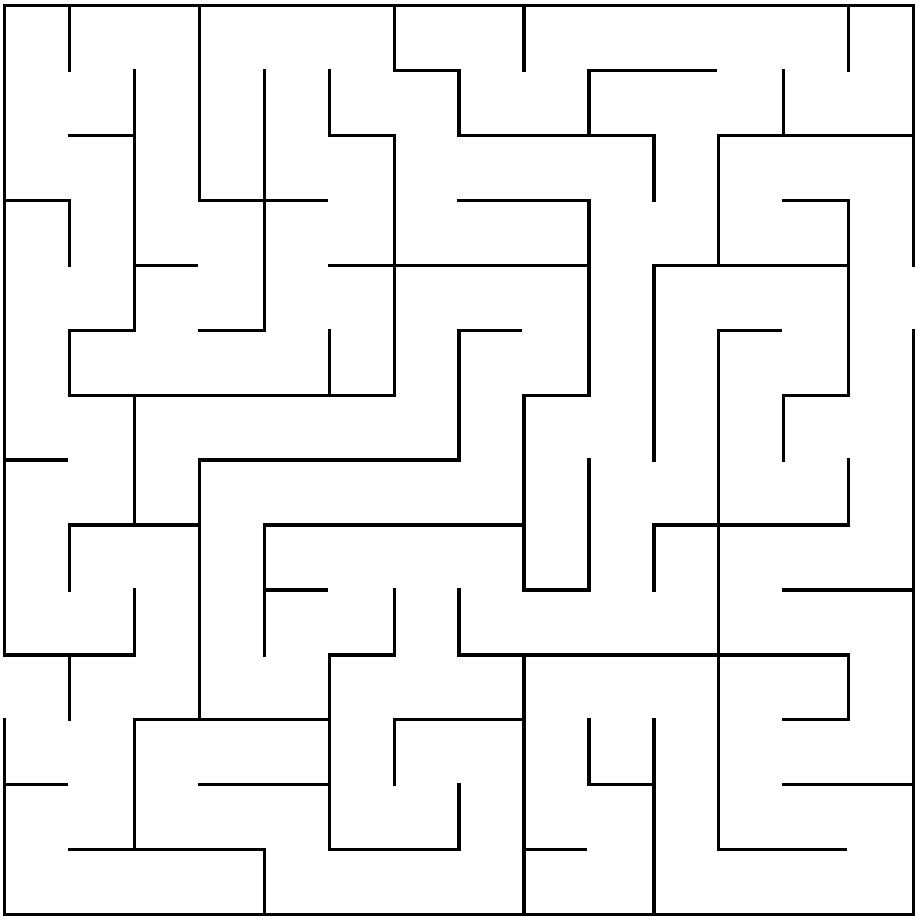
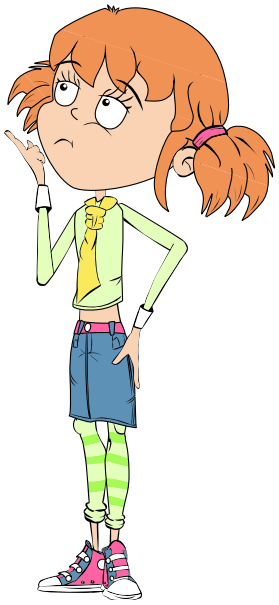
Did you know?

Surprise your friends and family with these fun facts!

- Antibiotics are special medicines that kill bacteria.
- Antibiotics do not work on viral infections which cause runny noses, colds and flu.
- Scientists have developed more than 150 antibiotics to help treat bacterial infections.
- Because of medicines like antibiotics, people today live up to 40 years longer than they did in 1901.



Antibiotic Awareness Maze Worksheet

Can you find your way through the maze to help Amy reach her antibiotics?

Amy has a bacterial infection. Her doctor has given her antibiotics to make her feel better. Can you help Amy collect her antibiotics at the chemist?