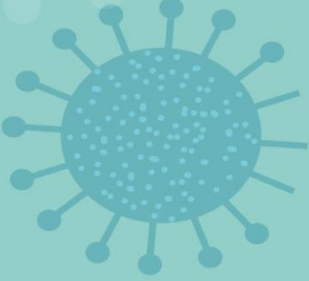




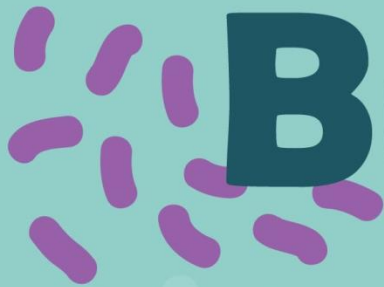
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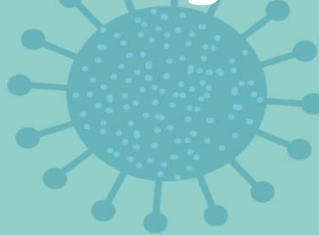
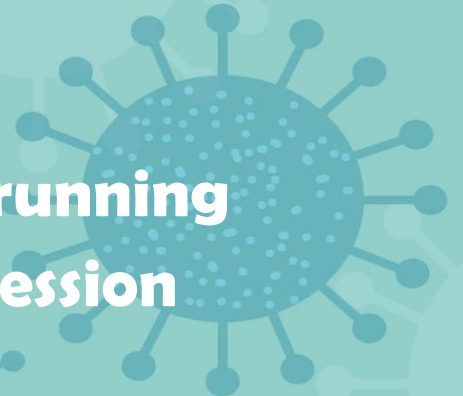
Meet the



Bugs



**A complete guide to running
the Meet the Bugs session**



Introduction

This session gives an overview of microbes. Participants are introduced to the world of microbes, firstly by exploring the different types and shapes of microbes and then, by discussing different useful and harmful microbes.

Learning outcomes

All participants will understand that:

- There are three different types of microbes, which can be found everywhere
- Useful bacteria are found in and on our body
- Many of our useful microbes are put to good use every day to help keep us healthy
- We need to protect our useful microbes
- Sometimes the harmful microbes can make us ill

Key words

Microbes
Virus
Fungi
Bacteria
Germ
Micro-organism

Available web resources

Videos of the activities.
Variety of microbial photographs.
Participant handouts in MS PowerPoint format.
Meet the Bugs Poster

Materials required

Activity 1: 2 plastic cups, flour, yeast solution, sugar, 2 graduated cylinders, basin, hot water. A copy of [Participation Handout 1 \(PH1\)](#) and [Participation Worksheet 1 \(PW1\)](#).

Activity 2: Cut out and laminate set of playing cards [PH2](#).

Activity 3: Magazines, A4 plain paper, scissors and glue.

Activity 4: Images of microbes, petri dishes and play dough.

Activity 5: A copy of [PH3](#) and [PW2](#).

Action plan: Copies of the action plan worksheet at the end of this session for each participant.

Background information

Micro-organisms (microbes) are living organisms too small to be seen with the naked eye. They are found almost everywhere on earth and can be both useful and harmful to humans. 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 many can cause illness in humans. Viruses cannot survive by themselves. They require a 'host' cell, such as a human cell, in which to live and reproduce. Once inside the host cell, they multiply and can destroy the cell in the process.

Fungi can be both useful and harmful to humans. Fungi range in size from being microscopic to very large. Harmful fungi can cause an infection such as athlete's foot, or are poisonous to eat such as some mushrooms. Examples of useful or harmless fungi include *Penicillium* which produces the antibiotic penicillin and *Agaricus* which is the button mushroom and can be eaten. Fungi spread through the air in small hard seed-like spores. When these spores land, for example on bread or fruit, they open and grow under the right conditions (dampness).

Bacteria can multiply very quickly, on average once every 20 minutes. During their normal growth, some bacteria produce toxins which are extremely harmful to humans and cause disease such as tetanus. Some bacteria are completely harmless to humans, and some others are extremely useful to us (*Lactobacillus* in the food industry) and even necessary for human life such as those involved in plant growth (*Rhizobacterium*). Over 70% of bacteria are non-pathogenic (harmless) micro-organisms.

Bacteria can be simply divided into three groups by their shapes – cocci (balls), bacilli (rods) and spirals. Scientists use these shapes to help find out which infection a patient has.

As living creatures, microbes have certain growth requirements but these vary depending on where the microbe is found. For example, microbes which live in humans prefer a temperature of 37°C, whereas microbes living in deep sea thermal vents prefer much higher temperatures. Microbes living in arctic regions prefer much lower temperatures. Microbes also vary in their nutrient requirements. A sudden change in the environment, such as an increase in temperature, can kill many microbes although it is important to remember that microbes are extremely adaptable and gradual changes can result in microbes adapting to suit their environment e.g. antibiotic resistant bacteria.

Many bacterial infections are easily treated with antibiotics. However, the bacteria are fighting back and some bacteria have developed resistance against antibiotics; these are called **antibiotic resistant bacteria**. For example, skin infections caused by *Staphylococcus aureus* used to be treated by Penicillin. However as resistance has developed over the years, first against penicillin and then another antibiotic, Flucloxacillin, these bacterial infections called MRSA (Methicillin Resistant Staphylococcus aureus) can now be life threatening.

Introduction

Begin the session by asking participants what they already know about microbes. Most participants will already know that microbes can cause illness but may not know that microbes can also be good for us. Ask the group where they would look if they wanted to find microbes. Do they think microbes are important to us?

Explain that microbes are the smallest living creatures on earth and that the word micro-organism literally translates into micro: small and organism: life. Microbes are so small they cannot be seen without the use of a microscope.

Show the group that there are three different types of microbe: bacteria, viruses and fungi. The '**Meet the Bugs**' poster can be used to show the different types of microbes and images of microbes. Use PH3 to demonstrate how these three microbes vary in shape and structure. The web activity found at www.e-bug.eu can be used to help demonstrate the varying sizes of bacteria, viruses and fungi in relation to each other (www.e-Bug.eu/movies/Microbe_Animation_V2_eng_eng.swf).

Emphasise that although microbes cause disease, there are also useful microbes. Ask participants to identify some benefits of useful microbes. These include *Lactobacilli* in yogurt and the fungus *Penicillium* which produces the antibiotic penicillin. Or the yeast in bread and beer which causes bread to rise and sugar to become fermented to alcohol respectively.

Highlight to the group that microbes can be found EVERYWHERE – floating around in the air we breathe, on the food we eat, in the water we drink and on the surface of and in our bodies. Emphasise that although there are harmful microbes that can make us ill, there are many more useful microbes that we can use, and other microbes that are everywhere that have no effect on us.

Explain that we have useful microbes in our bodies and that we should try to protect our useful microbes. This video will help discuss the topic of useful microbes: www.youtube.com/watch?v=5DTrENdWvM

Discuss with the group that antibiotics can treat many bacterial infections but some bacteria are fighting back and becoming resistant to the antibiotics. These resistant bacteria can spread just as easily.

The following pages describe 5 activities about microbes, some recommended and some optional. Choose the most appropriate activities for your group.

Recommended Activities

The following three activities are recommended.

Activity 1 – Yeast Races (30 mins)

Advance preparation: Prior to starting the activity make up a liquid yeast solution as outlined on the yeast packaging, with water and dried yeast. This may vary between different brands. Do not add sugar until stated in the main activity. If made too far in advance the yeast will start to ferment.

1. This activity is for groups of 2 – 5 participants.
2. Highlight to the participants that a useful fungus known as yeast is used to make bread. The yeast helps the bread rise by a process known as fermentation.
3. Supply the groups with the Yeast Races Recipe (**PH 1**). The recipe can also be found on the [e-Bug Junior Useful Microbes Teacher website](#) for white board use.
4. Have participants carry out the activity in their groups. When the recipe is complete, participants should observe the yeast and record their observations on the participant worksheet (**PW 1**).
5. Can the group 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.*

If this activity is used, enough time should be left to record observations for 30 minutes. Participants could move on to a second or third activity, taking time to measure the dough in between activities.

Learning outcomes achieved:

1. There are three different types of microbes, which can be found everywhere
2. Many of our useful microbes are put to good use every day to help keep us healthy

Activity 2 – Top Trumps (10-20 mins)

In this activity groups of 3 – 4 participants play a card game (PH2) which helps them remember some of the technical words relating to microbes as well as familiarising participants with a variety of microbial names, the differences in size, capability of causing harm and if antibiotic resistance occurs.

Please note: Microbe size and number of species are correct at the time of resource development; however, as new microbes are continuously being discovered and reclassified, these numbers may be subject to change. The numbers in the other headings used on the cards are only to be used as a guide, they are not accurate as there is no formulae to create these and they may be subject change i.e. bacterial species may develop resistance to more antibiotics resulting in them having a higher number in this column and being more dangerous to humans.

Game rules

1. The dealer should mix the cards well and deal all the cards face down to each player. Each player holds their cards face up so that they can see the top card only.
2. The player to the dealer's left starts by reading out an item from the top card in their hand (e.g. Size 50). In a clockwise direction, the other players then read out the same item. The player with the highest value wins, taking the other players top cards and placing them to the bottom of their pile. The winner then selects the item to read out from the next card in their hand.
3. If 2 or more players have the same top value then all the cards are placed in the middle and the same player chooses again from the next card. The winner then takes the cards in the middle as well. The person with all the cards at the end is the winner.
4. Finish up the activity with a quick discussion. *What have you learnt? Which microbes were the most useful to humans? Were many bacterial microbes resistant to antibiotics?*

Alternatively, a similar game called 'Bacteria Combat' can be downloaded in app form for participants to play in class or at home. A link to download the game can be found on the [e-Bug Young Adult Student games webpage](#).

Learning outcomes achieved:

1. There are three different types of microbes, which can be found everywhere
2. Useful bacteria are found in and on our body
3. Many of our useful microbes are put to good use every day to help keep us healthy
4. We need to protect our useful microbes
5. Sometimes the harmful microbes can make us ill

Activity 3 – Magazine Microbes (10-20 mins)

1. This activity can be done either individually or in groups.
2. Provide participants with different magazines.
3. Ask participants to look through the magazines and find images of places where microbes can be found (i.e. a picture of a fridge, kitchen worktop, shoes, clothes etc.)
4. Ask participants to cut out the images using scissors and stick onto an A4 piece of paper to make a collage with the title "*Where can microbes be found?*"
5. At the end of the activity, explain to the participants that microbes are found everywhere even on the magazine they were looking through. Stress that microbes are found all over our skin, mouths, gut and especially hands. Most are completely harmless that we carry without knowing.
6. Discuss that the bacteria on our bodies are important as they act as a barrier to stop other more harmful bacteria entering your body and making you ill.
7. If time permits and participants are comfortable to they can present their posters to the rest of the group.

Learning outcomes achieved:

1. There are three different types of microbes, which can be found everywhere
2. We all carry around bacteria on our bodies and we need to look after these useful microbes.

Optional Activities

Activity 4 – Make your own microbes (10-20 mins)

1. This activity can be done either individually or in groups.
2. Provide each group with either a colour handout (**PH2**) of the different types of microbes or place colourful posters on the classroom walls from the [e-Bug student website downloads section](#). These handouts will show the range of shapes and sizes of microbes with names and whether they are useful or harmful microbes.
3. Provide each group with play dough or other materials from the scrap store, in a variety of colours, and paper plates to make the microbes on.
4. Ask each individual / group to recreate a microbe or groups of microbes based on the coloured images provided, or to design their own microbe.
5. If designing their own, each individual must decide whether their microbe is useful or harmful and provide its name.
6. Remind the group that fungi are the largest microbes and viruses are the smallest.
7. If time permits and participants are comfortable to they can then present their microbes to the rest of the group, saying what type of microbe it is and whether it is useful or harmful.
8. Finish up the activity with a quick discussion. *What have you learnt?*

Learning outcomes achieved:

There are three different types of microbes, which can be found everywhere.

Activity 5 – What microbe am I? (15 mins)

1. Provide each participant with a copy of **PH3** and **PW2**.
2. By reading the descriptions and using the information on their handouts participants must decide whether the microbes are bacteria, virus or fungi.

Answers:

- 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.

Learning outcomes achieved:

1. There are three different types of microbes, which can be found everywhere
2. Useful bacteria are found in and on our body
3. Many of our useful microbes are put to good use every day to help keep us healthy
4. Sometimes the harmful microbes can make us ill

Discussion

Discuss what the group have learnt today with open questions and refer back to the 'Meet the Bugs' poster if necessary.

What have you learnt today?

What will you take home from today?

Lead the discussion to reflect back on the sessions learning objectives.

- There are three different types of microbes, which can be found everywhere
- Useful bacteria are found all over our body
- Useful microbes can help us keep healthy and most are beneficial
- We need to protect our useful microbes
- Sometimes the harmful microbes can make us ill

Extension questions:

1. What are microbes?

Microbes are living organisms too small to be seen with the naked eye.

2. Where are microbes found?

Microbes are found everywhere.

3. What are the three different types of microbes?

Viruses, Bacteria and Fungi.

4. What are the main difference between bacteria and viruses?

Bacteria are much more complex than viruses and can live virtually ANYWHERE, whereas viruses need to live in a host cell in order to survive. Viruses are not killed by antibiotics; antibiotics are only effective against bacteria.

5. How can we look after our useful microbes?

Eat healthy foods such as fruit and vegetables and yoghurt to help increase the useful microbes in our gut. Not using antibiotics if they are not needed as these can kill useful microbes as well as harmful.

Action Plan

Ask participants to complete an action plan for this session (found at the back of this session booklet).

Ask participants to either choose one of the action plans from below or to make up their own if they are confident enough.

1. I will remember that there are 3 types of microbes; fungi, bacteria and viruses.
2. I will remember that microbes are found everywhere and are too small to be seen with the naked eye.
3. I will remember that we have useful microbes in our bodies which we should try to protect.

Acknowledgements

This session plan was written by the e-Bug team and assisted by the Kingfisher Treasure Seekers Community Group.

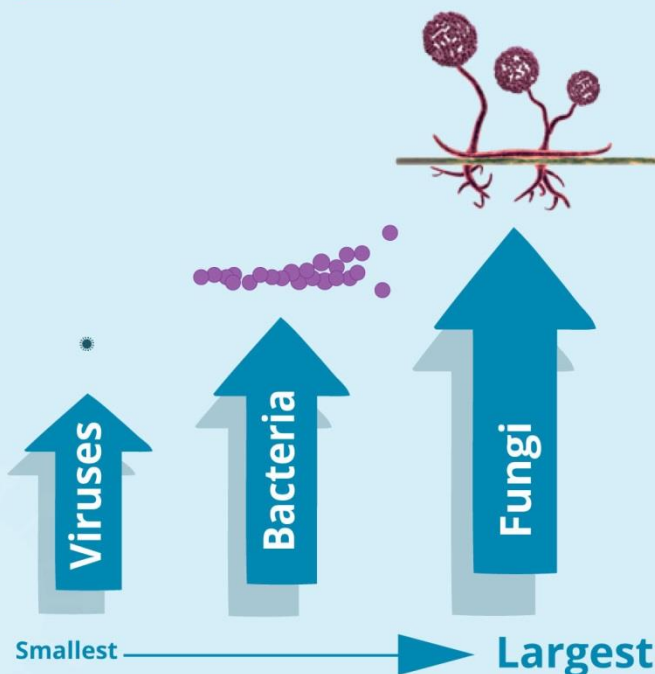
Meet the Bugs

**BEAT THE
BUGS**

Microbes

- Microbes are found everywhere.
- There are more microbes than all other animals and plants in the world.
- Microbes are found all over our bodies.
- Microbes help keep us healthy.
- There are millions of useful microbes in our gut.
- If there were no microbes, there would be no people!

Three types of microbe



1. Fungi



- The giants of all microbes.
- Fungi can be useful and harmful. Useful fungi can be used to make bread (yeast) or antibiotics. Harmful fungi can cause mould on food or diseases such as athlete's foot.

2. Bacteria



- There are three different shapes of bacteria; balls, spirals and rods, and scientists use these shapes to help identify them.
- Most bacteria in our gut and on our bodies are useful.
- Some bacteria are harmful, causing wound and chest infections.

3. Virus



- Viruses are tiny and need to live inside other animals, plants and even other microbes.
- There are very few good viruses and most viruses make us ill.
- Viruses include coughs, colds, flu, vomiting and chickenpox.

Useful Microbes

- Useful microbes are found in and on our body.
- Most of our microbes are good for us and do not cause disease.
- Useful microbes are used to make foods such as wine, cheese, vinegar, yoghurt, and chocolate.
- Useful microbes are used to make certain antibiotics.
- Microbes produce at least half the oxygen we breathe.
- Useful microbes live on the roots of plants and help them take in food and water.
- We can look after our useful microbes by taking less antibiotics.

Harmful Microbes

- Some microbes can be harmful to humans and cause illness.
- Harmful microbes love it when you help them spread around by not washing your hands, coughing, sneezing, and eating under cooked food.
- Remember, microbes multiply very fast so it only takes one harmful microbe to get into your body and make you sick!
- Most cough, colds, sore throats and flu are caused by viruses.
- Some bacteria can destroy antibiotics. They are called antibiotic resistant bacteria.

Yeast Races



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



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



Add enough **yeast solution** to plastic **cup A** until it has the consistency of a thick milkshake.



Add enough **yeast and sugar solution** to plastic **cup B** until it has the consistency of a thick milkshake.



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



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



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




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



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


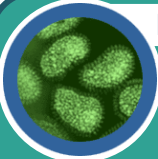
Participant Handout 2a



Tobamovirus
Tob-A-Mo-Virus
Virus

Max Size (nm)	18
Number of species	125
Danger to humans	12
Usefulness to humans	34
Antibiotic resistance	N/A



Tobamovirus are a group of viruses that infect plants, the most common being tobacco mosaic virus, which infects tobacco and other plants causing a mosaic like discoloration on the leaves. This virus has been very useful in scientific research.

Influenza A
In-Flu-En-Za A
Virus

Max Size (nm)	90
Number of species	1
Danger to humans	146
Usefulness to humans	12
Antibiotic resistance	N/A



The flu is an infection caused by *Orthomyxoviridae*. Every year 5 – 40% of the population get the flu but most people recover completely in a couple of weeks. In 1918, before there were any vaccines for the flu, twenty million people were killed!

Lyssavirus
Lice-A-Virus
Virus

Max Size (nm)	180
Number of species	10
Danger to humans	74
Usefulness to humans	5
Antibiotic resistance	N/A



The *Lyssavirus* infect both plants and animals. The most common *Lyssavirus* is the Rabies virus and is usually associated with dogs. Rabies has been responsible for over 55,000 deaths worldwide but can be prevented by vaccination.

Ebola
E-Bowl-Ah
Virus

Max Size (nm)	1500
Number of species	1
Danger to humans	200
Usefulness to humans	0
Antibiotic resistance	N/A


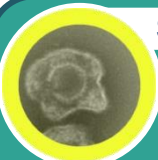
Filovirus causes a disease more commonly known as Ebola. It is one of the more dangerous viruses known to humans due to the fact that there is no known preventative vaccine or treatment. 50 – 90% of victims die from the disease!

Lymphocryptovirus
Lim-Foe-Cryp-Toe-Virus
Virus

Max Size (nm)	110
Number of species	7
Danger to humans	37
Usefulness to humans	2
Antibiotic resistance	N/A



The Epstein-Barr virus is a type of *Lymphocryptovirus* causing an illness known as the Kissing Disease or Glandular fever. Patients suffer from sore throats, swollen lymph glands, and extreme tiredness. Transmission requires close contact such as kissing or sharing drinks.

Simplex Virus
Sim-Plex Virus
Virus

Max Size (nm)	200
Number of species	2
Danger to humans	64
Usefulness to humans	2
Antibiotic resistance	N/A



Herpes simplex is one of the oldest known sexually transmitted infections. In many cases, *Herpes* infections produce no symptoms at all but unsightly scab-like symptoms do occur in about one third of people infected.

Rhinovirus
Rhino-Virus
Virus

Max Size (nm)	25
Number of species	2
Danger to humans	28
Usefulness to humans	14
Antibiotic resistance	N/A


There are over 250 different kinds of cold viruses! But *Rhinovirus* is by far the most common. *Rhinoviruses* are responsible for almost 35% of colds. *Rhinovirus* can survive three hours outside someone's nose. If it gets on your fingers and you rub your nose, you've caught it!


Varicellovirus
Var-E-Cell-O-Virus
Virus

Max Size (nm)	200
Number of species	2
Danger to humans	21
Usefulness to humans	7
Antibiotic resistance	N/A

Chickenpox is caused by the *Varicella-Zoster* virus. It is highly contagious although rarely serious and is spread through direct contact (or coughing and sneezing). Almost everyone caught chickenpox in their childhood prior to the discovery of the chickenpox vaccine.





Participant Handout 2b



Penicillium
Pen-Ee-Sil-Ee-Um
Fungi

Max Size (nm)	332, 000
Number of species	16
Danger to humans	64
Usefulness to humans	198
Antibiotic resistance	N/A



Penicillium is a fungus that has literally changed the world! Since this discovery, the antibiotic has been mass produced to fight bacterial infections. Unfortunately, due to its overuse many bacterial species have become resistant to this antibiotic.

Saccharomyces
Sac-A-Row-My-Sees
Fungi

Max Size (nm)	10,000
Number of species	19
Danger to humans	1
Usefulness to humans	184
Antibiotic resistance	N/A



For at least 6,000 years, *Saccharomyces cerevisiae* (Brewers yeast) has been used to make beer and bread! It is also used to make wine and it is widely used in biomedical research. One yeast cell can turn into 1,000,000 in only six hours.

Tinea
Tin-Ee-A
Fungi

Max Size (nm)	110,000
Number of species	12
Danger to humans	43
Usefulness to humans	14
Antibiotic resistance	N/A



Although a variety of fungi can cause foot rashes, *Tinea* cause the itchy, cracked skin typically between the fourth and fifth toes known as Athlete's foot, which is the most common fungal skin infection. Athlete's foot affects nearly 70% of the population.

Stachybotrys
Stack-Ee-Bo-Trys
Fungi

Max Size (nm)	72,000
Number of species	2
Danger to humans	83
Usefulness to humans	2
Antibiotic resistance	N/A



Stachybotrys (or straw mould) is a black toxic fungus that although itself is not pathogenic, it does produce a number of toxins that can cause a variety of health problems ranging from rashes to life threatening reactions for those with respiratory problems.

Aspergillus
Ass-Per-Gill-Us
Fungi

Max Size (nm)	
Number of species	101, 000, 200
Danger to humans	47
Usefulness to humans	124
Antibiotic resistance	N/A



Aspergillus is both beneficial and harmful to humans. Many are used in industry and medicine. This fungus accounts for over 99% of global citric acid production and is a component of medications which manufacturers claim can decrease flatulence!

Cryptococcus
Cryp-Toe-Coccus
Fungi

Max Size (nm)	7, 500
Number of species	37
Danger to humans	98
Usefulness to humans	37
Antibiotic resistance	N/A



Cryptococcus is a fungus which grows as a yeast. It is best known for causing a severe form of meningitis and meningo-encephalitis in people with HIV/AIDS. The majority of *Cryptococci* live in the soil and are not harmful to humans.

Candida
Can-Did-A
Fungi

Max Size (nm)	10,000
Number of species	44
Danger to humans	74
Usefulness to humans	175
Antibiotic resistance	N/A


Candida is among the natural flora living in the human mouth and gastrointestinal tract. Under normal circumstances these fungi live in 80% of the human population with no harmful effects, although overgrowth results in candidiasis (Thrush).


Verticillium
Ver-Tee-Sil-Ee-Um
Fungi

Max Size (nm)	8,500,000
Number of species	4
Danger to humans	1
Usefulness to humans	18
Antibiotic resistance	N/A

Verticillium is a widely distributed fungus that inhabits decaying vegetation and soil. Some *Verticillium* may be pathogenic to insects, plants, and other fungi but very rarely cause human disease.




Participant Handout 2c



Chlamydia
Clam-id-E-A Bacteria

Max Size (nm)	1000
Number of species	3
Danger to humans	37
Usefulness to humans	1
Antibiotic resistance	5


Chlamydia, a sexually transmitted infection (STI) caused by the bacteria *Chlamydia trachomatis*. It can cause mild symptoms such as discharge from the vagina or penis to more serious complications, i.e. inability to have children or swollen testicles.



Salmonella
Sam-on-ella Bacteria

Max Size (nm)	1000
Number of species	3
Danger to humans	89
Usefulness to humans	15
Antibiotic resistance	40


Salmonella are rod shaped bacteria most commonly known for causing food poisoning and typhoid fever. Symptoms range from vomiting to diarrhoea and even death, in worse case scenarios.



Staphylococcus
Staff-ill-O-coccus Bacteria

Max Size (nm)	1000
Number of species	19
Danger to humans	174
Usefulness to humans	20
Antibiotic resistance	90


Meticillin Resistant Staphylococcus aureus (MRSA) are the bacteria responsible for causing difficult to treat infections in hospitals. They are a variation of the common *Staphylococcus aureus* that have evolved to become resistant to many common antibiotics.



Streptococcus
Strep-Toe-Coccus Bacteria

Max Size (nm)	1000
Number of species	21
Danger to humans	50
Usefulness to humans	75
Antibiotic resistance	20


Many *Streptococcus* are harmless to humans and are the normal flora of the mouth and hands. However, some *Streptococcus* bacteria cause about 15% of sore throats. Strep throat symptoms include sudden fever, stomach aches, and swollen glands.



Escherichia
Esk-Er-Ic-E-A Bacteria

Max Size (nm)	2000
Number of species	7
Danger to humans	54
Usefulness to humans	184
Antibiotic resistance	N/A


Many strains of *E. coli* are harmless, and huge numbers are present in the human and animal gut. In addition, *E. coli* is among the most studied of all creatures great and small. In some cases, however, *E. coli* cause both urinary and serious abdominal infections and food poisoning.



Pseudomonas
Sued-O-Moan-Us Bacteria

Max Size (nm)	5000
Number of species	126
Danger to humans	50
Usefulness to humans	150
Antibiotic resistance	80


Pseudomonas are one of the most common microbes found in almost all environments. Although some may cause disease in humans, other species are involved in decomposition and bioremediation.



Lactobacillus
Lac-Toe-Ba-Sil-Us Bacteria

Max Size (nm)	1500
Number of species	125
Danger to humans	0
Usefulness to humans	195
Antibiotic resistance	10

Lactobacilli are very common and usually harmless to humans. They are present in the vagina and the gastrointestinal tract, and make up a small portion of the gut flora. These bacteria have been extensively used in the food industry - in yogurt and cheese making.



Treponema
Trep-O-Nee-Ma Bacteria

Max Size (nm)	2000
Number of species	3
Danger to humans	115
Usefulness to humans	8
Antibiotic resistance	10

Syphilis is an extremely contagious disease, caused by *Treponema* bacteria. Symptoms start with a skin rash and flu-like symptoms and can lead to brain damage and death. Syphilis can be cured with antibiotics however resistant strains are becoming more frequent.

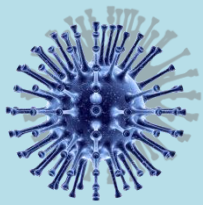
What are Microbes?

- 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



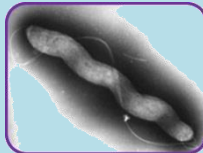
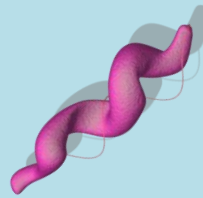
- Viruses are even smaller than bacteria and can sometimes live INSIDE bacteria!
- Some viruses make us sick.
- Diseases like CHICKENPOX and the FLU are caused by viruses.
- Viruses can spread from one person to another but it depends on the type of virus.

BACTERIA

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

Spirals

(e.g. *Campylobacter*)



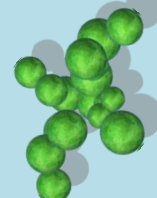
Rods

(e.g. *Lactobacillus*)



Balls

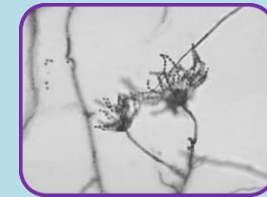
(e.g. *Staphylococcus*)



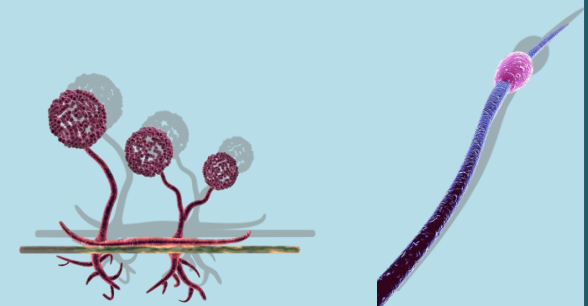
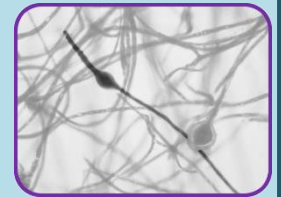
- They are so small that 1000s of bacteria could fit on the full stop at the end of this sentence.
- Some bacteria are helpful in cooking, for example, making yogurt and cheese.
- Some bacteria are harmful and cause infection.
- Bacteria multiply very fast.

FUNGI

Penicillium

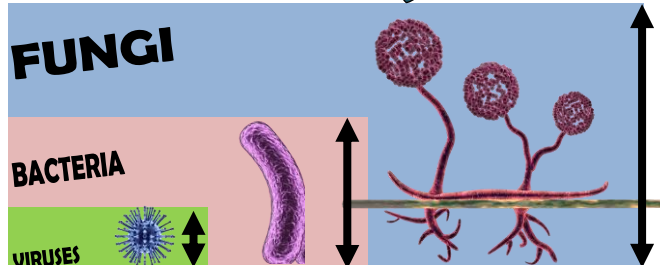


Dermatophyte



- 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.

Microbe Size



Yeast Races

Procedure

1. Follow the instructions in the **Yeast Races Recipe**.



My Results

Time	YEAST ALONE	
	Volume of dough	Change in volume of dough / ml
	0	0

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



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?

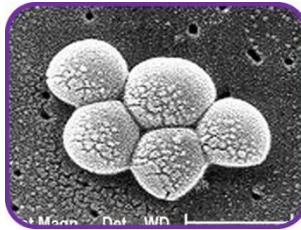
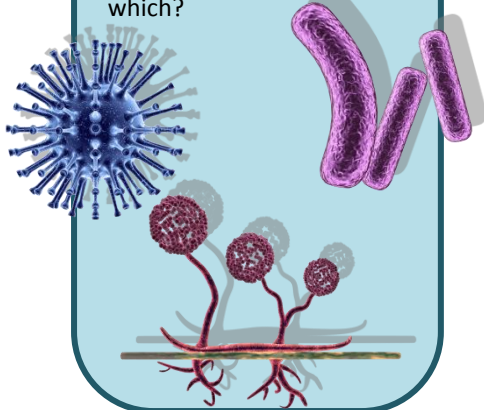
4. What other food products are the result of bacteria or fungi growing and changing substances?



What microbe am I?

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

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



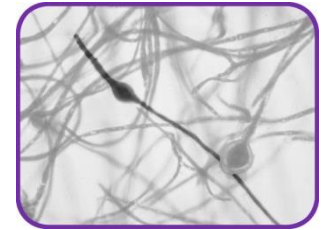
My name is ***Staphylococcus***. I am round in shape and I like to live in your nose or armpit! If I live on your skin I can give you spots. If I get into your bloodstream I can make you ill! What am I?

Staphylococcus is a:



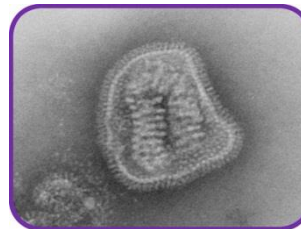
My name is ***Lactobacillus***. People call me 'friendly' because I change milk into yogurt! When you eat me in yogurt I live in your guts and help you digest other food. What am I?

Lactobacillus is a:



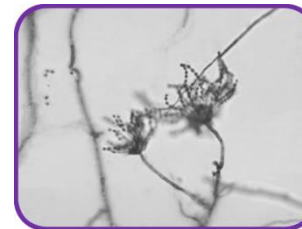
I'm called a ***Dermatophyte*** and I like to live on your skin. I especially like living in damp places like between the toes on sweaty feet! When I live there I give people athlete's foot! What am I?

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 known as 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:

Name: _____

Action Plans



Meet the Bugs

My favourite activity was:

After this session I will remember that (please circle):

1. There are 3 types of microbes
2. Viruses are very small microbes and cause coughs, colds, sore throats and flu.
3. We have useful microbes in our bodies which we should try to protect.

Or write your own:

BEAT THE BUGS

This pack contains an educational hygiene resource for community groups.

This session can be used independently or as part of a six week course and has information, suggested lesson plans and possible activities for you to use in your community groups to help you inspire and inform individuals.

This project was led in collaboration with the Primary Care Unit, Public Health England, and Kingfisher Treasure Seekers.

