



# Micro-organisms: Harmful Microbes

**Close examination of various illnesses illustrates to pupils how and where harmful microbes cause disease. Pupils test their knowledge of disease-causing microbes by researching various illnesses and how they can impact the community.**

## Northern Ireland Curriculum Links

### Curriculum Skills

- Communication
- Problem-solving
- Working with others

### Areas of Learning

Learning for life and work (Personal development statutory content)

- Develop an understanding of how to maximise and sustain their own health and wellbeing
- Recognise, assess and manage risk in a range of real-life contexts

### Science and Technology (including relevant CCEA qualifications)

- GCSE Biology
- GCSE Science Single Award
- GCSE Science Double Award

## Learning Intentions

All pupils will:

- Understand that sometimes microbes can make us ill and cause infection.
- Understand how harmful microbes (pathogens) can pass from person to person.
- Understand that different infections can have different associated symptoms.
- Understand how global travel has influenced the spread of disease.

Most pupils will:

- Understand how infectious diseases impact the local community.

## Key Words

Bacteria, COVID-19, Epidemic, Fungi, Infection, Pandemic, Pathogens, Toxin, Virus

## @ Weblink

[e-bug.eu/eng/KS4/lesson/Harmful-Microbes](https://e-bug.eu/eng/KS4/lesson/Harmful-Microbes)

## Fascinating Fact

Lower respiratory infections remain the world's most deadly communicable disease, ranked as the 4th leading cause of death. In 2019 it claimed 2.6 million lives.

## Resources Required

**Main activity: Harmful Microbes and their Diseases**  
*Per class/group*

- Copy of SH1, SH2, SH3, SW1
- Differentiated versions adaptable for pupils of different abilities SH4, SH5, SW2
- Copy of TS1, TS2

**Main Activity 2: Harmful Microbes Fill in the Blanks**  
*Per group*

- Devices with internet access or biology textbooks
- Copy of SW3
- Copy of TS3

**Outbreak Activity 1 and 2**

- Groups of 4 or 5 pupils

## Advance Preparation

1. Cut out the disease cards in SH1 - SH3, one set per group. Laminate these or stick onto stiff card for future use.  
(Differentiated version: SH4-SH5)
2. Copy SW1 for each group.  
(Differentiated version: SW2)

# Supporting Materials

TS1 Disease Match Answer sheet

## Answer Sheet

**1. Infectious Microbes**

| Infectious Microbe | Disease  |
|--------------------|--|
| Bacteria           | Bacterial meningitis, Chlamydia, MRSA            |
| Virus              | Flu, Chickenpox, Flu, Measles, Gonorrhoea, Fever |
| Fungi              | Thrush   |

**2. Symptoms**

| Symptoms | Disease |
|----------|---------|
|          |         |

**3. Transmission**

| Transmission   | Disease  |
|----------------|--|
| Sexual contact | Chlamydia, HIV, Thrush                         |
| Blood          | Bacterial meningitis, HIV                      |
| Touch          | Flu, Measles, Chickenpox, MRSA                 |
| Inhalation     | Flu, Measles, Chickenpox, Bacterial meningitis |
| Mouth to mouth | Flu, Gonorrhoea, Fever                         |

**4. Prevention of Infection**

| Prevention | Disease  |
|------------|--|
| Wash hands | Flu, Measles, Chickenpox, MRSA, Bacterial meningitis |
| Wash hands |  |

TS1 Harmful Microbes and Their Diseases Answer Sheet

SW1 Disease Match Worksheet

## Disease Match

**1. Infectious Microbes**

| Infectious Microbe | Disease |
|--------------------|---------|
| Bacteria           |         |
| Virus              |         |
| Fungi              |         |

**2. Symptoms**

| Symptoms | Disease |
|----------|---------|
|          |         |

**3. Transmission**

| Transmission   | Disease |
|----------------|---------|
| Sexual contact |         |
| Blood          |         |
| Touch          |         |
| Inhalation     |         |
| Mouth to mouth |         |

**4. Prevention of Infection**

| Prevention | Disease |
|------------|---------|
| Wash hands |         |

SW1 Disease Match Worksheet

TS2 Disease Match Differentiated Answer sheet

## Answer Sheet

**1. Infectious Microbes**

| Infectious Microbe | Disease                  |
|--------------------|--------------------------|
| Bacteria           | Chlamydia                |
| Virus              | Chickenpox, Flu, Measles |
| Fungi              | Thrush                   |

**2. Symptoms**

| Symptoms     | Disease   |
|--------------|-----------|
| Asymptomatic | Chlamydia |

**4. Prevention of Infection**

| Prevention                 | Disease                  |
|----------------------------|--------------------------|
| Wash hands                 | Flu, Measles, Chickenpox |
| Cover coughs and sneezes   | Flu, Measles, Chickenpox |
| Use a condom               | Chlamydia, Thrush        |
| Unnecessary antibiotic use | Thrush                   |
| Vaccination                | Chickenpox, Measles, Flu |

TS2 Harmful Microbes and Their Diseases Differentiated Answer sheet

SW2 Differentiated Disease Match Worksheet

## Disease Match

**1. Infectious Microbes**

| Infectious Microbe | Disease   |
|--------------------|-----------|
| Bacteria           | Chlamydia |
| Virus              |           |
| Fungi              |           |

**2. Symptoms**

| Symptoms     | Disease |
|--------------|---------|
| Asymptomatic |         |
| Fever        |         |

**4. Prevention of Infection**

| Prevention                       | Disease |
|----------------------------------|---------|
| Wash hands                       |         |
| Cover coughs and sneezes         |         |
| Use a condom                     |         |
| Avoid unnecessary antibiotic use |         |
| Vaccination                      |         |

SW2 Differentiated Disease Match

Harmful Microbes Fill in The Blanks

| Disease       | Pathogen | Transmission  | Symptoms  | Prevention  | Treatment            | Resistant                         |
|---------------|----------|---|---|---|----------------------|-----------------------------------|
| HIV/AIDS      | Virus    | Sexual contact, blood transfusion, sharing needles, mother to child | Asymptomatic, swollen lymph nodes, weight loss, fever, night sweats, persistent cough, diarrhoea, skin rashes | Condoms, safe blood transfusion, safe needle use, antenatal screening | Antiretroviral drugs | Resistant to all known treatments |
| Measles       | Virus    | Inhalation of respiratory droplets                                  | High fever, cough, runny nose, sore throat, red eyes, skin rash   | Vaccination   | Supportive care      | Resistant to all known treatments |
| Mononucleosis | Bacteria | Contact with saliva   | Swollen lymph nodes, sore throat, fever, fatigue, enlarged spleen   | Avoid sharing saliva, use of mouthwash                                | Antibiotics          | Resistant to all known treatments |
| Chlamydia     | Bacteria | Sexual contact  | Discharge from penis/women, pain during sex   | Condoms   | Antibiotics          | Resistant to all known treatments |

TS3 Harmful Microbes Till in The Blanks

Harmful microbes Fill in The Blanks

| Disease | Pathogen | Transmission | Symptoms | Prevention | Treatment | Resistant |
|---------|----------|--------------|----------|------------|-----------|-----------|
|         |          |              |          |            |           |           |
|         |          |              |          |            |           |           |
|         |          |              |          |            |           |           |

Harmful Microbes Fill in The Blanks

| Disease       | Pathogen | Transmission  | Symptoms  | Prevention  | Treatment            | Resistant                         |
|---------------|----------|---|---|---|----------------------|-----------------------------------|
| HIV/AIDS      | Virus    | Sexual contact, blood transfusion, sharing needles, mother to child | Asymptomatic, swollen lymph nodes, weight loss, fever, night sweats, persistent cough, diarrhoea, skin rashes | Condoms, safe blood transfusion, safe needle use, antenatal screening | Antiretroviral drugs | Resistant to all known treatments |
| Measles       | Virus    | Inhalation of respiratory droplets                                  | High fever, cough, runny nose, sore throat, red eyes, skin rash   | Vaccination   | Supportive care      | Resistant to all known treatments |
| Mononucleosis | Bacteria | Contact with saliva   | Swollen lymph nodes, sore throat, fever, fatigue, enlarged spleen   | Avoid sharing saliva, use of mouthwash                                | Antibiotics          | Resistant to all known treatments |
| Chlamydia     | Bacteria | Sexual contact  | Discharge from penis/women, pain during sex   | Condoms   | Antibiotics          | Resistant to all known treatments |

SW3 Harmful Microbes Fill in The Blanks

Harmful Microbes Fill in The Blanks

| Disease | Pathogen | Transmission | Symptoms | Prevention | Treatment | Resistant |
|---------|----------|--------------|----------|------------|-----------|-----------|
|         |          |              |          |            |           |           |
|         |          |              |          |            |           |           |
|         |          |              |          |            |           |           |

SH1-3 Harmful Microbes and Their Diseases Sheet

### Methicillin Resistant Staphylococcus aureus (MRSA)

**Infectious agent:** Bacteria: Staphylococcus aureus

**Symptoms:** Asymptomatic in healthy individuals. Can cause skin infections, infect surgical wounds, the bloodstream, the lungs, or the urinary tract in previously healthy people.

**Diagnosis:** Swab and antibiotic susceptibility test.

**Mortality Rate:** High - Fatal given the correct antibiotic.

**Transmission:** Contact. Direct skin contact.

**Prevention:** Regular hand washing.

**Treatment:** Resistant to many antibiotics. While some antibiotics still work, MRSA is constantly adapting.

**History:** First reported 1961, increasing problem globally.

**Measles**

**Infectious agent:** Virus: Paramyxovirus

**Symptoms:** Fever, runny nose, and watery eyes, a cough, a red rash and a sore, swollen throat.

**Diagnosis:** Swab sample and antibody test.

**Mortality Rate:** Low, but can be high in children under 5 years old, when treatment can be hard to access.

SH1-3 Information Sheets

SH4-5 Differentiated Harmful Microbes and Their Diseases Sheet

**Measles**

**Microbe:** Virus: Paramyxovirus

**Symptoms:** Fever, runny nose, and watery eyes, a cough, a red rash and a sore, swollen throat.

**Transmission:** Airborne droplets and contact.

**Prevention:** Vaccination, hand washing, avoiding contact with infected people.

**Treatment:** Bed rest and fluid intake.

**Flu**

**Microbe:** Virus: Influenza

**Symptoms:** Headache, fever, chills, muscle aches, possibly sore throat, cough, chest pain.

**Transmission:** Spread in coughs and sneezes, breathing in virus in the air, direct contact.

SH4-5 Differentiated Information Sheets



# Lesson Plan



## Introduction

1. Begin the lesson by explaining to the class that sometimes microbes can be harmful to humans and cause disease. These are known as pathogenic microbes. Once bacteria and viruses enter your body, they can reproduce rapidly. Bacteria can also divide by binary fission and produce toxins when they reproduce which are harmful to the body. Viruses act like parasites multiplying inside our cells and destroying them. Some fungi like to grow on our skin making it itchy and sore. Find out how many different words they have for microbes – germs, bugs, etc.
2. Ask the class to create a list of infections (infectious/ communicable diseases) by brainstorming any diseases they have heard of. Do they know what microbes cause the diseases? Do they know how these pathogenic (harmful) microbes are spread - modes of transmission? Ask the pupils what disease they think poses a threat to pupils in the class today? Tell them that in the early 1900s the disease of greatest threat was measles; many children who caught measles died.

There are 4 main mode of transmission for pathogenic microbes:

- a. By air including droplet transmission – many pathogens are carried and spread from one organism to another by air. When you are ill, you expel tiny droplets full of pathogens from your respiratory system when you cough, sneeze, or talk. Other people breathe in the droplets, along with the pathogens they contain, so they pick up the infection. Examples include flu (influenza), tuberculosis, and the common cold.
- b. Direct contact - spread by direct contact of an infected organism with a healthy one. Pathogens such as the viruses which cause HIV/AIDS or hepatitis enter the body through direct sexual contact, cuts, scratches, and needle punctures that give access to the blood.
- c. By consumption - eating raw, undercooked, or contaminated food, or drinking water containing sewage can spread diseases such as diarrhoeal diseases, cholera, or salmonellosis. The pathogen enters your body through your digestive system.
- e. Vector – some diseases e.g. malaria, are vector-borne, this means that some living organism can transmit infectious pathogens between humans, or from animals to humans.

Lifestyle factors often affect the spread of disease. For example, when people live in crowded conditions with no sewage system, infectious diseases can spread very rapidly.

3. Explain to the class that someone who has contracted harmful disease-causing microbes is said to be infected. Discuss the difference between an infectious microbe and a non-infectious one. Discuss with pupils the various routes of transmission, i.e. touch, water, food, body fluid and air. Identify any infectious diseases mentioned in the brainstorming session and how they are transmitted.

# Main Activity: Harmful Microbes and Their Diseases

**1 Discover the different types of infectious diseases caused by harmful microbes and their characteristics**

**2 By working in groups, fill in the various subheadings (symptoms, transmission, treatment)**

**3 Present your results to the class**



**Disease Match**

**1. Infectious Microbes**

| Infectious Microbe | Disease |
|--------------------|---------|
| Bacteria           |         |
| Virus              |         |
| Fungi              |         |

**2. Symptoms**

| Symptoms                         | Disease |
|----------------------------------|---------|
| Asymptomatic                     |         |
| Fever                            |         |
| Rash                             |         |
| Reddened/swollen lymphatic nodes |         |
| Lethargy                         |         |
| White discharge                  |         |

**3. Transmission**

| Transmission        | Disease |
|---------------------|---------|
| Respiratory contact |         |
| Blood               |         |
| Touch               |         |
| Inhalation          |         |
| Mouth-to-mouth      |         |

**4. Prevention of Infection**

| Prevention                       | Disease |
|----------------------------------|---------|
| Wash hands                       |         |
| Cover coughs and sneezes         |         |
| Use antibiotics                  |         |
| Avoid unnecessary antibiotic use |         |
| Vaccination                      |         |

**5. Treatment of Infection**

| Treatment    | Disease |
|--------------|---------|
| Antibiotics  |         |
| Rest         |         |
| Antifungals  |         |
| Hand hygiene |         |

**Procedure**

- Group your diseases into 5 headings to be matched to each row.
- Do you notice any similarities or differences between the diseases based on each of these headings?

## Harmful Microbes and Their Diseases

- This activity should be carried out in groups of 3 – 5 people. Explain that during this activity pupils are going to learn about some infectious diseases that cause problems in the world today.
- Provide each group with the disease cards found in SH1 – SH3. (Differentiated version: SH4 – SH5).
- Tell the class that sometimes scientists need to group diseases under different headings to address different problems. Each group should research the headings on SW1. (Differentiated version: SW2) for each disease. Teacher answers can be found at TS1-2.
- Ask each group to complete SW1 (Differentiated version: SW2) for the first heading – Infectious agent. After a few minutes, ask a spokesperson in each group to read out their results. Write all the results on a white board for discussion.

- After each heading in SW1/2 is complete, discuss the results with the class.
  - Infectious organism:** Remind pupils that there are three main types of microbes. It is important to identify the microbe causing the disease in order to treat the disease properly, e.g. antibiotics cannot be used to treat viruses.
  - Symptoms:** Pupils may notice that some diseases exhibit similar symptoms, e.g. fever or rash. You may wish to discuss how important it is for people to visit their doctor when they are ill to receive a correct and accurate diagnosis.
  - Transmission:** Many diseases are transmitted very easily through touch or by inhalation. Other diseases are quite specific and require the transfer of blood or other bodily fluids.
  - Preventative measures:** People can prevent the spread of, and protect themselves against, infection by a few simple steps. Regular hand washing and covering our coughs

and sneezes has been shown to reduce the incidence of many common infections. The correct use of a condom can reduce the transmission of many STIs.

- e. **Treatment:** It is important to note here that not all illnesses require medical treatment; some require bed rest and an increased fluid intake; however, painkillers may be used to alleviate some of the symptoms. Highlight to the pupils that antibiotics are only used to treat bacterial infections.

### Main Activity 2: Harmful Microbes Fill in the Blanks

This activity can be conducted in small groups or as an individual task. Making use of classroom devices with internet access and/or textbooks, ask pupils to research the disease-causing microbes in SW3 to fill in the gaps. Answers can be found at TS3. There is a row empty for pupils to select their own pathogenic (harmful) microbe to research. Once completed, this table can serve as a great way to consolidate information.

## Extension Activities

### Outbreak activity

Divide the class into groups of 4-5 to facilitate group discussion. Choose an infectious disease or have the class make up their own. For example, you could base this activity on a foodborne disease (food poisoning), COVID-19 or a fictional disease.

1. Tell the class that they are the public health team for your local council, there has been an outbreak of an

infectious disease meaning lots of people have become sick with the same thing. It is the responsibility of the class to co-ordinate a response.

2. Have the groups discuss who would be involved in responding to an outbreak: nurses, doctors, public health officials, government, scientist, epidemiologists, all play a vital role in public health. More information about these careers in public health can be researched online (NHS public health, prospects.ac.uk).

- To start them off you can ask them who they would go to if they got sick. Who would that person tell? Who would the doctor tell? What would those people do? What advice would the government give? What can the public health officials do to keep to government advice and keep cases down? Are there existing methods of diagnosis or treatment? Do vaccines exist for this disease?
- You can create a flow-chart to record the chain of command.

3. As public health officials they must decide how they can stop the spread of the infection. What questions would they ask that could help them stop the spread of the sickness?

- How many people are sick? How is the infectious agent spreading? Who needs to know about this? Pupils should be encouraged to list as many questions as possible and share the most frequent with the class.

This exercise should give the pupils a little more understanding of how individuals, groups and organisations work together to respond to outbreaks.

4. To finish give the pupils the following scenario:

Three main outbreaks have been identified in the local area:

- A school
- Leisure centre
- Office building

Ask the pupils in their groups to create a plan to communicate with the local residents about stopping the spread of the disease.

### **Outbreak Activity 2**

Ask pupils to research an infectious disease and produce a visual timeline to be presented at the next lesson. The timeline should include reference to the following:

- A history of the disease
- The microbe involved
- Rate of transmission
- Symptoms, and treatment
- Mortality rates

### **Guest Speaker**

To bring the learning to life, you may wish to invite your local authority public health lead to talk about the local response to Covid-19 and the procedures that were established.

## **Learning Consolidation**

Ask pupils to write a paragraph or three statements to summarise what they have learned during the lesson.

Check for understanding by asking pupils if the following statements are true or false.

1. Microbes that can cause diseases are called pathogens. Diseases caused by such microbes are said to be infectious diseases.

Answer: True

2. Microbes can pass from one person to another only by touch.

Answer: False, microbes can pass from one person to another by a number of different routes – air, touch, water, food, aerosols (coughs and sneezes).

3. Some new infectious agents can cause epidemics (community) or travel all over the world causing a pandemic.

Answer: True



## Discussion

Check for understanding by asking the pupils the following questions:

**What is a disease?**

An illness or sickness characterised by specific signs or symptoms.

**What is an infectious disease?**

An infectious disease is a disease that is caused by a microbe and can be spread to other people.

**Why do we see infectious diseases that used to be found in a single region, all over the world today?**

Many infectious diseases start in a specific region or country. In the past the infection could be easily contained or isolated. Today, however, people travel faster, more quickly and further than ever before. A person travelling from Australia to England can make the journey in under a day, with or without flight changes en route. If this person has a new strain of the flu virus, they could spread it to anyone they came into contact with at their transfer airport and people they came into contact with when they landed in England. These people could also carry the flu to other people they come into contact with all over the world. Within a few days, this new strain of influenza virus could be found worldwide. You may want to discuss how quickly the virus causing the disease COVID-19 spread around the world.







# Answer Sheet

## 1. Infectious Microbes

| Infectious Microbe | Disease  |
|--------------------|--|
| Bacteria           | Bacterial meningitis, Chlamydia, MRSA          |
| Virus              | HIV, Chickenpox, Flu, Measles, Glandular Fever |
| Fungi              | Thrush   |

## 2. Symptoms

| Symptoms          | Disease  |
|-------------------|--|
| Asymptomatic      | Chlamydia, MRSA                                |
| Fever             | Flu, Measles, Chickenpox, Bacterial meningitis |
| Rash              | Bacterial meningitis, Chickenpox, Measles,     |
| Sore throat       | Flu, Glandular fever                           |
| Tiredness         | Glandular fever                                |
| Lesions           | HIV  |
| Whitish discharge | Chlamydia, Thrush                              |

### Points to Note

MRSA is an antibiotic resistant bacterium, it is specifically resistant to methicillin and some other commonly used antibiotics. Its resistance status is attributed to the overuse and misuse of this and other antibiotics. Treatment is still via antibiotic therapy, however, MRSA is also developing resistance to these as well.

## 3. Transmission

| Transmission   | Disease  |
|----------------|--|
| Sexual contact | Chlamydia, HIV, Thrush                         |
| Blood          | Bacterial meningitis, HIV                      |
| Touch          | Flu, Measles, Chickenpox, MRSA                 |
| Inhalation     | Flu, Measles, Chickenpox, Bacterial meningitis |
| Mouth to mouth | Flu, Glandular fever                           |

## 4. Prevention of Infection

| Prevention                       | Disease  |
|----------------------------------|--|
| Wash hands                       | Flu, Measles, Chickenpox, MRSA, Bacterial meningitis |
| Cover coughs and sneezes         | Flu, Measles, Chickenpox, Bacterial meningitis       |
| Use a condom                     | Chlamydia, HIV, Thrush                               |
| Avoid unnecessary antibiotic use | MRSA, Thrush   |
| Vaccination                      | Chickenpox, Measles, Flu                             |

## 5. Treatment of Infection

| Treatment    | Disease                                   |
|--------------|---|
| Antibiotics  | Chlamydia, Bacterial meningitis, MRSA     |
| Bed Rest     | Chickenpox, Glandular fever, Measles, Flu |
| Antifungals  | Thrush                                    |
| Fluid Intake | Chickenpox, Glandular fever, Measles, Flu |





# Answer Sheet

## 1. Infectious Microbes

| Infectious Microbe | Disease                  |
|--------------------|--------------------------|
| Bacteria           | Chlamydia                |
| Virus              | Chickenpox, Flu, Measles |
| Fungi              | Thrush                   |

## 2. Symptoms

| Symptoms          | Disease                  |
|-------------------|--------------------------|
| Asymptomatic      | Chlamydia                |
| Fever             | Flu, Measles, Chickenpox |
| Rash              | Chickenpox, Measles      |
| Sore throat       | Flu                      |
| Whitish discharge | Chlamydia, Thrush        |

## 3. Transmission

| Transmission   | Disease                  |
|----------------|--------------------------|
| Sexual contact | Chlamydia, Thrush        |
| Touch          | Flu, Measles, Chickenpox |
| Inhalation     | Flu, Measles, Chickenpox |
| Mouth to mouth | Flu                      |

## 4. Prevention of Infection

| Prevention                 | Disease                  |
|----------------------------|--------------------------|
| Wash hands                 | Flu, Measles, Chickenpox |
| Cover coughs and sneezes   | Flu, Measles, Chickenpox |
| Use a condom               | Chlamydia, Thrush        |
| Unnecessary antibiotic use | Thrush                   |
| Vaccination                | Chickenpox, Measles, Flu |

## 5. Treatment of Infection

| Treatment    | Disease                  |
|--------------|--------------------------|
| Antibiotics  | Chlamydia                |
| Bed Rest     | Chickenpox, Measles, Flu |
| Antifungals  | Thrush                   |
| Fluid Intake | Chickenpox, Measles, Flu |





### Harmful Microbes Fill in the Blanks

| Disease    | Pathogen | Transmission  | Symptoms   | Prevention  | Treatment  | Problems  |
|------------|----------|---|--|---|--|---|
| HIV/AIDS   | Virus    | Exchange of bodily fluids (e.g. sharing needles) and breast milk from infected mother | Early - flu like symptoms. Later - immune system so damaged that get infections easily     | Barrier during intercourse, screening of blood, not sharing needles and bottle feeding.<br>No vaccine | Anti-retroviral drugs allow sufferers to live very long life.<br>Stem cell transplants (novel treatment in early stages of research and development) | Fatal if not treated. In some people, the virus has become resistant to the antiretroviral medication leading to concerns for the future of HIV treatment.            |
| Measles    | Virus    | Inhalation of droplets from sneezes and coughs  | Red rash and fever   | MMR Vaccine   | No treatment   | Can be fatal if there are complications.  |
| Salmonella | Bacteria | Contaminated food or food prepared in unhygienic conditions                           | Fever, abdominal cramps, vomiting and diarrhoea.   | Good food hygiene   | Antibiotics given to the young and very old to prevent severe dehydrations.  | Can cause long term health problems, though this is rare. The bacteria are becoming resistant to some antibiotics.  |
| Gonorrhoea | Bacteria | Sexually transmitted  | Early symptoms include yellow/green discharge from infected areas and pain when urinating. | Condoms   | Antibiotics  | If untreated can lead to infertility, ectopic pregnancy and pelvic pain. The bacteria are becoming resistant to antibiotics meaning they are more difficult to treat. |





**Harmful microbes fill in the blanks**

| Disease  | Pathogen | Transmission         | Symptoms          | Prevention  | Treatment              | Problems   |
|----------|----------|----------------------|-------------------|---|------------------------|--|
| Malaria  | Protist  | Vector - mosquito    | Flu like symptoms | Preventing mosquitos from breeding and mosquito needs treated with insecticide. | Anti-malarial drugs    | Fatal if not treated, with children under 5 the most vulnerable group. In some regions, antimalarial drug resistance has become a problem. |
| COVID-19 | Virus    | Droplet transmission | Flu like symptoms | Wearing a face cover<br>Practicing social distancing<br>COVID-19 vaccine        | Symptomatic treatments | Long term effects of disease unknown – ongoing research in this area   |





## Methicillin Resistant *Staphylococcus aureus* (MRSA)

|                         |  |
|-------------------------|--|
| <b>Infectious agent</b> | Bacterium: <i>Staphylococcus aureus</i>  |
| <b>Symptoms</b>         | Asymptomatic in healthy individuals. Can cause skin infections, infect surgical wounds, the bloodstream, the lungs, or the urinary tract in previously ill patients. |
| <b>Diagnosis</b>        | Swab and antibiotic sensitivity test.  |
| <b>Mortality Rate</b>   | High – if not given the correct antibiotics.   |
| <b>Transmission</b>     | Contagious. Direct skin contact.   |
| <b>Prevention</b>       | Regular hand washing.  |
| <b>Treatment</b>        | Resistant to many antibiotics. While some antibiotics still work, MRSA is constantly adapting.   |
| <b>History</b>          | First reported 1961, increasing problem globally.  |

## Measles

|                         |   |
|-------------------------|---|
| <b>Infectious agent</b> | Virus: <i>Paramyxovirus</i>   |
| <b>Symptoms</b>         | Fever, runny nose, red and runny eyes, a cough, a red rash and a sore, swollen throat.  |
| <b>Diagnosis</b>        | Blood sample and antibody test.   |
| <b>Mortality Rate</b>   | Low, but can be high in lower income countries, where treatment can be hard to access   |
| <b>Transmission</b>     | Contagious. Droplets from coughs and sneezes, skin contact or contact with objects that have the live virus on them.  |
| <b>Prevention</b>       | Prevention via vaccination.   |
| <b>Treatment</b>        | Bed rest and fluid intake.  |
| <b>History</b>          | Virus first reported 1911, has decreased dramatically in high and middle income countries in recent years although small epidemics do occur. Still a pandemic problem for low income countries. |

## Flu

|                         |  |
|-------------------------|--|
| <b>Infectious agent</b> | Virus: <i>Influenza</i>  |
| <b>Symptoms</b>         | Headache, fever, chills, muscle aches; possibly sore throat, cough, chest pain.      |
| <b>Diagnosis</b>        | Blood sample and antibody test.  |
| <b>Mortality Rate</b>   | Medium but higher in the very young and elderly.                                     |
| <b>Transmission</b>     | Highly contagious. Inhalation of viruses on airborne particles. Direct skin contact. |
| <b>Prevention</b>       | Vaccination against current strains.   |
| <b>Treatment</b>        | Bed rest and fluid intake. Antivirals in the elderly.                                |
| <b>History</b>          | Present for centuries, epidemics occur at regular intervals.                         |





## Thrush

|                         |   |
|-------------------------|---|
| <b>Infectious agent</b> | Fungus: <i>Candida albicans</i>   |
| <b>Symptoms</b>         | Itching, burning, soreness and white coating of the mouth or irritation of the vagina with a whitish discharge.   |
| <b>Diagnosis</b>        | Swab, microscopic examination and culturing.  |
| <b>Mortality Rate</b>   | None  |
| <b>Transmission</b>     | Person to person contact but is a normal part of the flora of the gut.  |
| <b>Prevention</b>       | Symptoms are caused by overgrowth of this fungus due to antibiotics killing off the normal protective bacteria. Therefore avoid unnecessary antibiotic use. |
| <b>Treatment</b>        | Antifungals   |
| <b>History</b>          | Almost 75% of all women have had this infection at least once.  |

## Chlamydia

|                         |   |
|-------------------------|---|
| <b>Infectious agent</b> | Bacterium: <i>Chlamydia trachomatis</i>   |
| <b>Symptoms</b>         | In many cases there are no symptoms but sometimes there is a discharge from the vagina or penis. Swollen testicles and inability to have children can also occur. |
| <b>Diagnosis</b>        | Swab or urine sample for molecular testing.   |
| <b>Mortality Rate</b>   | Rare  |
| <b>Transmission</b>     | Contagious through sexual contact.  |
| <b>Prevention</b>       | Use a condom during sexual intercourse.   |
| <b>Treatment</b>        | Antibiotics   |
| <b>History</b>          | First discovered in 1907. Global problem which is on the increase.  |

## Bacterial Meningitis

|                         |   |
|-------------------------|---|
| <b>Infectious agent</b> | Bacterium: <i>Neisseria meningitidis</i>  |
| <b>Symptoms</b>         | Headache, neck stiffness, high fever, irritability, delirium, rash.               |
| <b>Diagnosis</b>        | Spinal fluid sample and molecular testing.  |
| <b>Mortality Rate</b>   | Medium – higher risk in the young and elderly.                                    |
| <b>Transmission</b>     | Contagious, through saliva and inhalation of droplets.                            |
| <b>Prevention</b>       | Vaccination against many strains, avoid contact with infected patients.           |
| <b>Treatment</b>        | Penicillin, oxygen and fluids.  |
| <b>History</b>          | First identified as a bacteria in 1887. Regular epidemics in low income countries |





## HIV/AIDS

|                         |   |
|-------------------------|---|
| <b>Infectious agent</b> | Virus: Human immunodeficiency virus (HIV).  |
| <b>Symptoms</b>         | Failing immune system, pneumonia, lesions.  |
| <b>Diagnosis</b>        | Blood sample and antibody test.   |
| <b>Mortality Rate</b>   | Medium – high in countries where access to HIV testing and anti-HIV drugs is limited.                           |
| <b>Transmission</b>     | Highly contagious. Sexual contact, blood to blood contact, sharing of needles, mother to new born transmission. |
| <b>Prevention</b>       | Always wear a condom during sexual intercourse.   |
| <b>Treatment</b>        | There is no cure although anti-HIV drugs can prolong life expectancy.   |
| <b>History</b>          | First identified in 1983. Currently a global epidemic.  |

## Glandular fever (Kissing Disease)

|                         |  |
|-------------------------|--|
| <b>Infectious agent</b> | Virus: <i>Epstein Barr</i>   |
| <b>Symptoms</b>         | Sore throats, swollen lymph glands, extreme tiredness.   |
| <b>Diagnosis</b>        | Blood sample and antibody test.  |
| <b>Mortality Rate</b>   | Low  |
| <b>Transmission</b>     | Not very contagious. Direct contact such as kissing and sharing drinks.  |
| <b>Prevention</b>       | Avoid direct contact with infected patients.   |
| <b>Treatment</b>        | Bed rest and fluid intake, paracetamol can be used to relieve the pain.  |
| <b>History</b>          | First described in 1889, 95% population have had the infection, however, only 35% develop symptoms. Occasional isolated outbreaks. |

## Chickenpox

|                         |   |
|-------------------------|---|
| <b>Infectious agent</b> | Virus: <i>Varicella-zoster</i>  |
| <b>Symptoms</b>         | Blistering rash on the body and head.   |
| <b>Diagnosis</b>        | Blood sample and antibody test.   |
| <b>Mortality Rate</b>   | Low   |
| <b>Transmission</b>     | Highly contagious. Direct skin contact or inhalation of droplets from sneezing and coughing.                              |
| <b>Prevention</b>       | Prevention by vaccine.  |
| <b>Treatment</b>        | Bed rest and fluid intake, antivirals in some adult cases.  |
| <b>History</b>          | First identified in 1865. Decreased in countries where vaccination programmes have been implemented. No change elsewhere. |





## Measles

|                     |   |
|---------------------|---|
| <b>Microbe</b>      | Virus: <i>Paramyxovirus</i>   |
| <b>Symptoms</b>     | Fever, runny nose, red and runny eyes, a cough, a red rash and a sore, swollen throat.          |
| <b>Transmission</b> | Spread in coughs and sneezes.<br>Skin contact.<br>Touching objects with the live virus on them. |
| <b>Prevention</b>   | Vaccination.<br>Hand washing.   |
| <b>Treatment</b>    | Bed rest and fluid intake.  |

## Flu

|                     |   |
|---------------------|---|
| <b>Microbe</b>      | Virus: <i>Influenza</i>   |
| <b>Symptoms</b>     | Headache, fever, chills, muscle aches; possibly sore throat, cough, chest pain.         |
| <b>Transmission</b> | Spread in coughs and sneezes.<br>Breathing in virus in the air.<br>Direct skin contact. |
| <b>Prevention</b>   | Vaccination against current strains.  |
| <b>Treatment</b>    | Bed rest and fluid intake. Antivirals in the elderly.                                   |

## Thrush

|                     |  |
|---------------------|--|
| <b>Microbe</b>      | Fungus: <i>Candida albicans</i>  |
| <b>Symptoms</b>     | Itching.<br>Burning.<br>Soreness.<br>White coating in the mouth or irritation of the vagina with a whitish discharge.                  |
| <b>Transmission</b> | Person to person contact.  |
| <b>Prevention</b>   | The fungus that causes symptoms can grow better when our natural bacteria are killed off. Therefore, avoid unnecessary antibiotic use. |
| <b>Treatment</b>    | Antifungals  |







## Chlamydia

|                     |  |
|---------------------|--|
| <b>Microbe</b>      | Bacterium: <i>Chlamydia trachomatis</i>  |
| <b>Symptoms</b>     | In many cases there are no symptoms but sometimes there is a discharge from the vagina or penis.<br>Swollen testicles.<br>Inability to have children can also occur. |
| <b>Transmission</b> | Sexual contact.  |
| <b>Prevention</b>   | Use a condom during sexual intercourse.  |
| <b>Treatment</b>    | Antibiotics  |

## Chickenpox

|                     |   |
|---------------------|---|
| <b>Microbe</b>      | Virus: <i>Varicella-zoster</i>  |
| <b>Symptoms</b>     | Blistering rash on the body and head.   |
| <b>Transmission</b> | Direct skin contact.<br>Spread in coughs and sneezes.<br>Breathing in virus in the air. |
| <b>Prevention</b>   | Prevention by vaccine.<br>Handwashing.  |
| <b>Treatment</b>    | Bed rest and fluid intake, antivirals in some adult cases.                              |





# Disease Match

## 1. Infectious Microbes

| Infectious Microbe | Disease |
|--------------------|---------|
| Bacteria           |         |
| Virus              |         |
| Fungi              |         |

## 2. Symptoms

| Symptoms          | Disease |
|-------------------|---------|
| Asymptomatic      |         |
| Fever             |         |
| Rash              |         |
| Sore throat       |         |
| Tiredness         |         |
| Lesions           |         |
| Whitish discharge |         |

### Procedure

- 1 Group your disease cards according to the heading in each box.
- 2 Do you notice any similarities or differences between the diseases based on each of the headings?

## 3. Transmission

| Transmission   | Disease |
|----------------|---------|
| Sexual contact |         |
| Blood          |         |
| Touch          |         |
| Inhalation     |         |
| Mouth to mouth |         |

## 4. Prevention of Infection

| Prevention                       | Disease |
|----------------------------------|---------|
| Wash hands                       |         |
| Cover coughs and sneezes         |         |
| Use a condom                     |         |
| Avoid unnecessary antibiotic use |         |
| Vaccination                      |         |

## 5. Treatment of Infection

| Treatment    | Disease |
|--------------|---------|
| Antibiotics  |         |
| Bed Rest     |         |
| Antifungals  |         |
| Fluid Intake |         |





# Disease Match

## 1. Infectious Microbes

| Infectious Microbe | Disease          |
|--------------------|------------------|
| Bacteria           | <i>Chlamydia</i> |
| Virus              | 1                |
|                    | 2                |
|                    | 3                |
| Fungi              | 1                |

## 2. Symptoms

| Symptoms          | Disease |
|-------------------|---------|
| Asymptomatic      | 1       |
| Fever             | 1       |
|                   | 2       |
|                   | 3       |
| Rash              | 1       |
|                   | 2       |
| Sore throat       | 1       |
| Whitish discharge | 1       |
|                   | 2       |

## 3. Transmission

| Transmission   | Disease |
|----------------|---------|
| Sexual contact | 1       |
|                | 2       |
| Touch          | 1       |
|                | 2       |
|                | 3       |
| Inhalation     | 1       |
|                | 2       |
|                | 3       |
| Mouth to mouth | 1       |

## 4. Prevention of Infection

| Prevention                       | Disease |
|----------------------------------|---------|
| Wash hands                       | 1       |
|                                  | 2       |
|                                  | 3       |
| Cover coughs and sneezes         | 1       |
|                                  | 2       |
|                                  | 3       |
| Use a condom                     | 1       |
|                                  | 2       |
| Avoid unnecessary antibiotic use | 1       |
| Vaccination                      | 1       |
|                                  | 2       |
|                                  | 3       |

## 5. Treatment of Infection

| Treatment    | Disease |
|--------------|---------|
| Antibiotics  | 1       |
| Bed Rest     | 1       |
|              | 2       |
|              | 3       |
| Antifungals  | 1       |
| Fluid Intake | 1       |
|              | 2       |
|              | 3       |

### Procedure

- 1 Use the information sheets to find out which disease should go in each empty box below. This has been started for you.
- 2 Do you notice any similarities or differences between the diseases?





### Harmful Microbes Fill in the Blanks

| Disease    | Pathogen | Transmission  | Symptoms   | Prevention | Treatment  | Problems  |
|------------|----------|---|--|------------|--|---|
| HIV/AIDS   |          | Exchange of bodily fluids (e.g. sharing needles) and breast milk from infected mother |  |            | Anti-retroviral drugs allow sufferers to live very long life.<br>Stem cell transplants (novel treatment in early stages of research and development) |   |
| Measles    |          |   |  |            | No treatment   | Can be fatal if there are complications.  |
| Salmonella |          | Contaminated food or food prepared in unhygienic conditions                           |  |            | Antibiotics given to the young and very old to prevent severe dehydrations.  |   |
|            | Bacteria | Sexually transmitted  | Early symptoms include yellow/green discharge from infected areas and pain when urinating. | Condoms    | Antibiotics  | If untreated can lead to infertility, ectopic pregnancy and pelvic pain. The bacteria are becoming resistant to antibiotics meaning they are more difficult to treat. |





### Harmful Microbes Fill in the Blanks

| Disease  | Pathogen | Transmission | Symptoms          | Prevention   | Treatment           | Problems   |
|----------|----------|--------------|-------------------|--|---------------------|--|
| Malaria  |          |              | Flu like symptoms |  | Anti-malarial drugs |  |
| COVID-19 |          |              |                   | Wearing a face cover<br>Practicing social distancing<br>COVID-19 vaccine |                     | Long term effects of disease unknown - ongoing research in this area |

