Pathogens and Disease
Pathogens and disease

Transmission and defence

Growth and infection

Incidence

Treatment of disease

Summary activities
Some micro-organisms are pathogens

Organisms that cause disease are called **pathogens**.

What are the four major types of pathogen?

- **bacteria**
- **fungi**
- **virus**
- **protozoa**
Diseases caused by pathogens

Match each pathogen to its image and the diseases it may cause.

Can you remember what examples of each of the main types of pathogen look like? Do you know the diseases associated with each type? Press on an object in each row to match up the correct answers.

Press "start" to begin.
How pathogens enter the body

Pathogens must enter the body in order to cause infection.

They can enter the body:

- through the **nose**, for example airborne micro-organisms
- through the **mouth**, for example contaminated water or contaminated food
- through the **skin**, for example insect bites, cuts or infected needles
- via the **reproductive organs**, for example in the semen.
Different pathogens have different transmission routes. Brainstorm the ways that pathogens can be transmitted, and think about which diseases are spread using each method. Then press on the buttons in this mind map to check your ideas. Press "start" to begin.
Preventing transmission of disease
Plants defend themselves too

Plants, as well as animals, can be attacked by pathogens. Plant diseases caused by pathogens include blight and root rot.

Some plants produce chemicals to protect themselves from pathogenic disease. In some cases, these substances can be used to treat human disease. Examples include:

- salicylic acid, on which aspirin is based
- quinine used to treat cramp and malaria
- opiate painkillers, like morphine and codeine.
Pathogens and disease

Transmission and defence

Growth and infection

Incidence

Treatment of disease

Summary activities
What happens when a pathogen enters your body?

The pathogen begins to reproduce and may make toxins. The pathogen or toxins may destroy the body’s cells and make you feel unwell.

Painkillers can relieve the symptoms of an infection but do not kill the pathogen. Your immune system must begin to mount an attack.
How do pathogens cause illness?

The stages of an infectious disease include:

Entry
Pathogens enter the body via food, water, airborne droplets, contact, etc.

Reproduction
The number of pathogens rapidly increases. This can damage a cell, even causing it to burst.

Toxins
The pathogens will produce toxins. These are harmful substances that poison the body’s tissues and enzymes.

Immune response and symptoms
Symptoms of the infection will appear as a result of the accumulation of toxins, for example as a fever.
Bacteria can reproduce rapidly in warm, moist environments like the human body. How does temperature affect the growth rate of \( E. coli \) bacteria? Drag the temperature on the thermometer to 15\(^\circ\)C, 37\(^\circ\)C and 46\(^\circ\)C to compare the growth rates. Press "start" to begin.
Pathogens and disease

Transmission and defence

Growth and infection

Incidence

Treatment of disease

Summary activities
The incidence of a disease refers to the number of new cases of a disease in a given period of time.

Press the buttons to find out more information and to look at data relating to the incidence of influenza, food poisoning and cholera.

What does each graph suggest about the chance of infection?
Factors affecting disease

The spread of diseases like cholera and food poisoning can increase after natural disasters, such as earthquakes.

Why do you think this is?

- Those left without homes may migrate to safer areas and transfer pathogens.
- Damaged infrastructure disrupts the health services, meaning injured people are left untreated.
- Damaged water and sewage systems allow pathogens to spread more easily via water, food and poor sanitation.
- A lack of electricity may result in food decay.
Pathogens and disease

Transmission and defence

Growth and infection

Incidence

Treatment of disease

Summary activities
Combating infection

The pathogen or the toxins that they produce may destroy the body’s cells and make the person feel unwell.

What are treatments for illness?

- Some medicines, like painkillers, relieve the symptoms of an infection but do not kill the pathogen.

- Some drugs, like **antibiotics**, help to combat the illness by killing bacteria.

To prevent the spread of illness in hospitals, **antiseptics** are used to keep surfaces clean, equipment is sterilized or thrown away after use and medical staff wash their hands.
Scientists in the treatment of disease

Some pioneering work in medicine recognized that antibiotics and antiseptics can be used to control disease.

Click on the buttons below to find out more about each scientist and their discovery.
Antibiotics are powerful medicines that help to cure many diseases by **killing bacteria** inside the body.

There are different types of antibiotic, including penicillin. Not all antibiotics can be used to kill the same bacteria.

If these drugs had not been available during World War II, at least 300,000 more people would have died.

However, antibiotics do **not** affect viruses so cannot be used to treat viral infections.
## Chemicals that fight infection

### Are these statements about treating infections true or false?

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>All bacteria can be treated by the same antibiotics.</td>
<td>?</td>
</tr>
<tr>
<td>2.</td>
<td>Antibiotics can be used to kill viral pathogens, which live and reproduce inside cells.</td>
<td>?</td>
</tr>
<tr>
<td>3.</td>
<td>Penicillin is one kind of antibiotic, but there are also other types.</td>
<td>?</td>
</tr>
<tr>
<td>4.</td>
<td>Fleming discovered that some bacteria cause disease, and heat can be used to kill bacteria.</td>
<td>?</td>
</tr>
<tr>
<td>5.</td>
<td>Antibiotics have dramatically reduced the number of deaths from infectious diseases.</td>
<td>?</td>
</tr>
</tbody>
</table>
What are superbugs?

Some species of bacteria can double in number every 15–20 minutes. When bacteria divide, random changes called mutations sometimes occur in their genes.

The mutant and normal bacteria are subject to natural selection. Mutations that offer competitive advantages spread rapidly through the population.

A common type of mutation amongst bacteria is to develop resistance to an antibiotic. This means the antibiotic will become much less effective, or not work at all. If bacteria become resistant to several antibiotics, they are known as ‘superbugs’.
How do bacteria become resistant to antibiotics and turn into superbugs?

Press "start" to find out.

start
Antibiotic-resistant strains of bacteria

How can resistant strains of bacteria develop?

Sometimes our actions can lead to antibiotic-resistant strains of bacteria developing. Drag these sentences into the correct order.

Press "start" to begin.

start
Using antibiotics sensibly

Due to the emergence of antibiotic resistance, several methods of prevention and control have been adopted:

- Patients should finish the complete course of antibiotics – if not, there is a risk that any remaining resistant bacteria will survive and multiply.

- Patients should only be prescribed antibiotics if their body is unable to fight the infection itself.

- Reserve stronger antibiotics for serious infections – this will reduce the risk of the development of resistance.
Pathogens and disease

Transmission and defence

Growth and infection

Incidence

Treatment of disease

Summary activities
**antibiotic** – antibiotic – A chemical that either kills bacteria or inhibits their growth.

**antiseptic** – A chemical used to kill microbes outside the body.

**bacteria** – A type of pathogen that can cause diseases including cholera and tuberculosis.

**cholera** – Cholera is an acute infection of the gut caused by bacteria and leads to diarrhoea and vomiting.
Anagrams relating to pathogens and disease

How quickly can you unscramble words about pathogens and disease?

Press "start" to begin.

start

clue
Can you fight your way through this quiz about pathogens and disease?

Press "start" to begin.