Combatting Infection
Combatting Infection

- Ignaz Semmelweis
- Antibiotics
- Resistance to antibiotics
- Fighting infections
- Summary activities
Ignaz Semmelweis was a doctor who worked in Vienna in the 1840s. Semmelweis recognized the importance of handwashing in the prevention of spreading some infectious diseases.

Press on each tab to find out more about Semmelweis's discovery.
When Semmelweis left the hospital, staff stopped washing their hands again and death rates rose back up. Why do you think this was? Press on each person to find out why Semmelweis's findings were initially disregarded. Press "start" to begin.
Antiseptics in hospitals

Although Semmelweis’s ideas initially faced opposition, they were later developed by scientists such as Lister, Pasteur and Koch.

Together, these ideas helped to inform the **germ theory** of disease which we accept today.

In modern hospitals, antiseptics are widely used to keep surfaces clean, equipment is sterilized or thrown away after use and all medical staff wash their hands.
Combatting Infection

- Ignaz Semmelweis
- Antibiotics
  - Resistance to antibiotics
  - Fighting infections
  - Summary activities
Some drugs, like antibiotics, actually help to combat the illness by killing pathogens.
What are antibiotics?

**Antibiotics** are powerful medicines that help to cure many diseases by killing bacteria inside the body.

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

Many people in the world would not be alive today without antibiotics.

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

Antibiotics cannot be used to kill viruses, as viruses replicate inside human cells. This means that the antibiotic cannot reach a virus to kill it.

Alison has had the flu for a few days.

She goes to the doctor and asks for antibiotics to help her get better.

If you were the doctor, what would you say?
### 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>Antifungals are used to treat bacterial infections.</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>
Combatting Infection

- Ignaz Semmelweis
- Antibiotics
- Resistance to antibiotics
- Fighting infections
- Summary activities
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.
Antibiotic-resistant strains of bacteria

How can resistant strains of bacteria develop?

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

2. Resistant strains of bacteria are hard to kill with antibiotics.

3. A bacterium has a gene that codes for a protein that confers antibiotic resistance.

4. Antibiotics are widely used without a prescription.

5. Bacteria are everywhere and always present on our skin.

6. Press "start" to begin.
Using antibiotics sensibly

If you are prescribed antibiotics but do not finish your course of treatment, there is a risk that any remaining resistant bacteria will survive and multiply.

It is also important only to take antibiotics if your body is unable to fight an infection itself.

These days, antibiotics might not be used at all for mild infections. The strongest antibiotics should be reserved only for the most serious infections, in order to try and prevent resistance to them occurring.
## True or false?

Are these statements about antibiotics true or false?

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>There is currently a wide range of drugs that can treat antibiotic-resistant bacteria.</td>
<td>?</td>
</tr>
<tr>
<td>2.</td>
<td>You can stop taking antibiotics as soon as you feel better.</td>
<td>?</td>
</tr>
<tr>
<td>3.</td>
<td>Antibiotics are useful for treating colds and flu.</td>
<td>?</td>
</tr>
<tr>
<td>4.</td>
<td>You should disinfect your hands if you visit a hospital.</td>
<td>?</td>
</tr>
<tr>
<td>5.</td>
<td>You should take strong antibiotics as soon as you feel ill.</td>
<td>?</td>
</tr>
</tbody>
</table>

Buttons: true, false.
MRSA is ‘Methicillin-resistant Staphylococcus aureus’ – a bacterium that is resistant to several antibiotics.

About 30% of the population carry MRSA without any symptoms. In hospital patients, however, it can cause pneumonia, blood poisoning and even death.

The antibiotic vancomycin is used to treat MRSA infection, but resistance to this has evolved, creating VRSA.
Combatting Infection

- Ignaz Semmelweis
- Antibiotics
- Resistance to antibiotics
  - Fighting infections
  - Summary activities
Viruses and bacteria have mutated in the past, leading to outbreaks of disease. This noticeboard contains information about the Spanish Flu **pandemic** of 1918–1919. Begin by reading the information sheet in this activity, and then analyse the photos shown. Press on each image to see it enlarged. Press "**start**" to begin.
The future fight against infection

Press a button to find out more information about research into antibiotic-resistant bacteria

- deaths from MRSA
- current research
MRSA bacteria are resistant to many antibiotics and can cause serious infections when they infect wounds. These wounds can now be treated with wound dressings that are coated with a **bacteriophage**.

A bacteriophage is a virus that naturally infects bacteria, but which is harmless to humans.

The bacteriophage reproduces inside the bacterial cells, killing them and preventing infection.
When handling micro-organisms, it is important that any samples or equipment used are free from contamination.

Micro-organisms grow on **culture media**, such as agar jelly. Both the culture media and the Petri dishes it is poured into must be sterilized.

Inoculating loops must be sterilized by passing them through the flame of a Bunsen burner. Once the loop has cooled, it can be used to inoculate the Petri dish.

Petri dish lids should be sealed with tape to prevent the culture from being contaminated by micro-organisms in the air.
What risks can you identify in this microbiology lab? Press on each risk to reveal information. There are six to find in total. Press "start" to begin.
Combatting Infection

- Ignaz Semmelweis
- Antibiotics
- Resistance to antibiotics
- Fighting infections
- Summary activities
Glossary of keywords: combatting infection

**agar** – A jelly that microbes are grown on.

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

**antifungal** – A chemical used to kill fungus inside the body.

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

**autopsy** – An examination of a dead body to try and find
Can you resist this infectious quiz? See how much you know about combatting infection.

Press "start" to begin.