


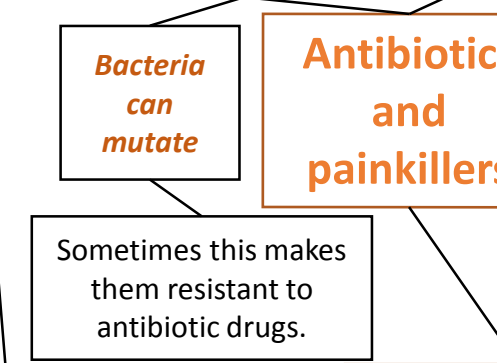


Most new drugs are synthesised by chemists in the pharmaceutical industry. However, the starting point may still be a chemical extracted from a plant

Traditionally drugs were extracted from plants and microorganisms		
<i>Digitalis</i>	<i>Aspirin</i>	<i>Penicillin</i>
Extracted from foxglove plants and used as a heart drug	A painkiller and anti-inflammatory that was first found in willow bark	Discovered by Alexander Fleming from the <i>Penicillium</i> mould and used as an antibiotic
		

**New medical drugs have to be tested and trialled before being used to check they are safe and effective**

**The emergence of bacterial strains resistant to antibiotics is of great concern**



**Use of antibiotics has greatly reduced deaths from infectious bacterial disease**

<b>antibiotics</b>	<i>e.g. penicillin</i>	Drugs that help cure bacterial disease by killing infective bacteria inside the body. Specific bacterial infections require specific antibiotics.	Antibiotics cannot be used to treat viral pathogens
<b>Painkillers and other medicines</b>	<i>e.g. aspirin, paracetamol, ibuprofen</i>	Drugs that are used to treat the symptoms of a disease. They do not kill pathogens	It is difficult to develop drugs to kill viruses without harming body tissues because viruses live and reproduce inside cells

**AQA INFECTION AND RESPONSE**

**Discovery and drug development**

**Vaccination**

**Vaccination can be used to immunise a large proportion of the population to prevent the spread of a pathogen**

**New drugs are extensively tested for:**

<b>Efficacy</b>	Make sure the drug works
<b>Toxicity</b>	Check that the drug is not poisonous
<b>Dose</b>	The most suitable amount to take



In a double blind trial the patients and scientists do not know who receives the new drug or placebo until the end of the trial. This avoids bias

Preclinical trials - using cells, tissues and live animals - must be carried out before the drug can be tested on humans.

**Clinical trials use healthy volunteers and patients**

<b>Vaccination</b>	<i>A vaccine contains a small amount of dead or inactive form of the pathogen than can be introduced into the body</i>	<b>1<sup>st</sup> infection by pathogen</b>	White blood cells detect pathogens in the vaccine. Antibodies are released into the blood. Pathogens are destroyed by the antibodies.	Vaccination means that a person is unlikely to suffer the symptoms of the harmful disease and it's spread in a population is prevented
		<b>Re-infection by the same pathogen</b>	White blood cells detect pathogens. Antibodies are made and released into the blood much faster and in larger amounts. Pathogens are destroyed by the antibodies much faster.	

Monoclonal antibodies create more side effects than expected (fatal in some cases) and are not as widely used as everybody hoped when first developed.

Stage 1	Stage 2	Stage 3	Stage 4
Healthy volunteers try small dose of the drug to check it is safe record any side effects	A small number of patients try the drug at a low dose to see if it works	A larger number of patients take the new drug and different doses are trialled to find the optimum dose	A double blind trial will occur to see how effective the new drug is. The patients are divided into groups. Some will be given the drug and some a placebo.

**Monoclonal antibodies (Biology HT)**

A placebo can look identical to the new drug but contain no active ingredients




<b>Monoclonal antibodies</b>	<i>Identical copies of one types of antibody produced in laboratory</i>	<ol style="list-style-type: none"> <li>1. A mouse is injected with pathogen</li> <li>2. Lymphocytes produce antibodies</li> <li>3. Lymphocytes are removed from the mouse and fused with rapidly dividing mouse tumour cells</li> <li>4. The new cells are called hybridomas</li> <li>5. The hybridomas divide rapidly and release lots of antibodies which are then collected</li> </ol>
------------------------------	---	---

**Monoclonal antibodies can be used in a variety of ways**

<i>Diagnosis</i>	<i>Detecting pathogens</i>	<i>Detecting molecules</i>	<i>Treatment</i>
e.g. pregnancy test – measure the level of hormones	Can detect very small quantities of chemicals in the blood	Fluorescent dye can be attached so it can be seen inside cells or tissues	Bound to radioactive substance, toxic drug or chemical which stops cancer cells growing and dividing. Cancer cells are targeted to normal body cells are unharmed

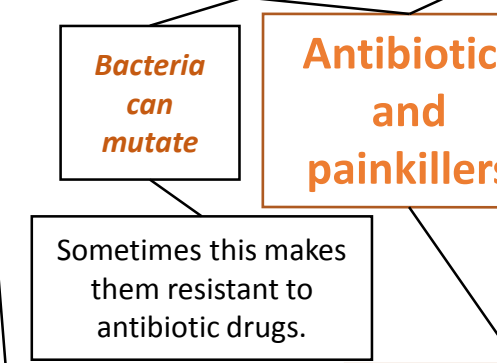
Monoclonal antibodies are specific to one binding site on the antigen. This means monoclonal antibodies can target specific chemicals or cells in the body

Most new drugs are synthesised by chemists in the pharmaceutical industry. However, the starting point may still be a chemical extracted from a plant

<i>Digitalis</i>	<i>Aspirin</i>	<i>Penicillin</i>
Extracted from foxglove plants and used as a heart drug	A painkiller and anti-inflammatory that was first found in willow bark	Discovered by Alexander Fleming from the <i>Penicillium</i> mould and used as an antibiotic
		

**New medical drugs have to be tested and trialled before being used to check they are safe and effective**

**The emergence of bacterial strains resistant to antibiotics is of great concern**



**Use of antibiotics has greatly reduced deaths from infectious bacterial disease**

	<i>e.g. penicillin</i>	Drugs that help cure bacterial disease by killing infective bacteria inside the body. Specific bacterial infections require specific antibiotics.
	<i>e.g. aspirin, paracetamol, ibuprofen</i>	Drugs that are used to treat the symptoms of a disease. They do not kill pathogens

Antibiotics cannot be used to treat viral pathogens

It is difficult to develop drugs to kill viruses without harming body tissues because viruses live and reproduce inside cells

**AQA INFECTION AND RESPONSE**

**Discovery and drug development**

**Vaccination**

**Vaccination can be used to immunise a large proportion of the population to prevent the spread of a pathogen**

<b>Efficacy</b>	Make sure the drug works
<b>Toxicity</b>	Check that the drug is not poisonous
<b>Dose</b>	The most suitable amount to take



In a double blind trial the patients and scientists do not know who receives the new drug or placebo until the end of the trial. This avoids bias

Preclinical trials - using cells, tissues and live animals - must be carried out before the drug can be tested on humans.

<i>A vaccine contains a small amount of dead or inactive form of the pathogen than can be introduced into the body</i>	<b>1<sup>st</sup> infection by pathogen</b>	White blood cells detect pathogens in the vaccine. Antibodies are released into the blood. Pathogens are destroyed by the antibodies.
	<b>Re-infection by the same pathogen</b>	White blood cells detect pathogens. Antibodies are made and released into the blood much faster and in larger amounts. Pathogens are destroyed by the antibodies much faster.

Vaccination means that a person is unlikely to suffer the symptoms of the harmful disease and it's spread in a population is prevented

Monoclonal antibodies create more side effects than expected (fatal in some cases) and are not as widely used as everybody hoped when first developed.

<i>Stage 1</i>	<i>Stage 2</i>	<i>Stage 3</i>	<i>Stage 4</i>
Healthy volunteers try small dose of the drug to check it is safe record any side effects	A small number of patients try the drug at a low dose to see if it works	A larger number of patients take the new drug and different doses are trialled to find the optimum dose	A double blind trial will occur to see how effective the new drug is. The patients are divided into groups. Some will be given the drug and some a placebo.

**Monoclonal antibodies (Biology HT)**

A placebo can look identical to the new drug but contain no active ingredients




- Identical copies of one types of antibody produced in laboratory**
1. A mouse is injected with pathogen
  2. Lymphocytes produce antibodies
  3. Lymphocytes are removed from the mouse and fused with rapidly dividing mouse tumour cells
  4. The new cells are called hybridomas
  5. The hybridomas divide rapidly and release lots of antibodies which are then collected

Monoclonal antibodies are specific to one binding site on the antigen. This means monoclonal antibodies can target specific chemicals or cells in the body

<i>Diagnosis</i>	<i>Detecting pathogens</i>	<i>Detecting molecules</i>	<i>Treatment</i>
e.g. pregnancy test – measure the level of hormones	Can detect very small quantities of chemicals in the blood	Fluorescent dye can be attached so it can be seen inside cells or tissues	Bound to radioactive substance, toxic drug or chemical which stops cancer cells growing and dividing. Cancer cells are targeted to normal body cells are unharmed



Most new drugs are synthesised by chemists in the pharmaceutical industry. However, the starting point may still be a chemical extracted from a plant

Extracted from foxglove plants and used as a heart drug	A painkiller and anti-inflammatory that was first found in willow bark	Discovered by Alexander Fleming from the <i>Penicillium</i> mould and used as an antibiotic
		

**New medical drugs have to be tested and trialled before being used to check they are safe and effective**

**The emergence of bacterial strains resistant to antibiotics is of great concern**

**Antibiotics and painkillers**

Sometimes this makes them resistant to antibiotic drugs.

**Use of antibiotics has greatly reduced deaths from infectious bacterial disease**

		Drugs that help cure bacterial disease by killing infective bacteria inside the body. Specific bacterial infections require specific antibiotics.
		Drugs that are used to treat the symptoms of a disease. They do not kill pathogens

Antibiotics cannot be used to treat viral pathogens

It is difficult to develop drugs to kill viruses without harming body tissues because viruses live and reproduce inside cells

**AQA INFECTION AND RESPONSE**

**Discovery and drug development**

**Vaccination**

**Vaccination can be used to immunise a large proportion of the population to prevent the spread of a pathogen**

	Make sure the drug works
	Check that the drug is not poisonous
	The most suitable amount to take



In a double blind trial the patients and scientists do not know who receives the new drug or placebo until the end of the trial. This avoids bias

Preclinical trials - using cells, tissues and live animals - must be carried out before the drug can be tested on humans.

	White blood cells detect pathogens in the vaccine. Antibodies are released into the blood. Pathogens are destroyed by the antibodies.
	White blood cells detect pathogens. Antibodies are made and released into the blood much faster and in larger amounts. Pathogens are destroyed by the antibodies much faster.

Vaccination means that a person is unlikely to suffer the symptoms of the harmful disease and its spread in a population is prevented

Monoclonal antibodies create more side effects than expected (fatal in some cases) and are not as widely used as everybody hoped when first developed.

Healthy volunteers try small dose of the drug to check it is safe record any side effects	A small number of patients try the drug at a low dose to see if it works	A larger number of patients take the new drug and different doses are trialled to find the optimum dose	A double blind trial will occur to see how effective the new drug is. The patients are divided into groups. Some will be given the drug and some a placebo.
---	--	---	---

**Monoclonal antibodies (Biology HT)**

A placebo can look identical to the new drug but contain no active ingredients

1. A mouse is injected with pathogen
2. Lymphocytes produce antibodies
3. Lymphocytes are removed from the mouse and fused with rapidly dividing mouse tumour cells
4. The new cells are called hybridomas
5. The hybridomas divide rapidly and release lots of antibodies which are then collected

Monoclonal antibodies are specific to one binding site on the antigen. This means monoclonal antibodies can target specific chemicals or cells in the body

e.g. pregnancy test – measure the level of hormones	Can detect very small quantities of chemicals in the blood	Fluorescent dye can be attached so it can be seen inside cells or tissues	Bound to radioactive substance, toxic drug or chemical which stops cancer cells growing and dividing. Cancer cells are targeted to normal body cells are unharmed

Most new drugs are synthesised by chemists in the pharmaceutical industry. However, the starting point may still be a chemical extracted from a plant



**New medical drugs have to be tested and trialled before being used to check they are safe and effective**

**The emergence of bacterial strains resistant to antibiotics is of great concern**

**Antibiotics and painkillers**

Sometimes this makes them resistant to antibiotic drugs.

**Use of antibiotics has greatly reduced deaths from infectious bacterial disease**

Antibiotics cannot be used to treat viral pathogens

It is difficult to develop drugs to kill viruses without harming body tissues because viruses live and reproduce inside cells

**AQA INFECTION AND RESPONSE**

**Discovery and drug development**

**Vaccination**

**Vaccination can be used to immunise a large proportion of the population to prevent the spread of a pathogen**




Preclinical trials - using cells, tissues and live animals - must be carried out before the drug can be tested on humans.

In a double blind trial the patients and scientists do not know who receives the new drug or placebo until the end of the trial. This avoids bias


Vaccination means that a person is unlikely to suffer the symptoms of the harmful disease and it's spread in a population is prevented

Monoclonal antibodies create more side effects than expected (fatal in some cases) and are not as widely used as everybody hoped when first developed.


**Monoclonal antibodies (Biology HT)**

A placebo can look identical to the new drug but contain no active ingredients



Monoclonal antibodies are specific to one binding site on the antigen. This means monoclonal antibodies can target specific chemicals or cells in the body