



Most new drugs are synthesised by chemists in the pharmaceutical industry.

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
		

Drugs have to be tested and trialled before to check they are safe and effective

New drugs are extensively tested for:	<i>Efficacy</i>	Make sure the drug works
	<i>Toxicity</i>	Check that the drug is not poisonous
	<i>Dose</i>	The most suitable amount to take

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

<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; different doses are trialled to find the optimum dose	A double blind trial will occur. The patients are divided into groups. Some will be given the drug and some a placebo.

Specific to one binding site on the antigen. Can target specific chemicals or cells in the body

Monoclonal antibodies
(Biology only HT)



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

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

Monoclonal antibodies	<i>Identical copies of one types of antibody produced in laboratory</i>	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

Antibiotics and painkillers

Bacteria can mutate

Sometimes this makes them resistant to antibiotic drugs.

Discovery and drug development

AQA INFECTION AND RESPONSE

Antibiotics have greatly reduced deaths from infectious bacterial disease

antibiotics	<i>e.g. penicillin</i>	Kill infective bacteria inside the body. Specific bacterial infections require specific antibiotics.
Painkillers and other medicines	<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

Vaccination

Used to immunise a large proportion of the population to prevent the spread of a pathogen

Vaccination	<i>Small amount of dead or inactive form of the pathogen</i>	<i>1st infection by pathogen</i>	White blood cells detect pathogens in the vaccine. Antibodies are released into the blood.
		<i>Re-infection by the same pathogen</i>	White blood cells detect pathogens. Antibodies are made much faster and in larger amounts.

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

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

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 Cancer cells are targeted to normal body cells are unharmed