

# Biology 3: Infection and Response

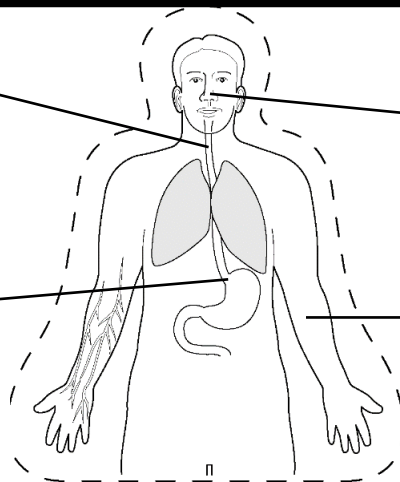
## Section 1: Pathogens and Diseases

Disease	Pathogen	How it is spread	Effect	Prevention/ Control
1 Measles	Virus	Droplets from sneezes and coughs	Can be fatal	Vaccination of children
2 HIV	Virus	Sexual contact, needle exchange	Damages some white blood cells	Antiretroviral drugs when infected
3 Tobacco Mosaic Virus	Virus	Direct contact	Mottling of leaves, reduces photosynthesis	
4 Salmonella	Bacteria	Infected food	Fever, abdominal cramps, diarrhoea, vomiting	Vaccination of poultry (chickens).
5 Gonorrhoea	Bacteria	Sexual contact	Discharge from penis/vagina, pain when urinating	Controlled by antibiotics. Spread prevented by condoms.
6 Rose Black Spot	Fungus	Spores carried by water or wind	Leaves turn yellow, fall early. Photosynthesis reduced.	Treated by fungicides or destroying affected leaves.
7 Malaria	Protist	By a vector – mosquito	Fever, can be fatal.	Preventing mosquitos from breeding, using mosquito nets.

## Section 2: Non-Specific Defences

**8 Trachea and Bronchi**  
Produces **mucus** to trap pathogens.  
Contains **cilia** to move mucus for swallowing

**10 Stomach**  
Contains **hydrochloric acid** to destroy pathogens.



**9 Nose**  
Contains **hairs** and **mucus** to trap pathogens

**11 Skin**  
A **physical barrier** to pathogens.

## Section 3: Key terms

12 Pathogen	A <b>microorganism</b> that <b>causes disease</b> .
13 Bacteria	A type of <b>pathogen</b> that <b>produces toxins that damage tissues</b> .
14 Viruses	A type of <b>pathogen</b> that <b>lives and replicates within cells</b> and causes <b>cell damage</b> . It is <b>difficult to kill viruses without damaging cells</b> .
15 Antibodies	Some white blood cells (lymphocytes) produce antibodies. These <b>bind to pathogens</b> and <b>destroy them</b> or <b>stick them together</b> .
16 Antitoxins	Some white blood cells (lymphocytes) produce antitoxins. Antitoxins <b>neutralise toxins</b> .
17 Antibiotics	Antibiotics <b>kill bacteria</b> . <b>Specific antibiotics</b> should be used for <b>specific bacteria</b> . <b>Some bacteria are resistant</b> to antibiotics. <b>Do not kill viruses</b> .
18 Painkillers	Painkillers <b>relieve symptoms</b> but <b>don't kill pathogens</b> .
19 Phagocytosis	Some white blood cells (phagocytes) <b>engulf, ingest and digest pathogens</b> .

## Section 4: Drugs

22 Aspirin	Originates from the <b>willow</b> tree.
23 Digitalis	A <b>heart drug</b> . Originates from <b>foxglove</b> plants.
24 Penicillin	Discovered by Alexander Fleming from the <b>Penicillium</b> fungus.
25 New drugs	Most new drugs are <b>synthesised by chemists in the pharmaceutical industry</b> . The <b>starting point</b> may be a <b>chemical extracted from a plant</b> .

### 20 Natural Immunity

Pathogen enters body

The correct white blood cell is found

Antibodies are produced

The white blood cells remain as memory cells

If the pathogen returns, antibodies will be produced quickly

### 21 Vaccination

Dead or weakened pathogen is injected

The correct white blood cell is found

Antibodies are produced

The white blood cells remain as memory cells

If the pathogen returns, antibodies will be produced quickly

## Section 5: Clinical Trials

Trial Stage	Purpose
26 1. <b>Preclinical – cells, animals</b>	Test for <b>toxicity</b> and <b>efficacy</b> before testing humans
27 2. <b>Healthy volunteers</b>	<b>Very low doses</b> to test for <b>toxicity</b> .
28 3. <b>Patients</b>	Larger groups. Test for <b>toxicity, efficacy</b> and <b>dose</b> . <b>Placebos</b> may be used in a <b>double-blind trial</b> .

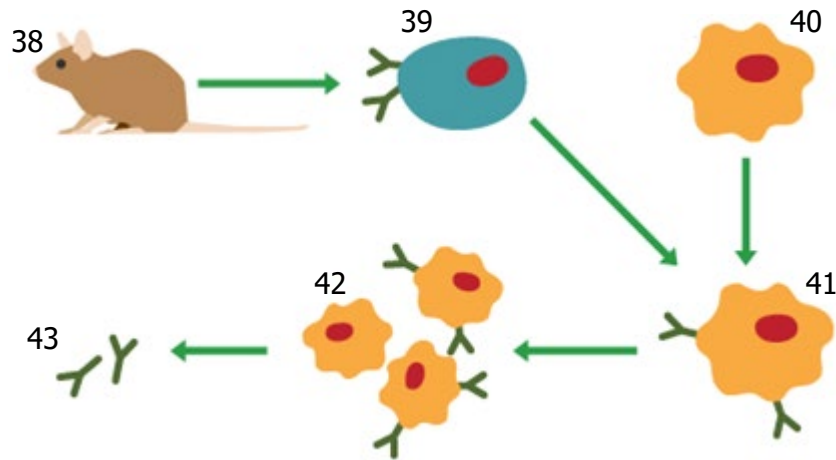
## Clinical Trial Key Terms

29 Placebo	A drug with <b>no active ingredients</b> , designed to test if the effects of a drug on a patient are just <b>psychological</b> .
30 Double-blind trial	The volunteers do not know which group they are in, and neither do the researchers, until the end of the trial
31 Toxicity	How <b>harmful</b> the drug is. May have dangerous <b>side effects</b> .
32 Efficacy	How <b>effective</b> the drug is.
33 Dose	The <b>amount</b> of the drug given to the patient.

## Biology 3: Infection and Response

### Section 6: Key terms

34 Monoclonal antibodies	Identical antibodies produced from the fusion of mouse spleen cells and myeloma cells
35 Myeloma cell	A cancer cell
36 Hybridoma	A monoclonal antibody-producing cell formed from the fusion of a mouse spleen cell and myeloma cell
37 Antigen	A protein (found on the surface of a pathogen), antibodies are produced to fit the exact shape of each different antigen



### Section 7: Producing monoclonal antibodies

38	stage 1	a mouse is injected/vaccinated/immunised with antigens, this starts the production of antibodies
39	stage 2	spleen cells/white blood cells that produce the antibodies are collected
40	stage 3	these are fused with myeloma cells
41	stage 4	forming hybridoma cells
42	stage 5	hybridoma cells are grown in a culture medium, producing large quantities of monoclonal antibodies
43	stage 6	monoclonal antibodies are collected

### Section 8: Using monoclonal antibodies

44	pregnancy tests	<b>48 Pros</b> In conventional cancer treatment drugs need to be toxic to kill the cancer cells, this causes death of normal body cells near the tumour as well as the cancerous cells. Using monoclonal antibodies is advantageous because they will only bind to cancerous cells, leaving those normal cells surrounding the cancer free from the toxic drug or radiation.
45	in labs to measure levels of hormones in blood or to detect pathogens	
46	in research to locate or identify specific molecules	
47	to treat cancer	

**49 Cons**  
 On the downside monoclonal antibodies create more side effects than expected. Therefore they are not yet as widely used as everyone hoped when they were first developed.

### Section 9: Plant diseases

50	Detection by	Stunted growth, spots on leaves, areas of decay, growths, malformed stems/leaves, discoloration, presence of pests
51	Identification by	<ul style="list-style-type: none"> <li>Refer to gardening manual/internet</li> <li>Lab analysis</li> <li>Testing kits containing monoclonal antibodies</li> </ul>

### Section 10: Plant diseases cont...

52	TMV	Viral pathogen, no cure, destroy infected plants
53	Rose black spot	Fungal pathogen, use fungicides
54	Aphids	Insects, use pesticides

### Section 11: Plant mineral ion deficiencies

Mineral ion	Why plants need it?	Symptoms if deficient in this mineral ion
55 Nitrate ion	for growth	stunted growth
56 Magnesium ion	for chlorophyll production	chlorosis (yellow leaves)

### Section 12: Plant defence responses

57 Physical defences:	cellulose cell walls, tough waxy cuticle, layers of dead cells around stems that fall off
58 Chemical defences:	antibacterial chemicals, Poisons to deter herbivores
59 Mechanical defences:	Thorns/hairs deter animals, leaves which curl when touched, mimicry