The Heart and Blood Vessels

GCSE Biology

March 10, 2025

The Heart

Key Functions:

- The heart pumps blood around the body in a double circulatory system.
- **Right ventricle:** Pumps blood to the lungs for gas exchange.
- **Left ventricle:** Pumps blood around the entire body.

Heart Rate

Control of Heart Rate:

- A group of cells in the right atrium acts as a natural pacemaker.
- Artificial pacemakers are electrical devices used to correct irregular heartbeats.

Blood Vessels

Arteries:

- Carry blood away from the heart (except pulmonary artery).
- Thick muscular walls.
- High-pressure blood flow.

Veins:

- Carry blood to the heart (except pulmonary vein).
- Thin walls, contain valves to prevent backflow.
- Low-pressure blood flow.

Capillaries:

- Found in muscles and lungs.
- One cell thick for efficient gas and nutrient exchange.

The Lungs

Alveoli:

- Large surface area and one cell thick to allow fast gas exchange.
- Surrounded by a network of capillaries.

Blood Components

Red Blood Cells:

- Flattened disc shape for a large surface area for gas exchange.
- Contains haemoglobin to absorb oxygen.
- No nucleus to maximize haemoglobin storage.

White Blood Cells:

- Protect the body against infection.

Platelets:

- Help blood clot, forming a scab.

Plasma:

- Transports substances like glucose and carbon dioxide.

Coronary Heart Disease

Key Points:

- Coronary arteries supply blood to the heart muscle.
- Fatty material build-up narrows arteries, reducing oxygen supply to the heart.

Coronary Heart Disease - Causes

What is Coronary Heart Disease?

- The coronary arteries supply blood to the heart muscle.
- In coronary heart disease, fatty deposits build up inside the coronary arteries, narrowing them.
- This reduces blood flow and oxygen supply to the heart muscle, potentially leading to heart attacks.

Risk Factors:

- Poor diet (high in saturated fats and cholesterol).
- Lack of exercise.
- Smoking and excessive alcohol consumption.
- High blood pressure and diabetes.

Coronary Heart Disease - Symptoms and Effects

Common Symptoms:

- Chest pain (angina), especially during exertion.
- Shortness of breath.
- Fatigue and dizziness.

Potential Consequences:

- Increased risk of heart attack due to a complete blockage of arteries.
- Reduced oxygen supply to heart muscles, causing tissue damage.
- Heart failure in severe cases.

Treatments for Coronary Heart Disease

Medical Treatments:

- **Stents:** Small mesh tubes inserted into arteries to keep them open.
- **Statins:** Drugs that reduce blood cholesterol levels, slowing down fatty deposits.

Lifestyle Changes:

- Eating a balanced diet low in saturated fats.
- Regular physical activity.
- Quitting smoking and reducing alcohol intake.

Surgical Interventions

Bypass Surgery:

- A healthy blood vessel from another part of the body is used to bypass a blocked artery.
- Allows normal blood flow to resume to the heart muscle.

Heart Transplants:

- In severe cases, heart transplants may be required.
- Patients may require artificial hearts while waiting for a transplant.

Treatments for Heart Disease

Stents:

- Keep coronary arteries open.

Statins:

- Reduce blood cholesterol levels, slowing fatty deposit build-up.

Faulty Heart Valves

Problems:

- Valves may not fully open or may leak, causing backflow of blood.
- The heart must work harder to circulate blood efficiently.

Treatment:

- Replacement with biological or mechanical valves.

Heart Failure

Artificial Hearts:

- Used temporarily for patients awaiting heart transplants.
- Can allow the heart to rest and recover.

Health and Disease

Health:

- A state of physical and mental well-being.

Diseases:

- Communicable: Caused by pathogens, can be transmitted.
- Non-communicable: Cannot be transmitted, often lifestyle-related.

Cancer

Key Points:

- Cancer is uncontrolled cell division.
- Benign tumours: Abnormal growths that do not spread.
- Malignant tumours: Cancerous, can spread via the bloodstream.

Causes:

- Genetic factors.
- Lifestyle factors such as smoking, alcohol, and diet.