

Coronary heart disease: a non-communicable disease

4.2.2.4 · Biology · revision notes

What coronary heart disease (CHD) is, and how CHD, faulty heart valves and heart failure are treated with drugs (statins), mechanical devices (stents, replacement valves, artificial hearts) or transplants. Expect 'explain' questions on how CHD damages the heart and 6-mark 'evaluate' questions comparing treatments.

Key facts

- CHD: fatty material builds up in the coronary arteries → narrower → less blood flow → less oxygen for the heart muscle
- Statins: lower blood cholesterol → slow down fatty deposits
- Replacement valves: biological (animal or human) or mechanical
- Artificial heart: usually temporary, until a transplant or while the heart rests
- Stent: a mesh tube that keeps a coronary artery open
- Faulty valve: does not open fully or leaks → heart pumps less efficiently
- Heart failure: transplant of a donor heart, or heart and lungs
- Transplant problems: donor shortage, rejection, lifelong immunosuppressant drugs

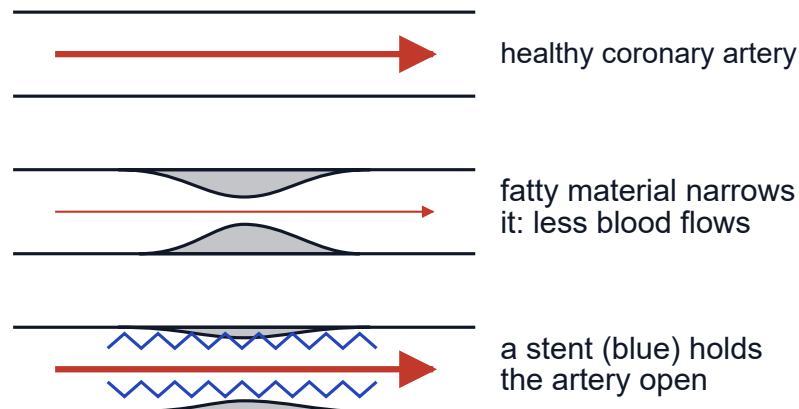
Notes

Coronary heart disease

- CHD is a **non-communicable** disease: it cannot be passed from one person to another.
- The **coronary arteries** supply the heart muscle with oxygenated blood.
- In CHD, layers of **fatty material** build up inside the coronary arteries, narrowing them.
- This reduces the flow of blood through the coronary arteries, so the heart muscle gets less oxygen for respiration. If an artery becomes blocked, part of the heart muscle can be damaged or die (a heart attack).

Treating CHD

- **Stents** are small mesh tubes placed inside a narrowed coronary artery to keep it open. Advantages: blood flow improves straight away, only a minor operation, quick recovery. Disadvantages: risks of the procedure (e.g. infection or a blood clot forming), and the artery can narrow again.



Coronary heart disease and a stent. The arrows show blood flow.

- **Statins** are drugs that reduce blood cholesterol levels, which slows down the rate at which fatty material is deposited. Advantages: no surgery; they reduce the risk of CHD developing or getting worse. Disadvantages: they must be taken regularly for a long time, take time to work and can have side effects.

Faulty valves and heart failure

- A heart valve may become faulty: it may not open fully, or it may leak. The heart then pumps blood less efficiently, so the person can become tired and breathless.
- Faulty valves can be replaced with **biological valves** (from animals or human donors) or **mechanical valves**. Mechanical valves last longer, but the patient must take drugs for life to stop blood clots forming.
- In heart failure, a **donor heart**, or heart and lungs, can be transplanted. Problems: a shortage of donors, major surgery, and the risk of rejection, so the patient must take immunosuppressant drugs for life.
- **Artificial hearts** are occasionally used to keep a patient alive while waiting for a transplant, or to let the heart rest as an aid to recovery. They are less likely to be rejected, but there is a risk of blood clots and infection, and parts can fail.

How to answer each type of question

Describe how a treatment works

2 to 4 marks

Grade 5

1. Say what the treatment is or where it goes.
2. Say what it does to the blood flow or to the fatty build-up.

Example. (a) Describe how a stent helps a person with coronary heart disease.
(b) Describe how statins reduce the risk of coronary heart disease.

Model answer. (a) The stent is placed inside the narrowed coronary artery (1) and holds it open, so more blood flows to the heart muscle (1).
(b) Statins lower blood cholesterol (1), which slows down the build-up of fatty material in the arteries (1).

Don't lose marks

- ✗ Saying the fatty material builds up in the heart or in veins. It builds up inside the coronary arteries.
- ✗ Saying the heart has less blood 'to pump'. The problem is less blood (and oxygen) reaching the heart muscle itself.
- ✗ Saying statins remove fat from the arteries. They lower blood cholesterol, which slows the build-up.
- ✗ In 'evaluate' questions, giving only advantages, or giving no conclusion.
- ✗ Saying artificial hearts are the normal long-term treatment. They are only occasionally used, usually for a limited time.

More tips

Memory tricks

- CHD chain: fat → narrow → less blood → less oxygen → less respiration. Each arrow is worth a mark.
- Stent = Scaffold (holds the artery open).
Statin = Slows (the fatty build-up, by lowering cholesterol).
- For every treatment, think RISC: Risks (surgery, clots, infection), Improvement (how fast, how long), Side effects or lifelong drugs, Cost and availability.

Exam technique

- 'Evaluate' means give advantages and disadvantages, then a judgement with a reason.
- Use any data in the question (costs, success rates, waiting times) in your evaluation, quoting the numbers.
- Write 'coronary arteries', not just 'arteries' or 'blood vessels', in CHD answers.
- Write 'less oxygen for respiration' to link reduced blood flow to damage to the heart muscle.

What each grade needs

What you need to be able to do, from the first marks up to the top grade.

Grade 3**Name the vessels that supply heart muscle**

The coronary arteries supply the heart muscle with oxygenated blood.

Grade 4**Describe what happens in coronary heart disease**

Layers of fatty material build up inside the coronary arteries and narrow them.

Grade 5**Describe how stents and statins treat CHD**

A stent holds the coronary artery open; statins lower blood cholesterol, which slows the build-up of fatty material.

Grade 5**Describe treatments for faulty valves and heart failure**

Faulty valves are replaced with biological or mechanical valves; heart failure can be treated with a donor heart (or heart and lungs) or, occasionally, an artificial heart.

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