

Exercise walk-through

1.7

Diet, cholesterol and CVD treatments (statements 1.19–1.20)

Pearson Edexcel · International A-Level · Biology

Atheroma, clot, catastrophe

Damage : smoking, hypertension, LDL cholesterol harm the endothelium

Plaque : inflammation and LDL deposition narrow and stiffen the artery

Clot : thromboplastin converts prothrombin to thrombin; fibrinogen becomes fibrin

Read a health study like an examiner

Your turn

Gum disease correlates with endothelial damage. List three checks before claiming causation.

- A. Who was sampled, how selected, how many?
- B. Were confounders like smoking, age, diet controlled?
- C. Is there a mechanism and a dose-response pattern?

DNA copies itself semi-conservatively

Unzip : helicase breaks the hydrogen bonds between the strands

Template : each old strand pairs with free nucleotides by complementary base pairing

Join : DNA polymerase links the nucleotides into a new strand

Exercises 2.1·2.3

2.1 Calculate the BMI of a person with mass 68 kg and height 1.60 m, and state their weight category. [2]

2.2 Statins lower blood cholesterol. Explain how, naming the organ and the molecule whose uptake increases. [3]

2.3 Give one benefit and one risk of anticoagulant treatment. [2]

Exercises 2.1·2.3

2.1 Calculate the BMI of a person with mass 68 kg and height 1.60 m, and state their weight category. [2]

2.1 $\text{BMI} = 68/1.60^2 = 68/2.56 = 26.6$ – overweight.

2.2 Statins lower blood cholesterol. Explain how, naming the organ and the molecule whose uptake increases. [3]

2.2 Statins inhibit (competitive inhibition of) an enzyme in the liver's cholesterol-synthesis pathway; the liver responds by making more LDL receptors; LDL-cholesterol is removed from the blood into the liver.

2.3 Give one benefit and one risk of anticoagulant treatment. [2]

2.3 Benefit: fewer clots, lower risk of stroke or heart attack. Risk: excessive bleeding after injury or internal bleeding, since clotting is impaired.

Exercises 3.1·3.2

3.1 A patient's energy intake is 11 500 kJ per day and expenditure is 9 800 kJ per day. A gram of body fat stores about 39 kJ. Calculate the theoretical weekly mass gain, and explain one reason why the real gain is usually smaller. [5]

3.2 Two 55-year-old men have the same blood pressure. Man A has LDL-cholesterol of 4.8 mmol dm^{-3} and refuses medication; Man B has 5.6 mmol dm^{-3} and takes a statin, which lowers his LDL by 35 %. Determine Man B's treated LDL, compare the two men's values, and discuss one benefit and one risk of Man B's choice that Man A has avoided.[6]

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3.1 Daily surplus = $11500 - 9800 = 1700$ kJ; weekly = 11900 kJ; mass = $11900/39 \approx 305$ g. Real gains are smaller because the body adapts – metabolic rate rises with mass, and dietary-fat efficiency varies; people also compensate by moving less or under-reporting intake.

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3.2 B's treated LDL = $5.6 \times 0.65 = 3.64 \text{ mmol dm}^{-3}$, below A's 4.8. Benefit: B's lower LDL means slower plaque growth and lower event risk despite the higher starting value. Risk: statins' side-effects – muscle pain or liver enzyme changes – need monitoring, which A avoids; A may also achieve benefit by diet change without drug risk.

Exercise 3.3

3.3 Atrial fibrillation makes clots form inside the heart. A patient with this condition is offered warfarin or daily aspirin. Compare the action of the two drugs, explain which is usually preferred for atrial fibrillation and why, and name the monitoring that warfarin requires. [6]

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3.3 Warfarin reduces the liver's production of clotting factors (vitamin-K dependent); aspirin blocks platelet aggregation, one step of clot formation. For clots forming inside the heart on stagnant blood, reducing the whole clotting cascade (warfarin) is usually preferred to attacking platelets alone. Warfarin requires regular blood tests (INR) to keep clotting within a safe window, because too much causes bleeding and too little does not protect.