Blood Under Pressure

Trace how different causes change blood and health

HAP.9.3 "Research and analyze the causes and effects of various pathological conditions (e.g., anemia, malaria, leukemia, hemophilia, and blood doping)."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline a cause and circle an effect for each of the four conditions and for blood doping. Give each linked cause and effect the same number to show how they connect.

Different Causes, Different Consequences

1. At a clinic, two patients report exhaustion, but their blood problems begin differently. One has iron-deficiency anemia: too little iron limits hemoglobin production, so red blood cells carry less oxygen. Climbing stairs can leave this patient breathless. The other recently returned from a region where malaria is common. An infected mosquito passed a Plasmodium parasite into the patient's blood. As the parasites multiply, they invade and rupture red blood cells, contributing to anemia and cycles of fever and chills. Both patients may feel weak because oxygen delivery is reduced, but only one has a parasite that requires treatment with antimalarial medicine.

2. On another ward, unusual bleeding points to two very different causes. In hemophilia, an inherited change in a gene for a clotting factor makes it harder for blood to form stable clots. A minor injury may lead to prolonged bleeding, and bleeding into joints can damage them over time. Leukemia, by contrast, is cancer of blood-forming cells in bone marrow. Abnormal cells multiply and crowd out normal blood cell production. Too few platelets can cause easy bruising or bleeding, while too few healthy red blood cells can cause fatigue. Leukemia can also leave fewer working white blood cells to fight infection.

3. Before a race, an athlete considers taking erythropoietin, or EPO, without a medical need. EPO is a hormone that stimulates red blood cell production. Using it to boost performance is blood doping, a practice, not a disease. More red blood cells can increase the blood's oxygen-carrying capacity, which may help endurance. But an excessive rise in red blood cells can increase blood viscosity and the risk of dangerous clots, especially if the athlete becomes dehydrated. Unlike a patient with iron-deficiency anemia, this athlete is deliberately raising a blood count that may already be normal. A similar blood change does not mean the underlying cause is the same.

2 ANSWER WITH EVIDENCE

Use the passage

1. How can iron-deficiency anemia and malaria both lead to weakness even though they begin differently?

2. Why might both hemophilia and leukemia cause bleeding? Compare the cause in each condition.

3. Trace how leukemia can increase the risk of infection and also cause fatigue.

4. What benefit might an athlete seek from EPO blood doping, and how can the same blood change become dangerous?

3 YOUR TURN

Your own words

A student claims, "Every change in red blood cells has the same cause, so boosting their production is always the answer." Test this claim using two different examples from the passage. For each example, trace a cause to an effect, then explain why the proposed approach does not address at least one underlying cause.

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PART 1 · READ AND MARK

Underline a cause and circle an effect for each of the four conditions and for blood doping. Give each linked cause and effect the same number to show how they connect. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	How can iron-deficiency anemia and malaria both lead to weakness even though they begin differently?	**Too little iron limits hemoglobin production in iron-deficiency anemia. In malaria, parasites rupture red blood cells. Both can reduce oxygen delivery and cause weakness.**
2	Why might both hemophilia and leukemia cause bleeding? Compare the cause in each condition.	**Hemophilia makes stable clots harder to form because of a change in a clotting-factor gene. Leukemia can reduce platelet production when abnormal cells crowd the bone marrow.**
3	Trace how leukemia can increase the risk of infection and also cause fatigue.	**Abnormal cells crowd out normal blood cell production, leaving fewer working white blood cells to fight infection and fewer healthy red blood cells, which can cause fatigue.**
4	What benefit might an athlete seek from EPO blood doping, and how can the same blood change become dangerous?	**The athlete seeks more red blood cells to carry oxygen and help endurance. An excessive increase can make blood more viscous and raise the risk of dangerous clots.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

The claim is false. In iron-deficiency anemia, too little iron limits hemoglobin production, so red blood cells carry less oxygen and the patient may feel breathless. Simply boosting cell production does not supply the missing iron. In malaria, parasites rupture red blood cells, which can reduce oxygen delivery and cause weakness. Producing more cells does not remove the parasites. The two conditions affect red blood cells, but their underlying causes differ.

Accept other accurate cause-to-effect chains supported by the passage. For Part 3, look for two distinct underlying causes and a clear explanation of why boosting red blood cell production does not resolve at least one of them.