

*The Making of the Fittest:  
Natural Selection in Humans*

NAME \_\_\_\_\_

DATE \_\_\_\_\_

1. Consider the statement: "Sickle cell disease is a(n) \_\_\_\_\_ disease."

Which of the following terms could fill in the blank to make the statement true? Write "yes" or "no" next to each possible response. **There may be more than one correct answer.**

Genetic \_\_\_\_\_

Infectious \_\_\_\_\_

Potentially lethal \_\_\_\_\_

Inherited \_\_\_\_\_

2. Consider the statement: "Malaria is a(n) \_\_\_\_\_ disease."

Which of the following terms could fill in the blank to make the statement true? Write "yes" or "no" next to each possible response. **There may be more than one correct answer.**

Genetic \_\_\_\_\_

Infectious \_\_\_\_\_

Potentially lethal \_\_\_\_\_

Inherited \_\_\_\_\_

3. Consider the statement: "An individual with two normal copies of the hemoglobin gene is said to be \_\_\_\_\_."

Which of the following terms could fill in the blank to make the statement true? Write "yes" or "no" next to each possible response. **There may be more than one correct answer.** (Note that a "locus" is a location on a chromosome.)

Homozygous at the hemoglobin locus \_\_\_\_\_

Susceptible to malaria \_\_\_\_\_

Heterozygous at the hemoglobin locus \_\_\_\_\_

An identical twin \_\_\_\_\_

4. At the beginning of the film, you were introduced to Davaun and Skyy Cooper, who both have sickle cell disease.

Which of the following must be true about their parents?

- One parent has at least one copy of the sickle cell allele.
- Both parents have at least one copy of the sickle cell allele.
- Both parents have sickle cell disease.
- One parent has sickle cell disease.

5. In three to five sentences, explain why sickle cell disease became so prevalent in certain East African populations.

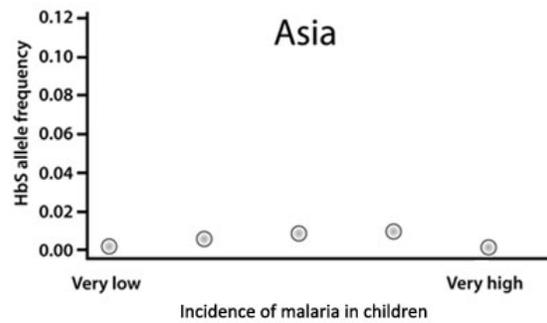
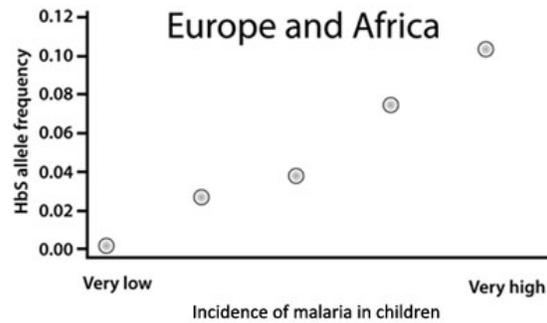


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6. There are now several effective antimalarial drugs that can treat people who have malaria or prevent them from getting the disease altogether. Predict what will happen to the frequency of the sickle cell allele as these drugs become more widely used. Support your answer with at least one piece of evidence from the film.
7. If sickle cell disease were caused by only one copy of the sickle cell allele, do you expect the frequency of the sickle cell allele to increase, decrease, or remain the same in places where there is a high incidence of malaria? Explain your answer in two or three sentences.
8. Due to climate change, the range of malaria is expected to spread to areas where it was previously not a problem. Given this piece of evidence, predict what will happen to the frequency of the sickle cell allele in areas where malaria is introduced.
9. Is the following statement true or false? "Malaria caused the sickle cell allele to appear." Justify your answer in one or two sentences.

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10. Recently, scientists compared the frequencies of the sickle cell allele (*HbS*) with the incidence of malaria in two different geographical areas. They grouped the children in five categories based on the incidence of malaria in children. They looked at *HbS* allele frequencies in each group. Their findings are in the graphs below.



Piel F. *et al.* Nature Communications. 2010

- How does the *HbS* allele frequency relate to malaria incidence in children in European and African populations compared to children in Asian populations?
- Provide an explanation, based on what you learned from the film, for the trends observed in the European and African populations.
- Provide a hypothesis that explains the findings in the Asian population.