

TESTING A HYPOTHESIS

INTRODUCTION

This worksheet serves as a guide to the HHMI short film *The Making of the Fittest: Natural Selection in Humans* by asking questions about the information provided in the film. It engages the students to answer questions about how Dr. Allison discovered the link between sickle-cell disease and resistance to malaria.

Dr. Tony Allison is credited with demonstrating the link between the inherited blood disorder sickle-cell disease (also referred to as sickle-cell anemia) and the parasitic disease malaria.

Early in his scientific career, he wanted to know if the common ABO blood types could provide information about the evolutionary relationships among East African tribal people and about human origins. In 1949, he took part in an expedition from the University of Kenya to investigate the distribution of blood groups and other inherited characteristics, including the sickle-cell allele, or "character," in East African tribes. In this study, he found much higher frequencies of the sickle-cell allele in the coastal regions of East Africa and lower frequencies in the highlands. These differences cut across tribal boundaries. This raised an interesting question: Why had the sickle-cell allele become so common in some parts of East Africa and not in others?

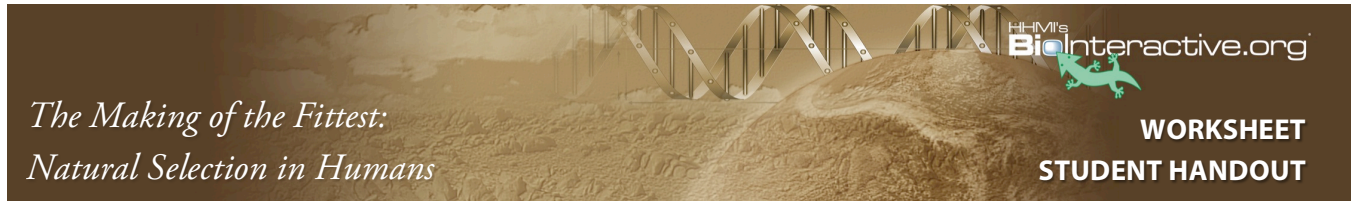
Dr. Allison had a flash of inspiration! He knew that there was a higher incidence of malarial transmission near the coastal regions of East Africa than in the highlands. He predicted that the sickle-cell allele and the presence of malaria were somehow related and hypothesized that people with the sickle-cell allele had a selective advantage against malaria. In order to test his hypothesis, Dr. Allison investigated the prevalence of the sickle-cell allele and malaria in East Africa.

PROCEDURE

1. Watch the film *The Making of the Fittest: Natural Selection in Humans*. After you watch, complete the chart on the following page. Record information as bulleted lists.
2. Use information from the film, the introduction paragraph, and the chart you completed to answer Questions 1-3.

CHART

| Film Information Chart | | |
|---|---|--|
| Sickle-cell | Malaria | Process of Discovery |
| <p>What is sickle-cell disease (or sickle-cell anemia)?</p> <p>Where is the sickle-cell allele, or "character," most common in East Africa?</p> <p>What happens in a blood sample of individuals who carry the sickle-cell allele when the blood is deprived of oxygen?</p> | <p>How is malaria transmitted?</p> <p>Where is malaria most prevalent in East Africa?</p> <p>What types of human cells does the malaria parasite, <i>Plasmodium falciparum</i>, infect?</p> <p>How does the sickle-cell allele protect against malaria?</p> | <p>What were Dr. Allison's initial questions when he went to East Africa in 1949?</p> <p>What were Dr. Allison's initial observations?</p> <p>What did Dr. Allison hypothesize after his 1949 expedition?</p> <p>What data did Dr. Allison collect to test his hypothesis?</p> |



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

QUESTIONS

1. Explain how Dr. Allison’s hypothesis was supported by the data he collected.

2. Why are there higher frequencies of the sickle-cell allele in areas where malaria is more prevalent?

3. Define natural selection and explain how Dr. Allison’s work provides an example of natural selection in humans.

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