Evolution and Human Health

What is a Mismatch Disease?

Evolution and Human Health

🔬 Introduction

Do you consider yourself to be "healthy?" What does it mean to be in "good health?" Did you know that examining our evolutionary past can help us to understand what influences human health today? The human body is an amazing example of complex engineering. The earliest members of our species, *Homo sapiens*, date back to about 200,000 years ago in Africa (but our human-like ancestors had already been around for almost 7 million years by that time). The earliest *Homo sapiens* were hunter-gatherers, meaning that they did not settle down into permanent towns or communities, but were nearly always moving in search of food. Because this is the environment in which modern humans evolved, it is a good match to our bodies' structures and functions. Our environment has changed rapidly since then, but bodies have not evolved as fast.

Many human disease are linked to changes in lifestyles, diet, and medicine. These **mismatch diseases** are the result of our environment changing in ways that have caused some once neutral or even helpful traits to now be harmful. In this lesson, you will learn about one of these mismatch diseases and how some researchers have begun to unravel its causes. To do that, they traveled all over the world to measure the skeletons of recently, and not-so-recently dead humans.

🔬 What To Do

Answer the Analysis Questions below, reading the Bite when instructed.

🔬 Analysis Questions

1. Describe the process of natural selection. More specifically, describe how heritability, variation and competition for resources influence the process of natural selection.

2. Many people think that evolution and natural selection mean the same thing. How would you explain the difference to someone?

3. What is the link between natural selection and reproductive success?

4. Are humans perfectly adapted to their environments? In your answer, provide evidence from your everyday experiences.

STOP & read **Science Bite**:
Ancient Bodies in a Modern World

5. In your own words, define the term "mismatch disease." Explain why osteoarthritis (OA) may be considered a mismatch disease.

6. Examine the image in **Figure 1** of the Bite. What do you observe about the healthy knee joint compared to the knee joint with OA?

7. How did scientists determine if skeletons from the museums had OA?

8. Examine the graph in **Figure 2** of the Bite.
   a. How does the prevalence of OA compare in early and post industrial skeletons?

b. Citing specific data from the Bite, provide evidence in support your statement above.

9. Will natural selection act to decrease OA in the population? Explain why or why not. (*Hint:* look back at your answer to Question 3.)

Some common diseases that may be considered mismatch diseases are shown in **Figure 1** below.
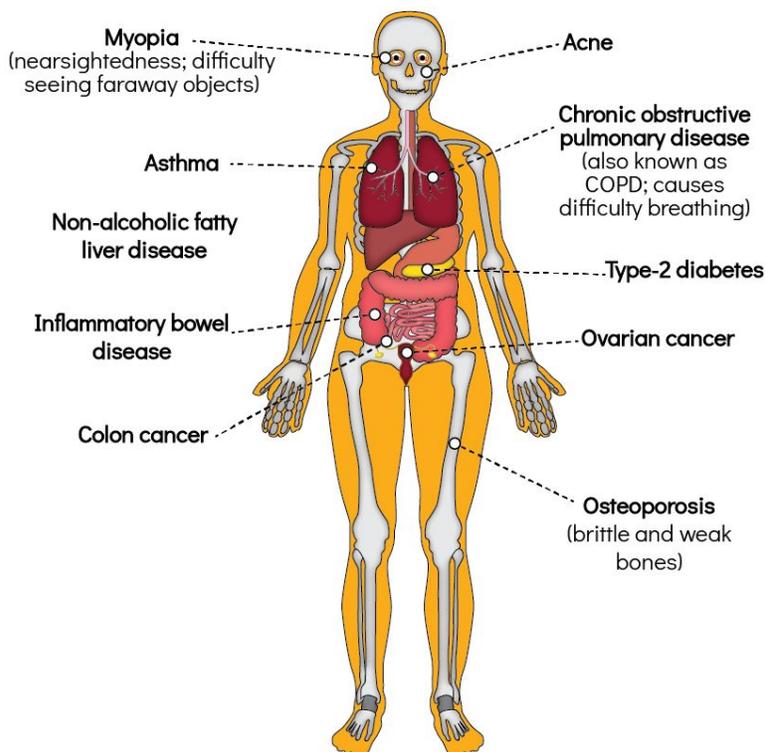

Figure 1. Common Mismatch Diseases. Scientists have suggested that common diseases from asthma to forms of cancer may be considered mismatch diseases.

10. **Connect to the Big Question** Choose one of the mismatch diseases from **Figure 1.** Use the Internet and other reference materials to develop a three-minute oral presentation about the disease. Use the outline below to help you develop your presentation. Be sure to list all websites and references.

- **Describe the disease. What are its symptoms? What treatments are available?**

- **How common is the disease?**

- **What are risk-factors for the disease (who tends to get it)?**

- **Why is this disease considered a mismatch disease?**

- **References (list all websites and materials used)**