BIOMEDICAL SCIENCE JOURNAL FOR TEENS

Bullfrogs - a Trojan horse for a deadly fungus?

TEACHER'S KEY

Check your understanding

1 What is chytridiomycosis? What causes it?

Answer

Chytridiomycosis is a skin disease caused by the fungus *Bd* (also called chytrid fungus). This fungus attacks amphibians' skin. Since amphibian skin helps to absorb oxygen, water, and electrolytes, infected amphibians can't regulate the amount of water and electrolytes in their body. This causes heart failure and death. *Bd* affects many species, and scientists believe it is responsible for the decline and extinction of more than 200 amphibian species worldwide.

2 The deadly fungus *Bd* has been spreading rapidly. What makes *Bd* such a devastating pathogen?

Answer

Bd can affect a wide range of amphibian species. Each species responds to *Bd* differently. Some die-off quickly, while others, like bullfrogs, can tolerate the fungus and not show signs of disease. These infected animals serve as vectors (carriers) to spread the disease to the uninfected animals. With human activities like global amphibian trade, *Bd* has spread quickly and affects amphibian populations worldwide.

3 What do you think: Is it in the fungi's interest to kill all of their hosts?

Answer

No, not really! Usually, if a pathogen is so deadly that it kills all of its hosts, it will soon die off without any hosts left!

4 There are records of *Bd* in the eastern US as early as the 1880s. Why aren't there any *Bd* related extinctions recorded in the eastern US while there are some in the western US?

Answer

Scientists are uncertain; however, the particular *Bd* strain that has caused declines and extinctions may have co-evolved with the amphibians in the eastern US. This could have allowed these species to develop a way to coexist. But when the fungus spreads to species in the western US or other parts of the world where amphibian populations have never been exposed to this strain of *Bd*, it can infect them and potentially cause mass die-offs.

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5 Scientists formed a hypothesis about the spread of *Bd* in the western US. What was their hypothesis and how did they test it?

Answer

Their hypothesis: *Bd* spread from the eastern U.S. with the introduction of American bullfrogs into the western U.S. If bullfrogs caused *Bd* to spread in the West, then one would expect that they arrived before or at the same time as *Bd*. To test this, they investigated the earliest records of *Bd* and bullfrogs in watersheds to the west of the Rocky Mountains. Of the 100 watersheds that had both *Bd* and bullfrogs, 83 had bullfrogs before or at the same time as *Bd*.

6 Scientists predicted the areas under highest risk of disease outbreak. How did they do that?

Answer

First, they used a model to determine areas where there is suitable habitat and host availability for *Bd* (areas where *Bd* has a better chance to survive and spread) in the western US. They mapped out the watersheds that had only bullfrogs and *Bd* was not yet detected. Then, they overlaid these watersheds on the habitat suitability model to find places where bullfrogs occur and the habitat is suitable for *Bd*. These areas are predicted to have the highest risk of disease outbreaks.

7 Figure 3 answer key: Which areas would have the highest risk of *Bd* outbreaks?

Answer

Areas where the black outlined watersheds overlap with deep red color. These areas will have bullfrogs and highly suitable environment for *Bd*.