Section 2: Biological Hazards

Preview

- Bellringer
- Objectives
- The Environment's Role in Disease
- Waterborne Disease
- Cholera
- Malaria
- Antibiotic Resistance

Section 2: Biological Hazards

Preview, *continued*

- Malaria on the March
- Emerging Viruses
- Cross-Species Transfer

Bellringer

Section: Biological Hazards

Review the "Estimated deaths per year (in millions)" column in **Table 2.** Explain why the number of deaths from respiratory diseases are greater than deaths from other diseases.

Write your responses in your ***EcoLog.***

Objectives

- **Explain** why the environment is an important factor in the spread of cholera.
- **List** two changes to the environment that can lead to the spread of infectious diseases.
- **Explain** what scientists mean when they say that certain viruses are emerging.

The Environment's Role in Disease

- Some of the damage to human health is not caused by toxic chemicals but by organisms that carry disease.
- Infectious diseases are caused by **pathogens**, a virus, microorganism, or other substance that causes disease.
- Some of these diseases are spread from person to person through the air. Others are spread by water that contains the pathogen.

The Environment's Role in Disease

- Other disease are transmitted by a secondary host, such as a mosquito.
- A **host** an organism from which a parasite takes food and shelter.
- The table on the following slide lists the most deadly infectious diseases worldwide.

The Environment's Role in Disease

Deaths from Infectious Diseases in 2000, Estimated by the World Health Organization		
Disease and examples	Cause	Estimated deaths per year (in millions)
Total infectious and parasitic diseases	bacteria, viruses, and parasites	10.5
Respiratory infections (pneumonia, influenza, and whooping cough)	bacteria, viruses	4.0
AIDS	virus	2.9
Diarrheal diseases (cholera, typhus, typhoid, and dysentery)	bacteria, viruses, parasites	2.1
Tuberculosis	bacteria	1.7
Childhood diseases (measles and diphtheria)	virus	1.5
Malaria	parasitic protist	1.1
Tetanus	bacteria	0.3
Tropical diseases (trypanosomiasis, Chagas' disease, schistosomiasis, and leishmaniasis)	bacteria, viruses, and parasites	0.1

Waterborne Disease

- Pathogens can transfer diseases directly to humans through water, or organisms that carry the pathogens can transfer them to humans.
- A **vector** is an intermediate host that transfers a pathogen or a parasite to another organism.
- Widespread construction of irrigation canals and dam increase habitats for vectors, such as mosquitoes.
- These organisms are intermediate hosts that transfer the pathogen or parasite to people.

Cholera

- Nearly three-fourths of infectious disease are transmitted through water.
- The deadliest waterborne diseases, such as those that cause **cholera** and **dysentery**, come from drinking water polluted by human feces.
- These diseases cause the body to lose water and become dehydrated, and they cause most of the infant mortality around the world

Malaria

- Malaria was once the world's leading cause of death.
- Malaria is caused by parasitic protists and is transmitted by a bite from female mosquitoes of many species.
- No effective vaccine for malaria exists, but preventative measures are used to control mosquitoes.

Antibiotic Resistance

- By altering the environment, we make it more suitable for pathogens to live and reproduce.
- Our actions cause pathogens to evolve resistance to antibiotics that are used to kill them.
- In 1979, 6% of European strains of pneumonia bacteria were resistant to antibiotics. Ten years later, 44% of the strains were resistant.

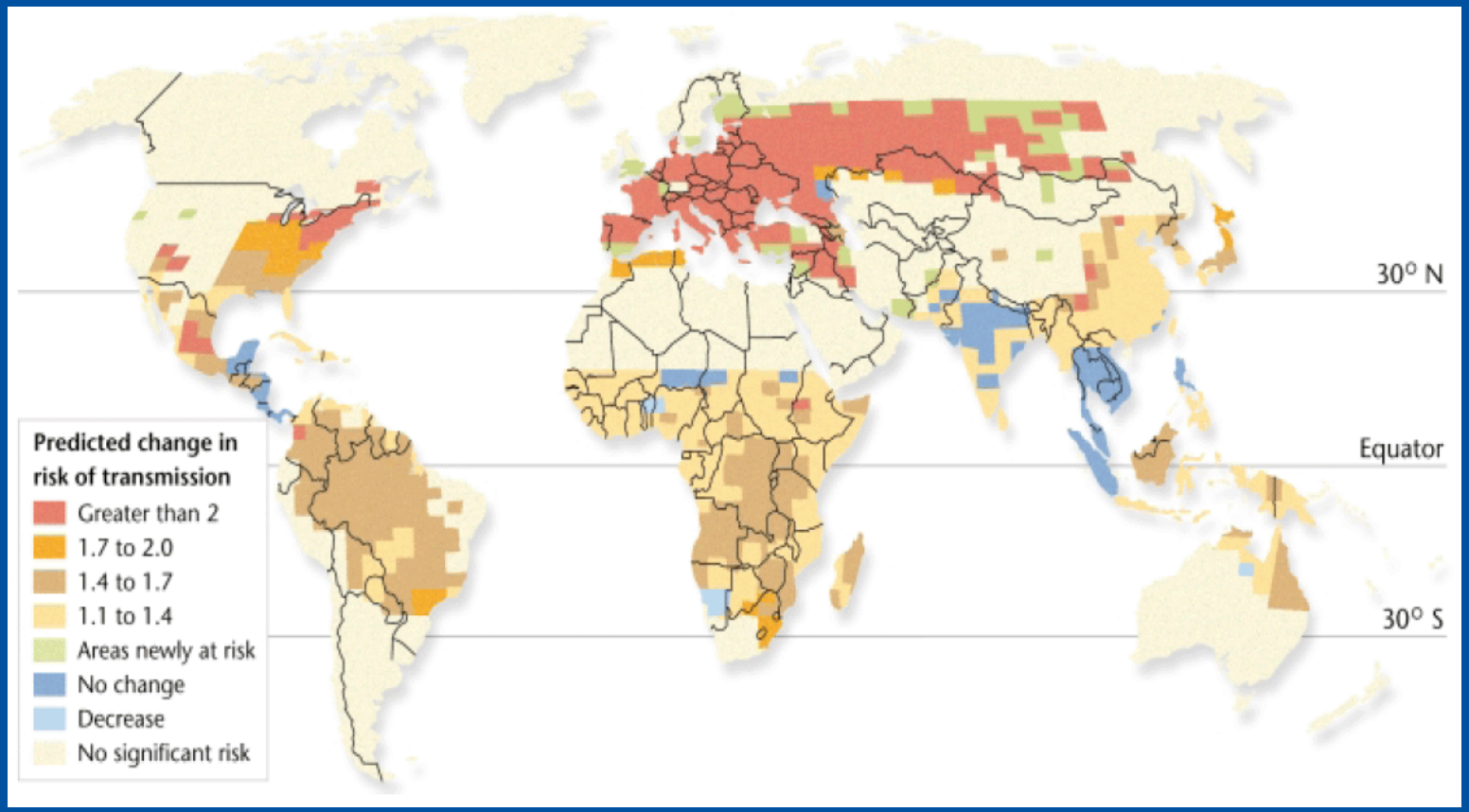
Malaria on the March

- Malaria was common in the United States and Europe before the days of mosquito control. Now it is most common in tropical countries.
- Historically, malaria was controlled by draining marshes and rice paddies and by spraying with pesticides.
- Since the 1970s, however, mosquitoes have evolved resistance to most pesticides.
- Currently, mosquitoes are controlled by spreading growth regulators that prevent mosquito larvae from maturing into adults or that sterilize the female mosquitoes

Malaria on the March

- The mosquitoes that transmit malaria are found in the warmer parts of the world.
- Thus it is thought that global warming could spread malaria to different parts of the world.
- The following slide shows the areas into which malaria might spread under specific global warming conditions.

Malaria on the March



Emerging Viruses

- In recent years, medical scientists have been focusing on previously unknown viruses.
- Examples of these “emerging viruses” include the hanta virus, the ebola virus, the West Nile virus, and the HIV, which causes AIDS.
- Most viral diseases spread directly from one person to another.
- Often, the virus invades the body through a cut or through mucus membranes.

Emerging Viruses

- We do not have many effective drugs to treat viral diseases.
- Our main defense against viral diseases is vaccination.
- However, vaccines are virus specific and viruses evolve rapidly.
- New vaccines must be developed when a new strain of a viral pathogen evolves.

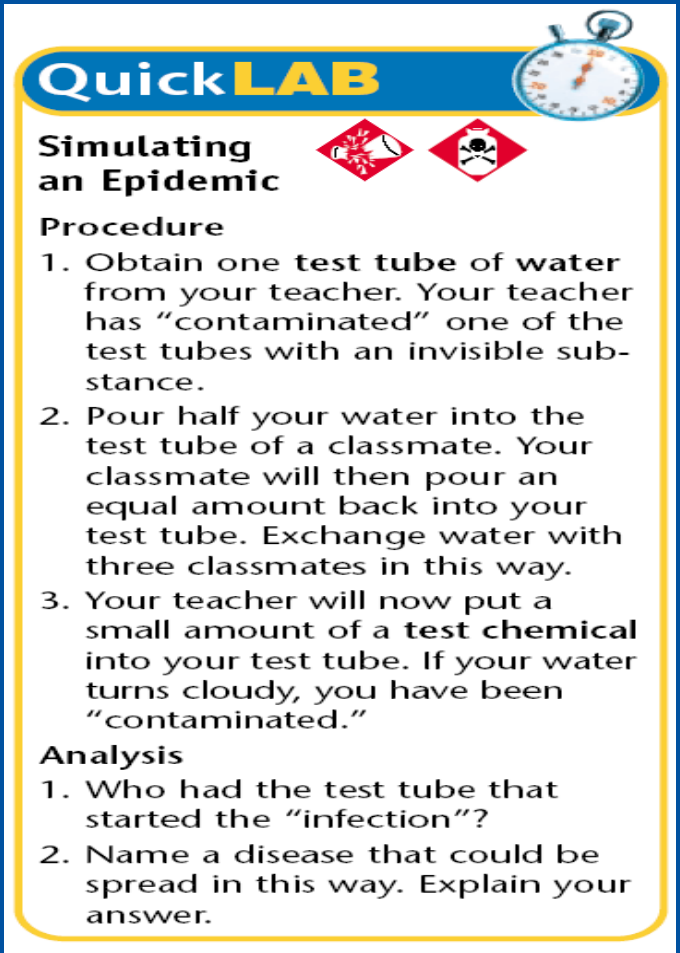
Cross-Species Transfer

- Lately, there has been an increasing number of pathogens that have made a **cross-species transfer**, or have moved from one species to another.
- These pathogens have lived for centuries in some species of wild animals and have often done little damage.

Cross-Species Transfer

- When the pathogens invade humans, the pathogens cause serious diseases. For example West Nile virus and HIV fall into this category.
- Some ecologists fear that cross-species transfer of diseases will be more common with continued destruction of habitats and of the environment.

Quick LAB



QuickLAB

Simulating an Epidemic

Procedure

1. Obtain one **test tube** of **water** from your teacher. Your teacher has "contaminated" one of the test tubes with an invisible substance.
2. Pour half your water into the test tube of a classmate. Your classmate will then pour an equal amount back into your test tube. Exchange water with three classmates in this way.
3. Your teacher will now put a small amount of a **test chemical** into your test tube. If your water turns cloudy, you have been "contaminated."

Analysis

1. Who had the test tube that started the "infection"?
2. Name a disease that could be spread in this way. Explain your answer.