Microorganisms and Food

(Taken from the State Science Teacher Resource Book, page 12.2.30 and 31.)

Many diseases are caused by microorganisms, little creatures too small to see. A large number of microorganisms thrive in water. They include bacteria, viruses, and protozoa. Infected people may pass them by sneezing, hand contact, or through sewage. Usually they cannot be seen, smelled, or tasted.

Many deaths in developing countries are caused by diarrhea and related dehydration. Poor sanitation contributes to the spread of bacterial disease, such as cholera, food poisoning, and shigella (shigellosis). Bacteria are everywhere, including our water supplies. Water supplies in the U.S. are tested and treated regularly, so we can normally drink water without concern. However, waterborne diseases are common in many other parts of the world where water is not tested and treated.

Grocery stores and restaurants in the United States must follow many health standards concerning food safety. They are responsible for providing us with quality, safe food. Health inspectors routinely inspect these to make sure they are following the guidelines. If health inspectors find that a business is not, they can penalize them by closing the business for a specific amount of time or perhaps indefinitely.

In the United States, we are fortunate to have a government that makes food safety a priority. In some countries, food may be produced or imported, but it is spoiled by pests or microorganisms due to poor storage. Pests (insects and rodents) and microorganisms (bacteria, mold, yeast) are the two chief causes of food spoilage. Food must be transported, stored, and prepared correctly to ensure safety. Agribusinesses that deal with food must know where their food is coming from. They must also know how their food was grown and how it was transported.

All food will spoil if it is not preserved in some way. Some foods such as nuts and grains can be stored for a long time without spoiling. Other foods such as bread and milk must be consumed quickly. Foods can be preserved in many ways. Canning, freezing, and dehydrating are just a few methods. Spoilage may occur before there is a change in taste or odor. Therefore, consumers should read expiration dates before eating food products bought from grocery stores.

People can reduce their risk of food-borne illness by handling it properly. Eighty-five percent of the cases of food-borne illness caused by bacteria can be avoided with proper food handling. Keys to food safety are washing hands, checking expiration dates, washing surfaces and utensils with hot, soapy water, refrigeration and freezing, rinsing fruits and vegetables, and storing foods in proper places.

Disease Background Information

(Taken from the State Science Teacher Resource Book, page 12.2.34 and 35.)

Enter toxigenic E. coli Gastroenteritis, caused by E. coli bacteria:

Leading cause of infant death worldwide. Visitors to Latin American countries who partake of the food and water occasionally come down with "traveler's diarrhea," also known as "turista" or "Montezuma's Revenge." A large outbreak of this disease occurred in 1975 in Crater Lake National Park, Oregon. About 2,000 park visitors and about 200 park employees became ill after consuming water that had been contaminated by sewage. Campers who drink from springs frequently contract this disease.

Typhoid Fever, caused by Salmonellatyphi bacteria:

Now uncommon in the U.S., this is usually acquired during foreign travel. During the first half of this century it was the most commonly reported cause of waterborne disease in the U.S. It can be acquired by contact with contaminated water, swimming, etc. In 1907, Mary Mallon, nicknamed "Typhoid Mary," was identified as a carrier of the disease. She transmitted the disease while working as a cook in restaurants and private homes in New York City. She escaped authorities for eight years, but was finally apprehended in 1915. She infected some 50 people, with three cases

resulting in death. In 1973 a major outbreak of typhoid fever affected 225 people in a migrant labor camp in Dade County, Florida. The well that supplied water to the camp was contaminated by surface water.

Giardiasis, caused by Giardia lamblia protozoan:

Sickness results with only a low dose of the protozoan. Today it is the most commonly reported cause of waterborne diseases. Normal hosts for the parasite are mammals, such as beavers, muskrats, and raccoons. The giardia protozoan is killed by boiling water for at least five minutes.

Legionnaire's Disease, caused by Legionella pneumophilia bacteria:
Found naturally in water environments; bacteria often colonized artificial water systems such as air conditioners and hot water heaters, and can be inhaled with aerosols produced by such systems. Smoking and lung disease increase susceptibility to disease.

Salmonellosis, caused by a species of Salmonella bacteria:

This is carried by humans and many animals; wastes from both can transmit the organism to water or food. The largest waterborne salmonella outbreak reported in the U.S. was in Riverside, California, in 1965 and affected over 16,000 people.

Shigellosis, caused by a species of Shigella bacteria:
Most infection is seen in children 1-10 years old; a very low dose can cause illness. Waterborne transmission is responsible for a majority of the outbreaks. It is quite common in the United States.

Hepatitis A, caused by Hepatitis A virus:

Third most common cause of waterborne disease in U.S. The term hepatitis relates to inflammation of the liver.

Patient #1 Background

Returns home from vacation in Central America. Problems start about 12 hours after drinking water in Central American restaurant. Diarrhea begins and ultimately causes dehydration. Muscles are tender and sore. Slight fever develops. Some nausea and vomiting occurs. Stomach and abdominal cramps cause increased discomfort.

Gastroneteritis

Patient #2 Background

Problems begin about 10 days after patient drinks from the same water glass as a family member who contracted a disease while visiting Africa. It becomes difficult for the patient to do any physical work (lethargic). Rose-colored spots appear on the skin. There are general aches and pains. Patient gets weaker (malaise), and loses appetite. Abdomen is tender to the touch. High fever develops and patient becomes delirious.

Typhoid Fever

Patient #3 Background

Symptoms start two weeks after a hike in the mountains. Patient drank water from a clear, cold mountain stream where there was evidence of beaver activity. Abdominal cramps begin. Bowel movement is greasy and foul-smelling. Patient experiences excessive intestinal gas. General weakness and discomfort ensues (malaise). Patient loses weight.

Giardiasis

Patient #4 Background

Patient is a heavy smoker. He/she likes a house cool, so uses the air conditioner and keeps windows closed. Sudden fever rises to 104° F. Patient gets chills, and notes that his/her breathing is very rapid, and a cough develops. There is a rattling sound in the lungs, and pains the chest. Patient experiences general muscle pain and tenderness. Mental confusion and severe headaches occur.

Legionnaire's Disease

Patient #5 Background

Patient develops symptoms 10 hours after eating a poorly cooked hamburger. General discomfort and weakness occur (malaise). Fever increases. Stomach cramps with dysentery is followed by nausea and vomiting.

Salmonellosis

Patient #6 Background

Patient is a four-year-old child. Symptoms begin the day after the patient attends a friend's birthday party. Patient shared food with other children, and now has severe abdominal cramps, and frequent painful dysentery. Blood and mucous are in patient's stool. Nausea and vomiting accompany the cramping. A high fever develops with chills and dehydration.

Shigellosis

Patient #7 Background

Patient has been swimming in a local river. Upon his/her return, general weakness and discomfort occur (malaise). Patient loses appetite and develops fever, mild diarrhea, and nausea. Patient's skin and whites of his/her eyes become yellow. The patient is sick for a week.

Hepatitis