



CHAPTER RESOURCES



Chapter: Immunity and Disease

Section 1: The Immune System


Section 2: Infectious Diseases

Section 3: Noninfectious Diseases



1

Lines of Defense

- Your body has many ways to defend itself.
- Its **first-line defenses** work against harmful **substances** and all types of disease-causing organisms, **called pathogens** (PA thuh junz).
- Your **second –line defenses** are specific and **work against specific pathogens**.
- This complex group of defenses is called your **immune system**. 



1

First-Line Defenses

- Your skin and respiratory, digestive, and circulatory systems are first-line defenses against pathogens.
- The **skin is a barrier that prevents many pathogens from entering your body.**



1

First-Line Defenses

- Although **most** pathogens **can't get through unbroken skin**, they can get into your body easily through a cut or through your mouth and the membranes in your nose and eyes.



1

First-Line Defenses

- The **conditions on the skin can affect pathogens.**
- Perspiration contains substances that can slow the growth of some pathogens.
- At times, secretions from the skin's oil glands and perspiration are acidic.
- Some pathogens cannot grow in this acidic environment.



Internal First-Line Defenses

- Your **respiratory system traps pathogens with hairlike structures**, called cilia (SIH lee uh), **and mucus**.
- Mucus contains an enzyme that weakens the cell walls of some pathogens.
- When you cough or sneeze, you get rid of some of these trapped pathogens.



Internal First-Line Defenses

- Your **digestive system** has several defenses against pathogens—saliva, enzymes, hydrochloric acid, and mucus.
- Saliva in your mouth contains substances that kill bacteria.
- Enzymes (ENZymes) in your stomach, pancreas, and liver help destroy pathogens.



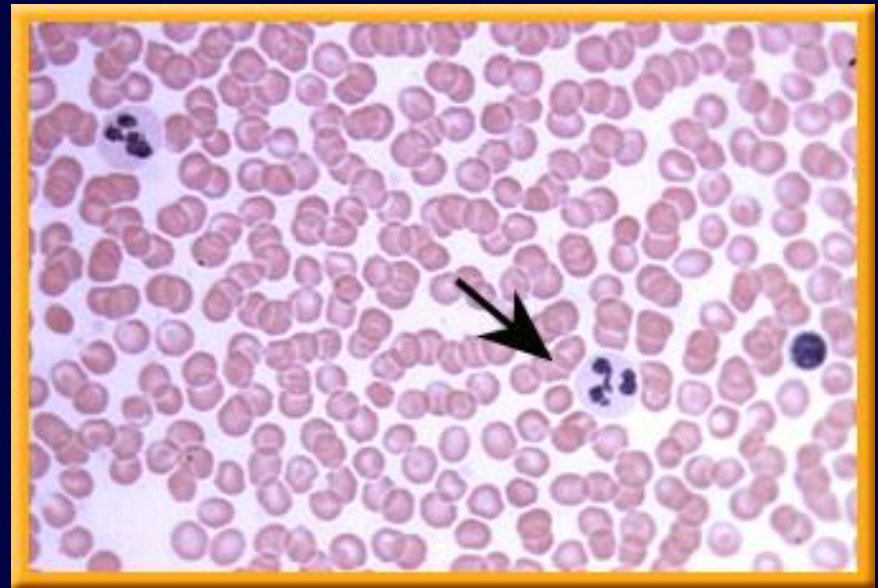
Internal First-Line Defenses

- Hydrochloric acid in your stomach kills some bacteria and stops the activity of some viruses that enter your body on food.
- The mucus found on the walls of your digestive tract contains a chemical that coats bacteria and prevents them from binding to the inner lining of your digestive organs.



Internal First-Line Defenses

- Your circulatory system contains white blood cells that surround and digest foreign organisms and chemicals.
- If the white blood cells cannot destroy the bacteria fast enough, you might develop a fever.



Internal First-Line Defenses

- Many pathogens are sensitive to temperature.
- A slight increase in body temperature slows their growth and activity but speeds up your body's defenses.




1

Inflammation

- When tissue is damaged by injury or infected by pathogens, it becomes inflamed.
- Signs of inflammation include **redness**, **temperature increase**, **swelling**, and **pain**.



Specific Immunity

- Molecules that are foreign to your body are called **antigens** (AN tih junz). 
- Antigens can be separate molecules or they can be found on the surface of a pathogen.
- When your **immune system recognizes molecules as being foreign to your body, special lymphocytes** called T cells respond.
- Lymphocytes are a type of white blood cell.



Specific Immunity

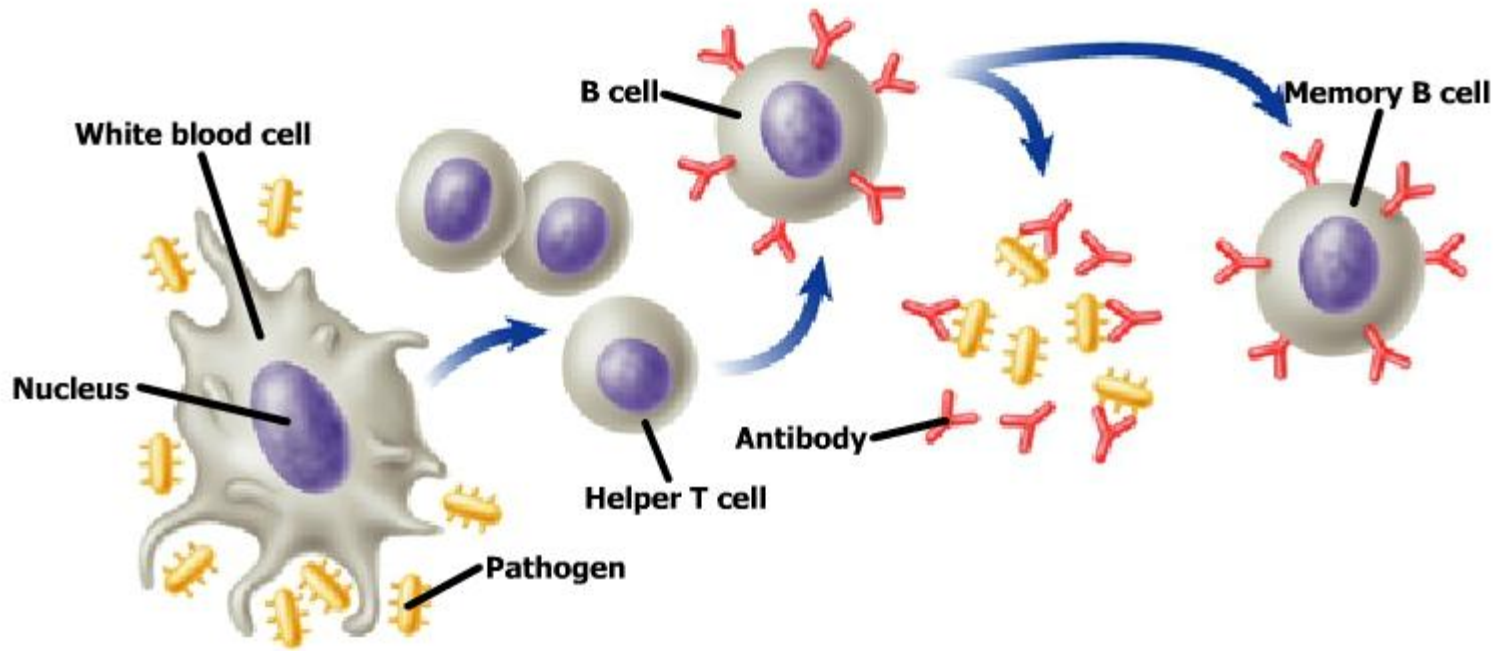
- One type of T cells, called **killer T cells**, releases enzymes that help **destroy invading foreign matter**.
- Another type of T cells, called **helper T cells**, **turns on the immune system**.
- They **stimulate other lymphocytes**, known as **B cells**, to form antibodies.



Specific Immunity

MAC OSX users click here to view.


Your Immune Response



CHAPTER RESOURCES



Specific Immunity

- An **antibody** is a protein made in response to a specific antigen. 
- The antibody attaches to the antigen and makes it useless.
- The pathogen might not be able to stay attached to a cell or might be changed in such a way that a killer T cell can capture it more easily.





Specific Immunity

- Another type of lymphocyte, called **memory B cells**, also has antibodies for the specific pathogen.
- Memory B cells remain in the blood ready to defend against an invasion by that same pathogen another time.



Active Immunity

- In **active immunity** your body makes its own antibodies in response to an antigen. 
- **Passive immunity** results when antibodies that have been produced in another animal are introduced into your body. 




Active Immunity

- When a pathogen invades your body and quickly multiplies, you get sick.
- Your **body immediately starts to make antibodies to attack the pathogen.**
- After enough antibodies form, you usually get better.
- Some antibodies stay on duty in your blood, and more are produced rapidly if the pathogen enters your body again.



1

Vaccination

- A vaccine is a form of an antigen that gives you immunity against a disease.
- A vaccine only can prevent a disease, not cure it.
- The process of giving a vaccine by injection or by mouth is called **vaccination**. 



1

Vaccination

- If a specific vaccine is injected into your body, your body forms antibodies against that pathogen.
- If you later encounter the same pathogen, your bloodstream already has antibodies that are needed to fight and destroy it.



Passive Immunity

- Passive immunity **does not last as long as active immunity does.**
- For example, you were born with all the antibodies that your mother had in her blood.
- However, these antibodies stayed with you for only a few months.
- Because newborn babies lose their passive immunity in a few months, they need to be vaccinated to develop their own immunity.



1

Tetanus

- Tetanus is a **disease caused by a common soil bacterium.**
- The bacterium **produces a chemical that paralyzes muscles.**
- Puncture wounds, deep cuts, and other wounds can be infected by this bacterium.
- Several times in early childhood you received active vaccines that stimulated antibody production to tetanus toxin.



1

Question 1

Which is a first-line defense against pathogens?

- A. antibiotics
- B. chemotherapy
- C. skin
- D. vaccine



1

Answer

The answer is C. Your skin is a barrier that prevents many pathogens from entering your body.



1

Question 2

_____ are molecules that are foreign to your body.

Answer

The answer is antigens. An antibody is a protein made in response to a specific antigen.

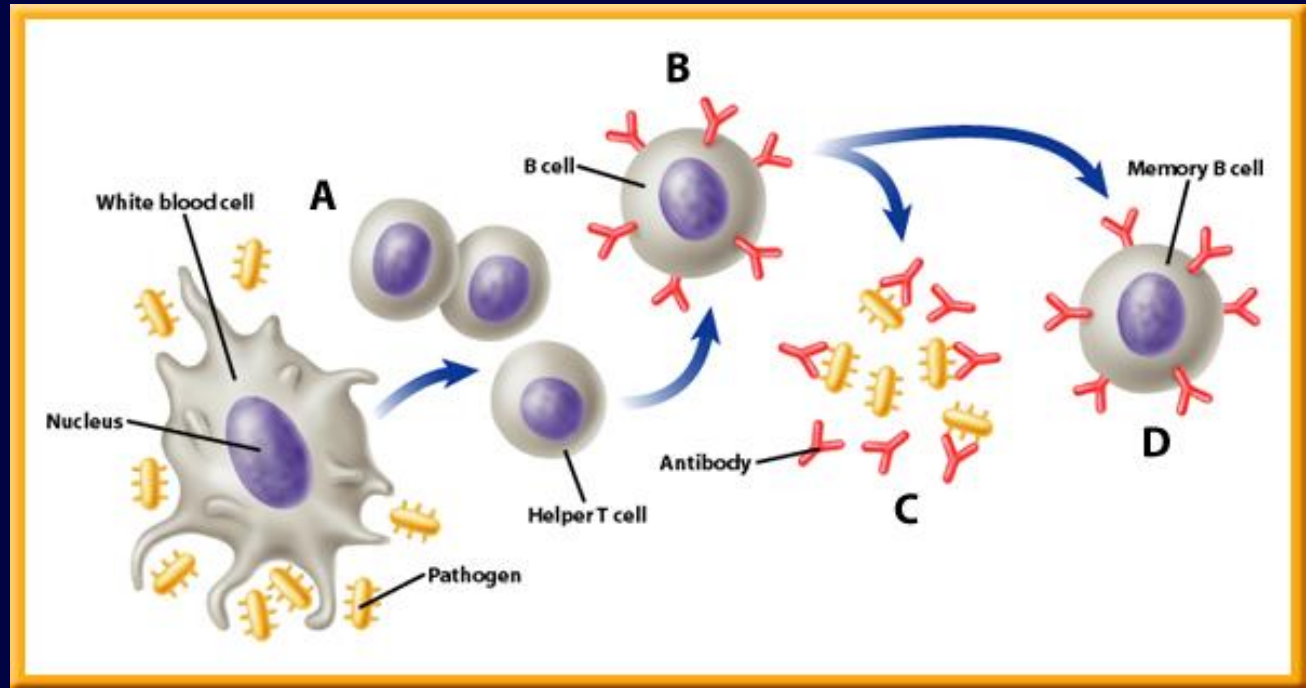


1

Question 3

Which phase illustrates the production of antibodies?

- A. A
- B. B
- C. C
- D. D



1

Answer

The answer is B. During mobilization, B cells produce antibodies.



2

Disease in History

- The plague, smallpox, and influenza have killed millions of people worldwide.
- Even today, there are diseases outbreaks, such as the Ebola virus in Africa that cannot be cured and severe acute respiratory syndrome (SARS).

Probable Cases of SARS (November 1, 2002 to July 7, 2003)		
Country	Number of Cases	Number of Deaths
Canada	251	38
China	7,756	730
Singapore	206	32
United States	73	0
Vietnam	63	5
Other countries	90	7



Microorganisms

- With the invention of the microscope in the latter part of the seventeenth century, bacteria, yeast, and mold spores were seen for the first time.
- It took almost 200 years more to discover the relationship between some of them and disease.



2


Microorganisms

- Decay-causing microorganisms cause changes in other organisms.
- It was hypothesized that **microorganisms could cause diseases and carry them from one person to another.**
- Scientists did not make a connection between viruses and disease transmission until the late 1800s and early 1900s.



2

Disease Organisms

- The French chemist Louis Pasteur discovered that microorganisms could spoil wine and milk.
- Pasteur invented **pasteurization** (pas chuh fuh ZAY shun), which is the process of heating a liquid to a specific temperature that kills most bacteria. 



2


Disease Organisms

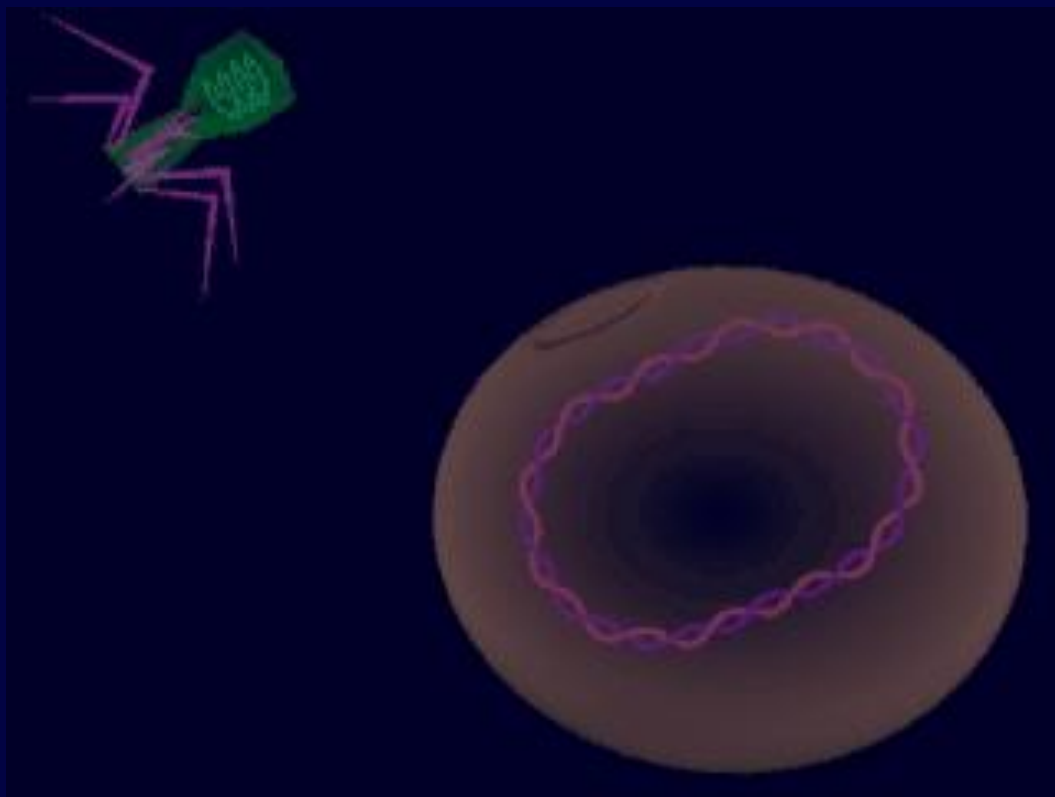
- Many diseases are caused by bacteria, certain viruses, protists (PROH tihsts), or fungi.
- Bacteria cause tetanus, tuberculosis, strep throat, and bacterial pneumonia.
- Malaria and sleeping sickness are caused by protists.
- Fungi are the pathogens for athlete's foot and ringworm.
- Viruses are the cause of colds, influenza, AIDS, measles, mumps, smallpox, and SARS.



2

Disease Organisms

- A **virus** is a minute piece of genetic material surrounded by a protein coating that infects and multiplies in host cells. 



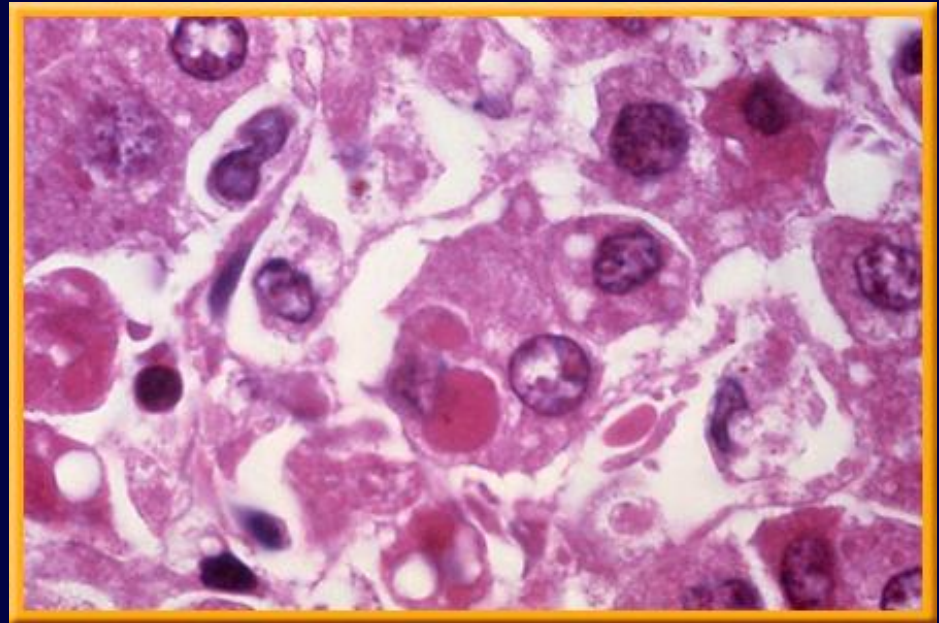
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2

Disease Organisms

- The **host cells die** when the **viruses break out** of them.
- These **new viruses infect** other cells, leading to the **destruction of tissues** or the **interruption of vital body activities**.



Disease Organisms

- **Pathogenic protists**, such as the organisms that cause malaria, **can destroy tissues and blood cells or interfere with normal body functions.**
- In a similar manner, **fungus infections can cause athlete's foot, nonhealing wounds, chronic lung disease, or inflammation of the membranes of the brain.**



Koch's Rules

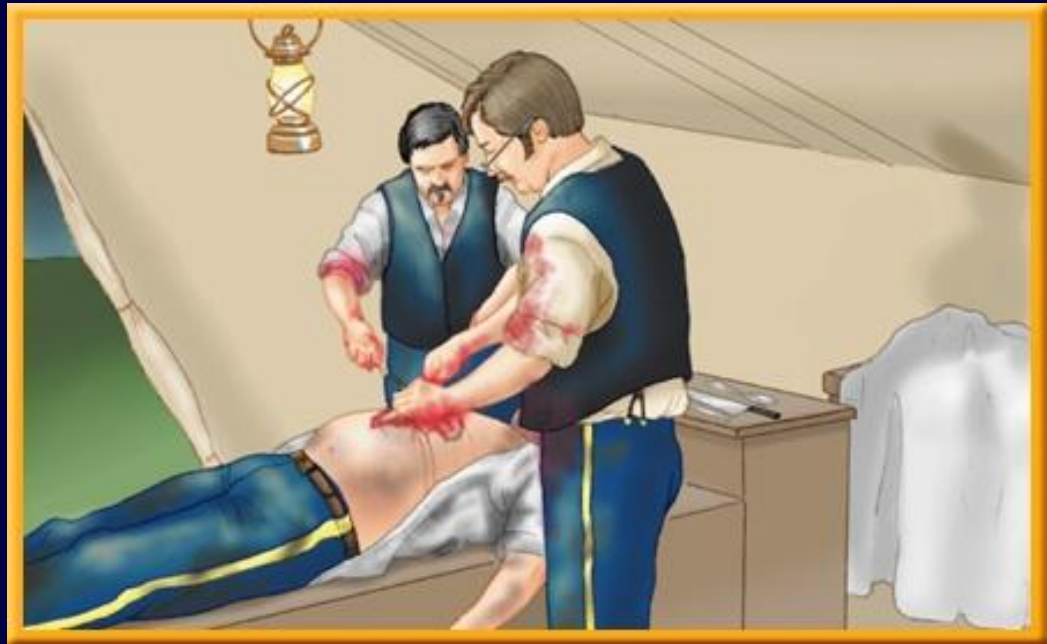
- Many diseases caused by pathogens can be treated with medicines.
- In many cases, these organisms need to be identified before specific treatment can begin.
- A young German doctor named Robert Koch first developed a way to isolate and grow one type of bacterium at a time to tell which specific organism causes which disease.



2

Keeping Clean

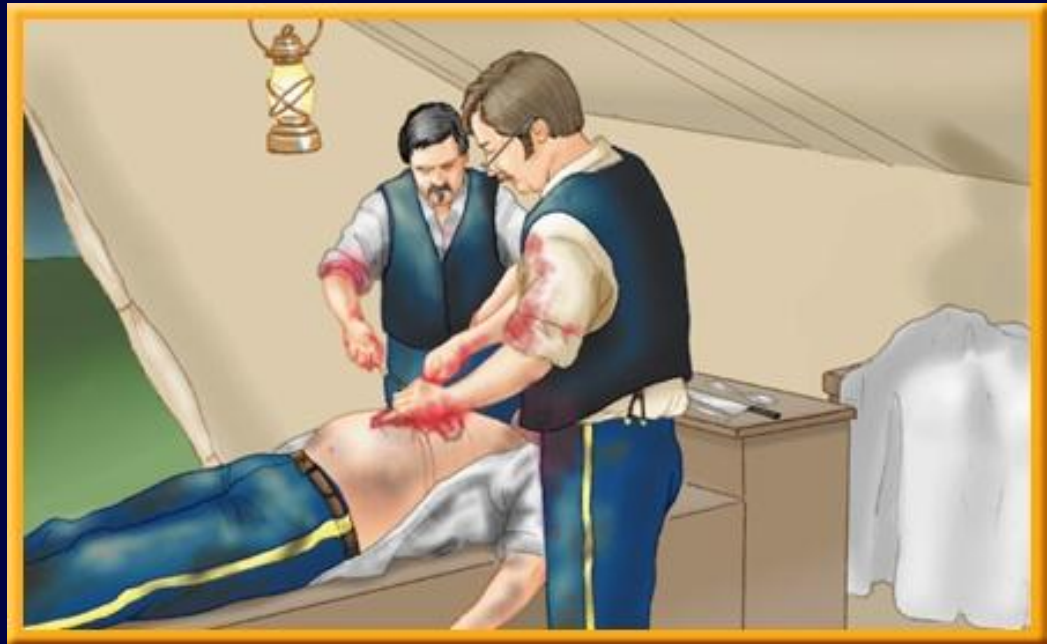
- Hand washing was not always a routine, even for doctors.
- Into the late 1800s, doctors regularly operated in their street clothes and with bare unwashed hands.



2

Keeping Clean

- More patients died from the infections that they contracted during or after the surgery than from the surgery itself.



2

Keeping Clean

- Joseph Lister, an English surgeon, recognized the relationship between the infection rate and cleanliness.
- Lister dramatically reduced the number of deaths among his patients by washing their skin and his hands with carbolic (kar BAH lihk) acid, which kills pathogens.



2

Modern Operating Procedures

- Today antiseptics and antiseptic soaps are used to kill pathogens on skin.
- Every person on the surgical team washes his or her hands thoroughly and wears sterile gloves and a covering gown.





2

Modern Operating Procedures

- The patient's skin is cleaned around the area of the body to be operated on and then covered with sterile cloths.
- All operating room equipment is sterilized.
- Even the air is filtered.



How Diseases Are Spread

- A disease that is caused by a virus, bacterium, protist, or fungus and is spread from an infected organism or the environment to another organism is called an **infectious disease**. 
- Infectious diseases are spread by direct contact with the infected organism, through water and air, on food, by contact with contaminated objects, and by disease-carrying organisms called **biological vectors**. 




2

How Diseases Are Spread

- People can also be carriers of disease.
- When you have influenza and sneeze, you expel thousands of virus particles into the air.
- Colds and many other diseases are spread through contact.
- The Centers for Disease Control and Prevention (CDC) in Atlanta, Georgia, monitors the spread of diseases throughout the United States.



Sexually Transmitted Diseases

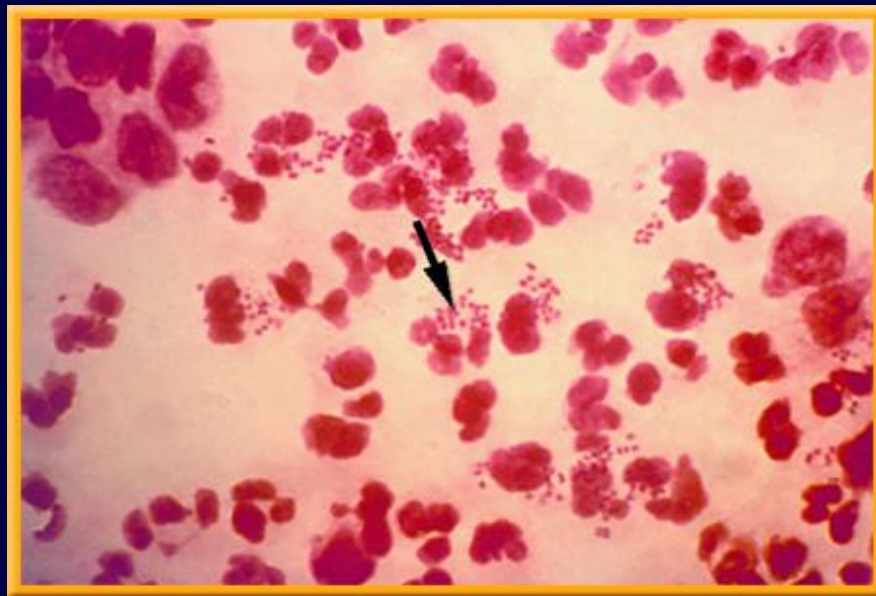
- Infectious diseases that are passed from person to person during sexual contact are called **sexually transmitted diseases** (STDs). 
- STDs are caused by bacteria or viruses.



2

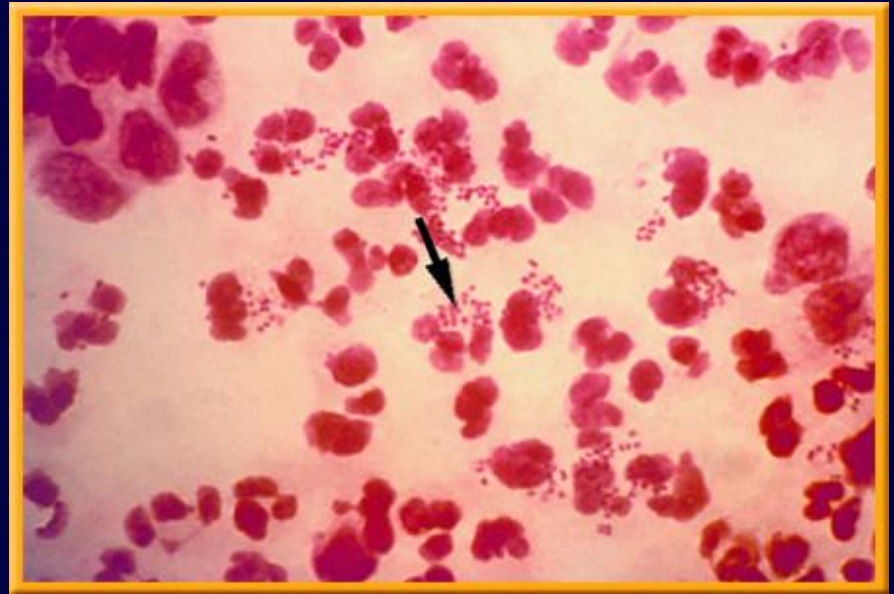
Bacterial STDs

- Gonorrhea (gah nuh REE uh), Chlamydia (kluh MIH dee uh), and syphilis (SIH fuh lis) are STDs caused by bacteria.
- When symptoms appear, they can include painful urination, genital discharge, and genital sores.



Bacterial STDs

- If they are **untreated**, gonorrhea and Chlamydia **can leave a person sterile** because the reproductive organs can be damaged permanently.



2

Bacterial STDs

- Syphilis has three stages.
- In stage 1, a sore that lasts 10 to 14 days appears on the mouth or genitals.
- Stage 2 may involve rash, fever, and swollen lymph glands. Within weeks to a year, these symptoms usually disappear.
- In stage 3, syphilis may infect the cardiovascular and nervous systems.
- In all stages, **syphilis is treatable with antibiotics.**



2

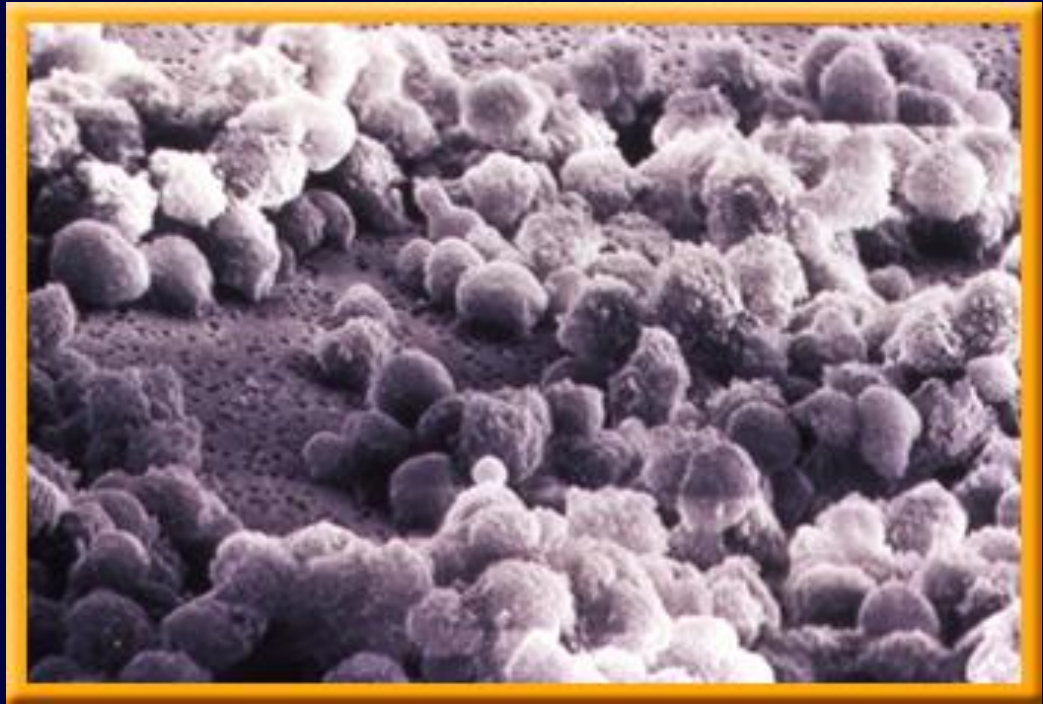
Viral STDs

- Genital herpes, a lifelong viral disease, caused painful blisters on the sex organs.
- It can be transmitted during sexual contact or from an infected mother to her child during birth.
- The herpes virus hides in the body for long periods of time and then reappears suddenly.
- Herpes has no cure, and no vaccine can prevent it but the symptoms of herpes can be treated with antiviral medicines.



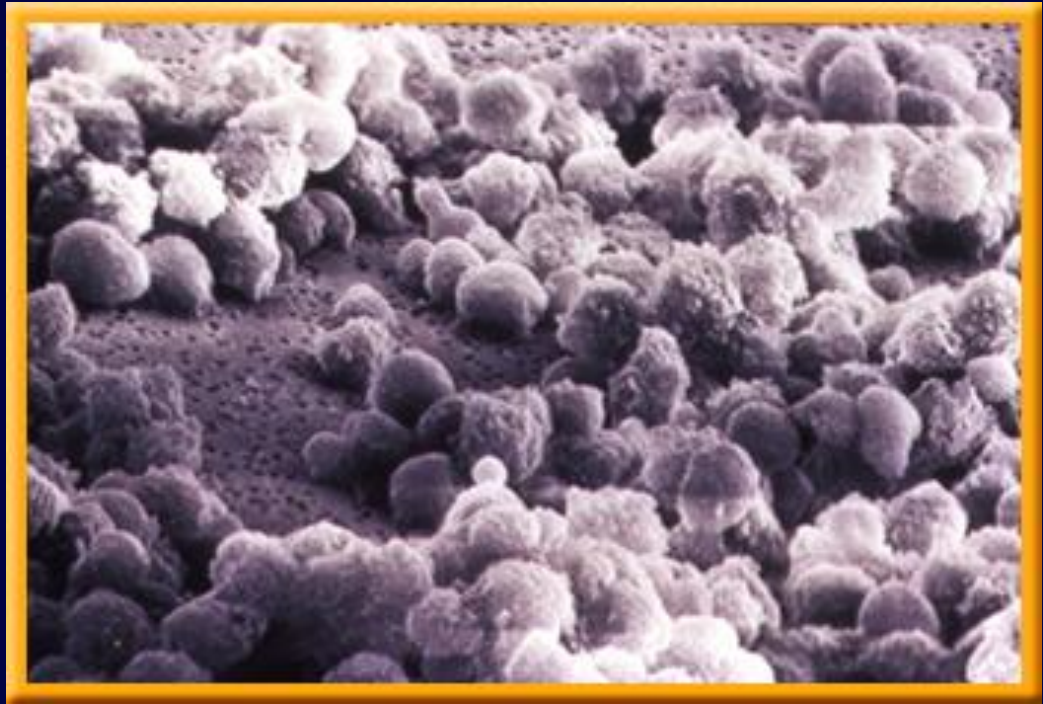
HIV and Your Immune System

- Human immunodeficiency virus (HIV) can exist in blood and body fluids.
- This virus can hide in body cells, sometimes for years.



HIV and Your Immune System

- You can become infected with HIV by having sex with an HIV-infected person or by reusing an HIV-contaminated hypodermic needle for an injection.



HIV and Your Immune System

- The risk of getting HIV through blood transfusion is small because all donated blood is tested for the presence of HIV.
- A pregnant female with HIV can infect her child when the virus passes through the placenta.
- The child also may become infected from contacts with blood during the birth process or when nursing after birth.



AIDS

- An HIV infection can lead to Acquired Immune Deficiency Syndrome (AIDS), which is a disease that attacks the body's immune system.
- HIV attacks the helper T cells in the immune system.
- The virus enters the T cell and multiplies.
- When the infected cell bursts open, it releases more HIV.



AIDS

- Soon, so many T cells are destroyed that not enough B cells are stimulated to produce antibodies.
- The body no longer has an effective way to fight invading antigens.
- When people with AIDS die it is from other diseases such as tuberculosis (too bur kyuh LOH sus), pneumonia, or cancer.



AIDS

- From 1981-2001, more than 816,000 cases of AIDS were documented in the United States.
- At this time the **disease has no known cure.**
- One group of medicines to help treat AIDS interferes with the way that the virus multiplies in the host cell.
- Another group of medicines blocks the entrance of HIV in the host cell.



2

Fighting Disease

- **Washing a small wound with soap and water** is the first step in preventing an infection.
- **Cleaning the wound with an antiseptic and covering** it with a bandage are other steps.
- Washing your body removes and destroys some surface microorganisms.



2

Fighting Disease

- In your mouth, microorganisms are responsible for mouth odor and tooth decay.
- Using dental floss and routine tooth brushing keep these organisms under control.
- Exercise and good nutrition help the circulatory and respiratory systems work more efficiently.
- Keeping up with recommended immunizations and having annual health checkups also can help you stay healthy.



2

Question 1

_____ is the process of heating a liquid to a specific temperature that kills most bacteria.

Answer

The answer is pasteurization. This process was developed by the French chemist, Louis Pasteur.



2

Question 2

Which is a means of reducing the spread of pathogens?

- A. antibiotics
- B. chemotherapy
- C. vaccinations
- D. washing your hands



2

Answer

The answer is D. Washing your hands helps remove and destroy pathogens that may have been picked up by touching a doorknob or answering the phone.



2

Question 3

Rules for determining the cause of particular diseases were developed by _____.

- A. Antoine Lavoisier
- B. Charles Darwin
- C. Gregor Mendel
- D. Robert Koch



2


Answer

The answer is D. Robert Koch was the first to develop a way to isolate and grow one type of bacterium at a time.



3

Chronic Disease

- Not all diseases are caused by pathogens.
- Diseases and disorders such as diabetes, allergies, asthma, cancer, and heart disease are **noninfectious diseases**. 
- They are **not spread from one person to another**.
- Many are **chronic** (KRAH nihd), which **means that they can last for a long time**.
- Some infectious diseases can be chronic if not treated.




Allergies

- An **allergy** is an overly strong reaction of the immune system to a foreign substance. 
- Many people have allergic reactions to cosmetics, shellfish, strawberries, peanuts, and insect stings.



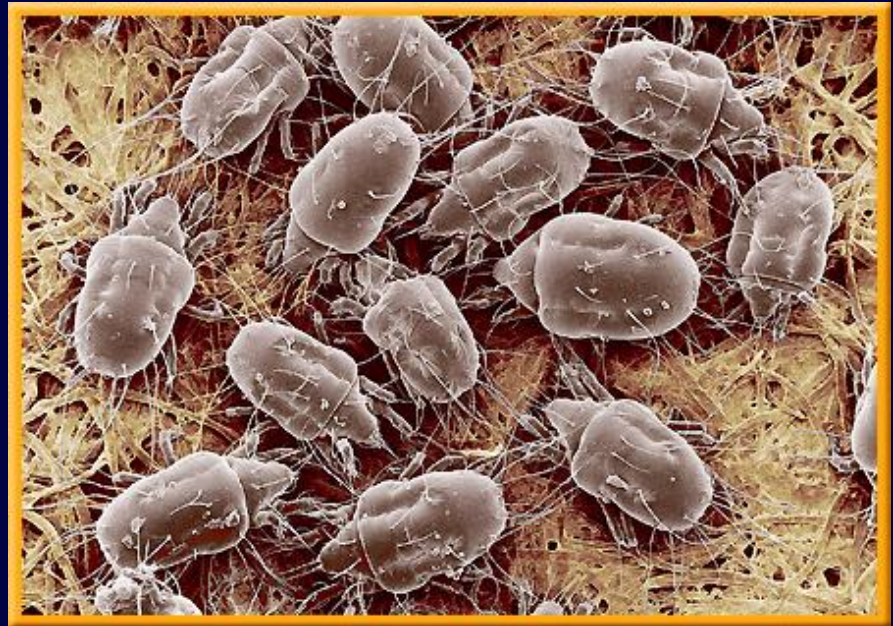
Allergens

- Substances that cause an allergic response are called **allergens**. 
- Some chemicals, certain foods, pollen, molds, some antibiotics, and dust are allergens for some people.
- Some foods cause hives or stomach cramps and diarrhea.
- Pollen can cause a stuffy nose, breathing difficulties, watery eyes, and a tired feeling in some people.



Allergens

- Dust can contain cat and dog dander and dust mites.
- Asthma (AZ muh) is a lung disorder that is associated with reactions to allergens.



Dust Mites



Allergens

- A person with **asthma can have shortness of breath, wheezing, and coughing** when he or she comes into contact with something they are allergic to.



Allergens

- When you come in contact with an allergen, your immune system usually forms antibodies.
- Your body reacts by releasing chemicals called histamines (HIHS tuh meenz) that promote red, swollen tissues.
- Antihistamines are medications that can be used to treat allergic reactions and asthma.



Diabetes

- A chronic disease associated with the **levels of insulin** produced by the pancreas is diabetes.
- **Insulin is a hormone that enables glucose to pass from the bloodstream into your cells.**
- Doctors recognize two types of diabetes.



3

Diabetes

- Type 1 diabetes is the result of too little or no insulin production.
- Type 2 diabetes, your body cannot properly process the insulin.
- Symptoms of diabetes include fatigue, excessive thirst, frequent urination, and tingling sensations in the hands and feet.



3

Diabetes

- Patients with **Type 1** diabetes must monitor their intake of sugars and usually require daily injections of insulin.
- Careful monitoring of diet and weight usually are enough to control **Type 2** diabetes.



3

Diabetes

- Although the cause of diabetes is unknown, scientists have discovered that **Type 2 diabetes is more common in people who are overweight** and that it might be inherited.



3

Chemicals and Disease

- Of the thousands of chemical substances used by consumers, less than two percent are harmful.
- Those **chemicals that are harmful to living things** are called **toxins**.



3

Chemicals and Disease

- Toxins can cause birth defects, cell mutations, cancers, tissue damage, chronic diseases, and death.



The Effects

- The amount of a chemical that is taken into your body and how long your body is in contact with it determine how it affects you.
- Low levels of a toxin might cause cardiac or respiratory problems. However, higher levels of the same toxin might cause death.



The Effects

- Some chemicals, such as the asbestos can be inhaled over a long period of time.
- Eventually, the asbestos can cause chronic diseases of the lungs.



3

The Effects

- Manufacturing, mining, transportation, and farming produce chemical wastes.
- These chemical substances interfere with the ability of soil, water, and air to support life.



The Effects

- Pollution, caused by harmful chemicals, sometimes produces chronic diseases in humans.
- Long-term exposure to carbon monoxide, sulfur oxides, and nitrogen oxides might cause bronchitis, emphysema (em fuh ZEE muh), and lung cancer.



Cancer

- Cancer is the name given to a group of closely related diseases that result from uncontrolled cell growth.
- It is a complicated disease, and no one fully understands how cancers form.

Characteristics of Cancer Cells

Cell growth is uncontrolled.

These cells do not function as part of your body.

The cells take up space and interfere with normal body functions.

The cells travel throughout the body.

The cells produce tumors and abnormal growths anywhere in your body.



3

Cancer

- Certain regulatory molecules in the body control the beginning and ending of cell division.
- If this control is lost, a mass of cells called a tumor (TEW mur) results from this abnormal growth.
- Tumors can occur anywhere in your body.
- Cancerous cells can leave a tumor, spread throughout the body via blood and lymph vessels, and then invade other tissues.



Types of Cancers

- **Leukemia** (lew KEE mee uh) is a cancer of white blood cells. The cancerous white blood cells are no longer effective in fighting disease.
- They crowd out red blood cells, normal white blood cells, and platelets.



Types of Cancers

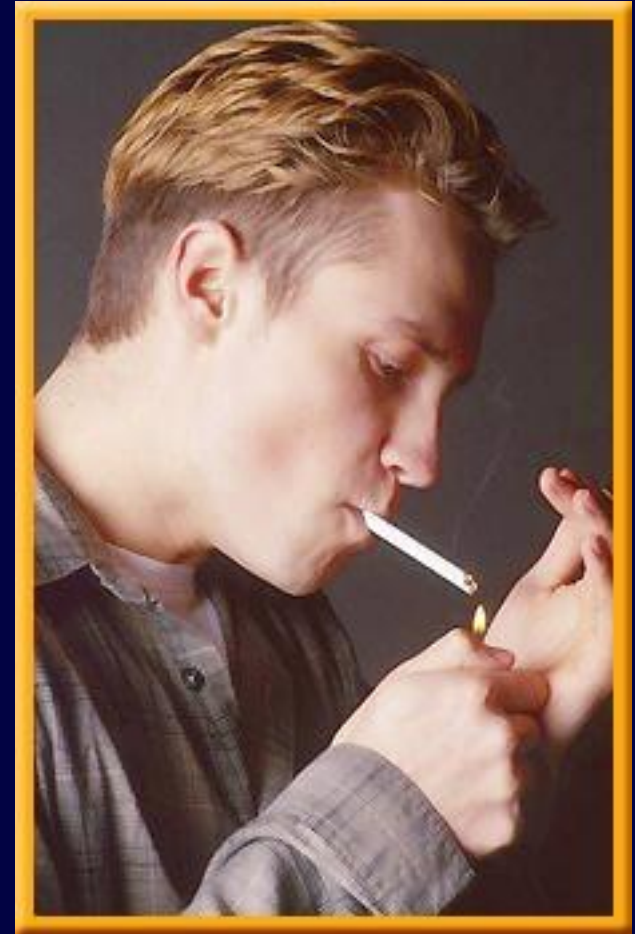
- **Colorectal cancer**, or **cancer of the large intestine**, is one of the leading causes of death among men and women.
- **Changes in bowel movements and blood in the feces** may be indications of the disease.
- In **breast cancer**, tumors grow in the breast.
- The second most common cancer in males is **cancer of the prostate gland**, which is an organ that surrounds the urethra.



3

Causes

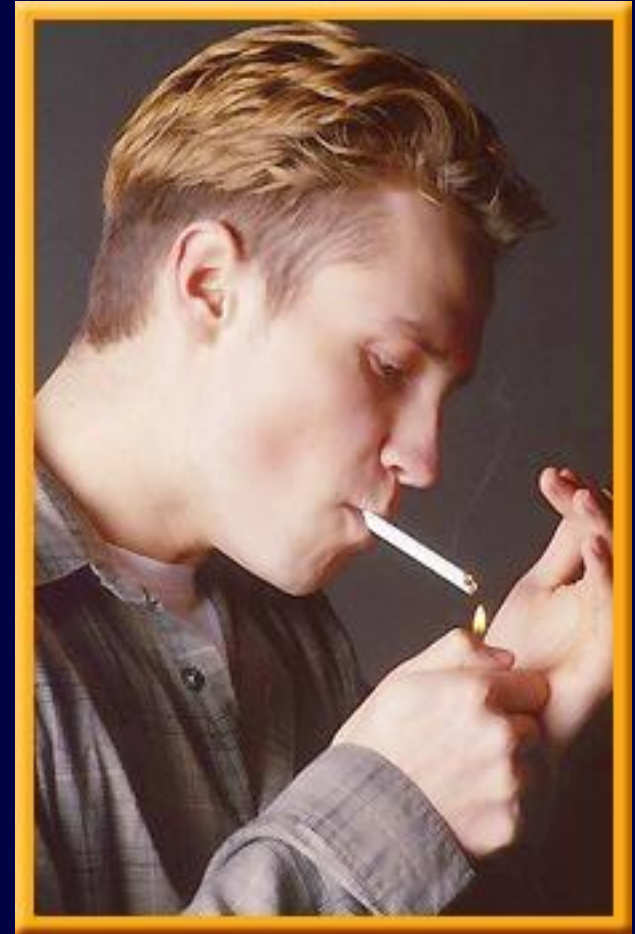
- **Smoking** has been linked to lung cancer.
- Lung cancer is the leading cause of cancer deaths for males in the United States.



3

Causes

- Exposure to certain **chemicals** also can increase your chances of developing cancer.
- These substances, **called carcinogens** (kar SIH nuh junz), includes asbestos, various solvents, heavy metals, alcohol, and home and garden chemicals.



Causes

- Exposure to **X rays, nuclear radiation, and ultraviolet radiation** of the Sun also increases your risk of getting cancer.
- Exposure to ultraviolet radiation might lead to skin cancer.
- Some people have a genetic predisposition for cancer, meaning that they have genes that make them more susceptible to the disease.



3

Treatment

- **Surgery** to remove cancerous tissue, radiation with X rays to kill cancer cells, and **chemotherapy** are some treatments for cancer.
- **Chemotherapy** (kee moh THER uh pee) is the use of chemicals to destroy cancer cells. 
- **Early detection of cancer is the key to any successful treatment.**



3

Treatment

- Research in the science of immune processes, called immunology, has led to some new approaches for treating cancer.
- Specialized antibodies produced in the laboratory are being tested as anticancer agents.
- These antibodies are used as carriers to deliver medicines and radioactive substances directly to cancer cells.



Prevention

- Knowing some causes of cancer might help you prevent it.
- The **first step is to know the early warning signs.**

Early Warning Signs of Cancer

Changes in bowel or bladder habits

A sore that does not heal

Unusual bleeding or discharge

Thickening or lump in the breast or elsewhere

Indigestion or difficulty swallowing

Obvious change in a wart or mole

Nagging cough or hoarseness

From the National Cancer Institute



Prevention

- Medical attention and treatments such as chemotherapy or surgery in the early stages of some cancers can cure or keep them inactive.

Early Warning Signs of Cancer

Changes in bowel or bladder habits

A sore that does not heal

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Nagging cough or hoarseness

From the National Cancer Institute



3

Prevention

- Choosing not to use tobacco and alcohol products can help prevent mouth and lung cancers.
- Selecting a **healthy diet** without many foods that are high in fats, salts, and sugar also might reduce your chances of developing cancer.
- Using **sunscreen** lotions and **limiting** the amount you **expose** your skin to direct **sunlight** can prevent skin cancer.



3

Prevention

- Inhaling certain air pollutants such as carbon monoxide, sulfur dioxide, and asbestos fibers is dangerous to your health.
- To **keep the air cleaner**, the U.S. Government has regulations such as the Clean Air Act.
- These laws are intended to reduce the amount of these substances that are released into the air.



3

Question 1

A(n) _____ is an overly strong reaction of the immune system to a foreign substance.

Answer

The answer is allergy. Most allergic reactions are minor; however, severe allergic reactions can occur.



3

Question 2

Which is a noninfectious disease?

- A. AIDS
- B. common cold
- C. chicken Pox
- D. diabetes



3

Answer

The answer is D. Diabetes, allergies, asthma, cancer, and heart disease are noninfectious diseases. They are not spread from one person to another.



3

Question 3

This table best represents _____.

Changes in bowel or bladder habits

A sore that does not heal

Unusual bleeding or discharge

Thickening or lump in the breast or elsewhere

Indigestion or difficulty swallowing

Obvious change in a wart or mole

Nagging cough or hoarseness



Section Check

3

Changes in bowel or bladder habits

A sore that does not heal

Unusual bleeding or discharge

Thickening or lump in the breast or elsewhere

Indigestion or difficulty swallowing

Obvious change in a wart or mole

Nagging cough or hoarseness

A. characteristics of cancer cells

B. characteristics of sexually transmitted diseases



Section Check

3

Changes in bowel or bladder habits

A sore that does not heal

Unusual bleeding or discharge

Thickening or lump in the breast or elsewhere

Indigestion or difficulty swallowing

Obvious change in a wart or mole

Nagging cough or hoarseness

C. early warning signs of diabetes

D. early warning signs of cancer



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3

Answer

The answer is D. The first step in preventing cancer is knowing the early warning signs.



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