

G L E N C O E

AIDS and Society



AIDS *and Society*

Mary Bronson Merki, Ph.D.



McGraw-Hill

New York, New York

Columbus, Ohio

Woodland Hills, California

Peoria, Illinois

Photo credits

Cover, © John Terence Turner / FPG International;

2. Aaron Haupt;
4. Doug Martin;
7. Pictures Unlimited;
12. Michael Melford/The Image Bank;
15. file photo;
16. Aaron Haupt/Campaign For Our Children, Inc., Baltimore, Maryland;
19. James Stevenson/Science Photo Library/Photo Researchers;
20. Doug Martin;
22. Paul Conklin/Photo Edit;
24. David Madison;
25. Doug Martin;
29. Pictures Unlimited;
30. Mak-I Photo Design;
32. Matt Meadows;
35. Pictures Unlimited;
36. Rick Brown/Medichrome;
40. Doug Martin;
41. Tom Ferentz/Medichrome;
42. file photo;
45. Doug Martin.

Illustrators

Richard Erickson
Felipe Passalacqua

Glencoe/McGraw-Hill

A Division of The McGraw-Hill Companies



Copyright © 1996, by Glencoe/McGraw-Hill. All rights reserved. Except as permitted under the United States Copyright Act, no part of this publication may be reproduced or distributed in any form or by any means, or stored in a database or retrieval system, without prior written permission from the publisher.

Printed in the United States of America.

Send all inquiries to:
Glencoe/McGraw-Hill
21600 Oxnard Street, Suite 500
Woodland Hills, California 91367

ISBN 0-02-651501-6 (Student Text)
ISBN 0-02-651502-4 (Teacher's Annotated Edition)

3 4 5 6 7 8 9 066 04 03 02 01 00 99 98 97

CHAPTER 1: A DISEASE CALLED AIDS2

Lesson 1 How the Body Fights Pathogens.....3

Lesson 2 How Viruses Affect the Body.....8

Health Update: Magic Johnson9

CHAPTER 2: HOW HIV IS TRANSMITTED12

Lesson 1 Who Can Become Infected with HIV?13

Lesson 2 How Is HIV Spread?16

Health Update: Health Care Professionals with HIV.....18

CHAPTER 3: PREVENTING THE SPREAD OF HIV INFECTION22

Lesson 1 Preventing HIV Infection23

Health Update: HIV/AIDS - Do Not Enter!26

Lesson 2 HIV Infection and Safer Sex28

CHAPTER 4: TESTING FOR HIV INFECTION32

Lesson 1 Detecting HIV33

Lesson 2 Results of Testing Positive35

Health Update: Who Should Be Treated for HIV?37

CHAPTER 5: CARE OF THE AIDS PATIENT AND AIDS RESEARCH40

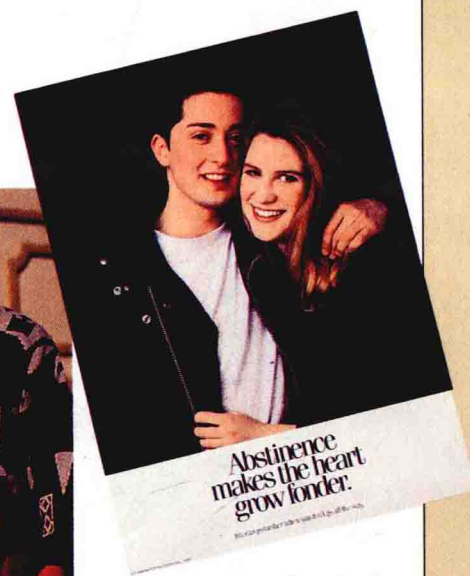
Lesson 1 Care of the AIDS Patient.....41

Lesson 2 AIDS Research.....44

Health Update: Is the Government Spending Too Much on AIDS?46

GLOSSARY49

INDEX51



A DISEASE CALLED AIDS

LESSON 1

How the Body
Fights Pathogens

LESSON 2

How Viruses
Affect the Body



HOW THE BODY FIGHTS PATHOGENS

AIDS is a disease you have probably heard a lot about. You may have read articles in a newspaper or magazine about this frightening disease. You may have seen shows or news stories about it on TV. You may know about famous people who have AIDS or have died from AIDS. You may even have had conversations about AIDS with your friends and family or in discussions in class at school.

With AIDS so much in the public eye, you would think that by now most people would be well-acquainted with the facts about the disease—with such matters as how a person gets AIDS and what the future holds for someone who does. Sadly, most people are not as well-informed as they should be. Some are influenced by one or more of the many misconceptions about the disease. Others simply fail to read past the headlines.

How about you? How much do you know about AIDS? Are you able to separate the myths from the facts? Here are several of each:

AIDS MYTHS AND FACTS

Myths

- You can become infected with the AIDS virus by donating blood.
- You can become infected with the AIDS virus by drinking water from a public fountain.
- You can become infected with the AIDS virus by eating food prepared in a restaurant.
- You can become infected with the AIDS virus by living in the same house with an infected person.
- Only homosexuals can become infected with the AIDS virus.

Facts

- AIDS is a sexually transmitted disease.
- The virus that causes AIDS can be passed among users of IV drugs.
- People of any skin color or race can become infected with the virus that causes AIDS.
- People of all ages, including babies, can become infected with the virus that causes AIDS.
- Anyone who practices behaviors known to transmit the AIDS virus can become infected.

LESSON 1 FOCUS

TERMS TO USE

- Acquired immune deficiency syndrome (AIDS)
- Lymphocytes
- Lymphatic system
- Antibodies
- Macrophages

CONCEPTS TO LEARN

- AIDS is a deadly disease.
- The body has many barriers against infection.
- HIV interferes with the body's ability to defend itself against pathogens.

Here is one more important myth and one more important fact that might be added to the list above. The myth is, there is a cure for AIDS. The fact is, there is no cure for AIDS. However, it can be prevented.

In this book, you will learn how the AIDS virus is spread and, just as importantly, how it is not. You will also learn about measures you can take to prevent becoming infected with this virus.

DID YOU KNOW?

- According to the Centers for Disease Control and Prevention, the number of adolescent and adult AIDS cases in the United States through June 1994 was 401,749. The number of cases of children under 13 was 5,743.
- Of the adolescent and adult cases of AIDS reported through December 1994, 1,965 cases involved persons aged 13 to 19, and 16,575 involved persons aged 20 to 24.

What Is AIDS?

Acquired immune deficiency syndrome, or **AIDS**, is a specific group of diseases or conditions that occur when the body's immune responses are suppressed as a result of infection with the human immunodeficiency virus (HIV). The effects of HIV in the body allow pathogens—disease-causing organisms—to freely attack the body with little resistance. Some of these pathogens can cause death. To understand how HIV affects the body, you first need to understand how your body works to protect itself against invading pathogens.

The Body's Immunity

Though you cannot see them, your body is exposed each day to millions of pathogens. Pathogens are in the air you breathe, and they cling to surfaces of objects you touch. When they enter your body, pathogens attack your body's cells and use these cells to grow and multiply. The end result of such an attack is an infection.

Most of the time your body manages to stay free of infection because of your immune system. Your body has two main types of defense with this system—the work of body barriers and cells. Both types work together to protect your body against pathogens that would harm you.

Mechanical Barriers

The body's main mechanical barrier is the skin. Unbroken skin helps prevent pathogens from entering body tissues. The mucous membranes of the mouth and nose, which produce mucous secretions to trap pathogens, are another type of mechanical barrier. Some mucous membranes have cilia, or tiny hairs. These can be found in the respiratory tract. Cilia help move pathogens to the back of the throat so they can be swallowed. Pathogens also are expelled from the body when you sneeze or cough. Tears and saliva help carry pathogens away.



Coughing helps you expel pathogens.

Chemical Barriers

Chemicals on the surface of cells can kill pathogens or prevent them from entering cells. Such chemicals can be found in tears, saliva, and sweat. The acidic digestive juices of the stomach are also chemical barriers. These juices destroy pathogens that are swallowed with food. Other chemicals cause body changes that help cells inside the body fight pathogens.

Organic Barriers

Bacteria are microscopic organisms that live in air, water, soil, plants, and animals. Bacteria are often thought of as disease-causing. However, certain bacteria are helpful to humans. One such strain of bacteria makes its home in the mouths and stomachs of humans. These bacteria make an organic barrier against infection by producing substances that kill pathogens. The bacteria also crowd out many pathogens that would otherwise grow and multiply in the body.

SOME LIKE IT HOT

Another way that the body reacts to and fights infection is fever. When pathogens invade the body, many internal chemical reactions speed up. When heat is formed faster than the body can get rid of it, fever results. Even though fever's function is not completely understood, it is clear that fever has a beneficial effect in some cases. Researchers have discovered that some pathogens cannot live or reproduce at temperatures higher than the normal body temperature. In such cases, the fever is responsible for weakening, and even killing, the invading pathogens.

Cells that Fight Pathogens

Sometimes pathogens break through the barriers that make up the body's first line of defense. When this happens, another body defense goes to work. This defense is the cells that not only fight off pathogens but also keep a record of them in case they enter the body again.

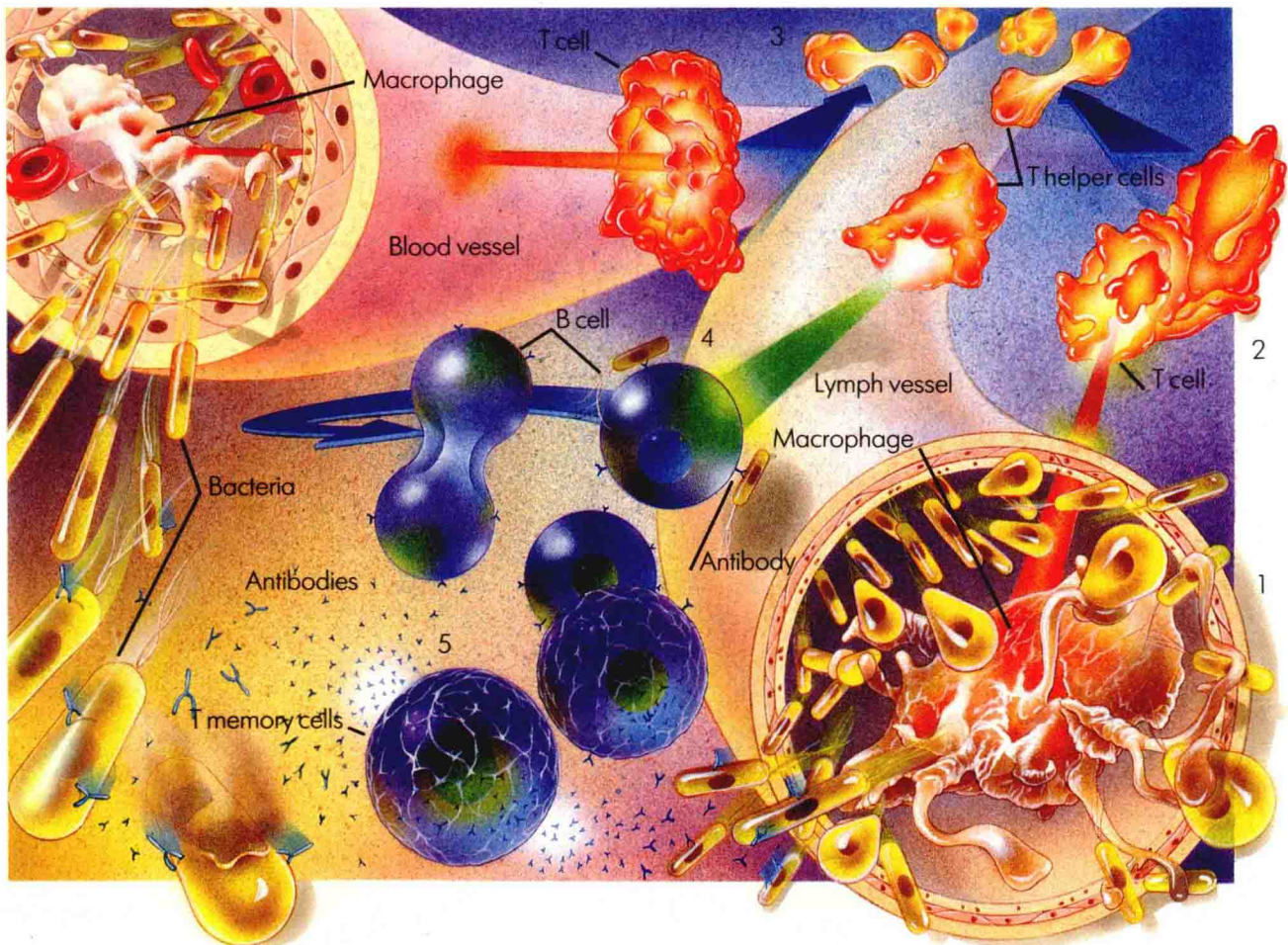
The immune system responds in several ways to pathogens. One way is to activate cells called **lymphocytes**. These white blood cells fight pathogens. They travel through your body along two networks of vessels. One of these networks is your blood vessels. The other network is your lymph vessels, a part of your **lymphatic system**. Your lymphatic system also includes your spleen, tonsils, thymus gland, lymph, and lymph nodes. This system is part of your body's defense system. Lymphocytes multiply in the lymph tissues, which include your spleen, tonsils, thymus gland, and lymph nodes.

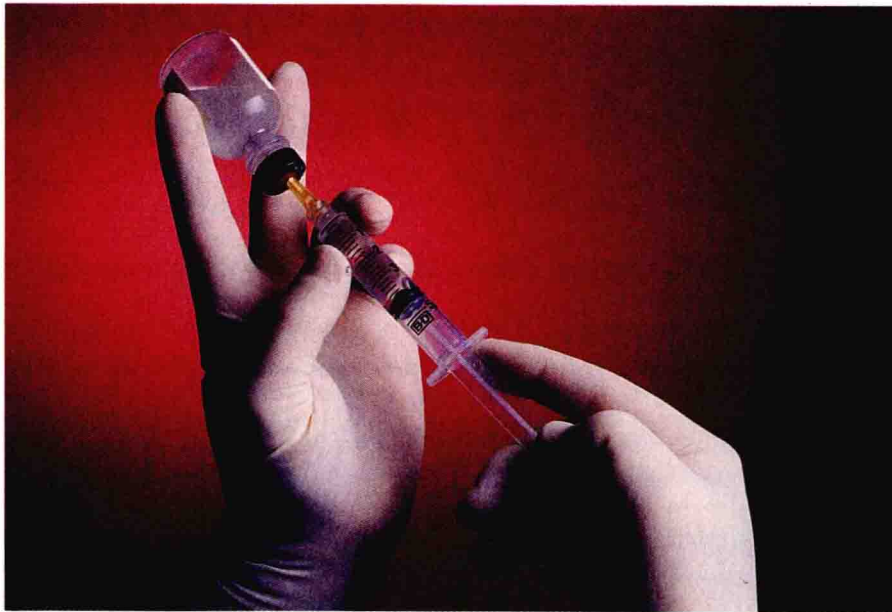
The immune system uses two major types of lymphocytes to do its job—T cells and B cells. T cells and B cells originate in bone marrow, the soft material at the core of your bones. T cells move through blood and mature in the thymus gland. Many types of T cells are formed. B cells mature in red bone marrow. Both types of cells travel between the blood and lymph tissues.

T cells and B cells both fight specific pathogens. Imagine that the pathogens causing a particular disease have entered your body. Your immune system searches your lymph nodes for the right T cell and B cell to fight the pathogens. When it finds the right T cell and B cell, your body begins producing many copies of these cells to ensure that enough lymphocytes are on hand to attack the pathogens. T cells and B cells fight pathogens in different ways.

- T effector cells destroy pathogens.
- T helper cells stimulate B cells to make antibodies. **Antibodies** are proteins that destroy or neutralize pathogens in your body.
- T suppressor cells shut down the production of antibodies once the infection is under control.
- T memory cells make a permanent record of a particular pathogen. If that pathogen ever enters the body again, the memory cell causes the immune system to react quickly and immediately.
- B cells produce antibodies with the help of T helper cells. Some antibodies destroy pathogens directly. Others attach themselves to a pathogen and decrease its effectiveness. Once a pathogen has been weakened in this way, it becomes an easy target for **macrophages**, a type of white blood cell that destroys pathogens by digesting them. The process by which macrophages destroy pathogens is known as phagocytosis. Macrophages pass the message about pathogens to T cells.

(1) When pathogens enter the blood or the lymphatic system, a macrophage will digest them. (2) The macrophage passes the message about the pathogen to T cells. (3) T cells multiply. (4) T helper cells activate B cells to make antibodies to destroy the foreign substances in the body. (5) T memory cells make a record of a pathogen, so the immune system can quickly attack if it enters the body again.





After receiving a vaccine, the body makes antibodies to fight pathogens.

Active Immunity. The immune response described so far is an example of natural active immunity. That is, when the body's internal, or built-in, ability to fight off infection begins working by producing antibodies. The antibodies stay in the blood to become active if the person encounters the pathogen again.

Humans also can fight pathogens by responding to artificial active immunity. This is immunity introduced into the body in the form of a vaccine, or substances composed of dead or weakened pathogens. Vaccines can be administered by an injection or pill. The body then makes antibodies to fight the pathogens. The body will then recognize and fight similar pathogens that enter.

LESSON 1 REVIEW

Reviewing Facts and Vocabulary

1. Tell what *AIDS* is short for. Use the term in a paragraph that also includes the terms *immune system* and *antibody*.
2. Name two mechanical barriers. Describe two types of cells that fight pathogens.
3. What are lymphocytes? In which lymph tissues do they multiply?

Thinking Critically

4. **Evaluation.** Review the myths about AIDS. What do most of the myths have in common? How do you think they originated?

5. **Synthesis.** Why do you think the body has different ways to fight pathogens?

Applying Health Knowledge

6. In an encyclopedia or other reference book, read about the Black Death, a fierce plague that caused many deaths throughout much of Europe and Asia during the Middle Ages. Investigate how the epidemic got its name and what measures people took to safeguard against it. How do the events surrounding this disease compare to those facts regarding AIDS?

How VIRUSES AFFECT THE BODY

LESSON 2 FOCUS

TERMS TO USE

- Virus
- Human immunodeficiency virus (HIV)
- Parasite
- Opportunistic infections
- Retrovirus

CONCEPTS TO LEARN

- AIDS is caused by a virus known as HIV.
- HIV disables the immune system.
- People infected with HIV are open to opportunistic infections.

AIDS is caused by a type of pathogen called a virus. A **virus**, which is the smallest form of life, is 10 to 100 times smaller than bacteria. Viruses are also among the human body's worst enemies. The particular virus that causes AIDS is the **human immunodeficiency virus**, or **HIV**, for short.

An examination of viruses reveals that they are not cells. They have no nucleus, no cytoplasm, and no cell membrane. A viral particle consists of nucleic acid—a complex chemical present in the cells of all organisms—surrounded by a protein coating.

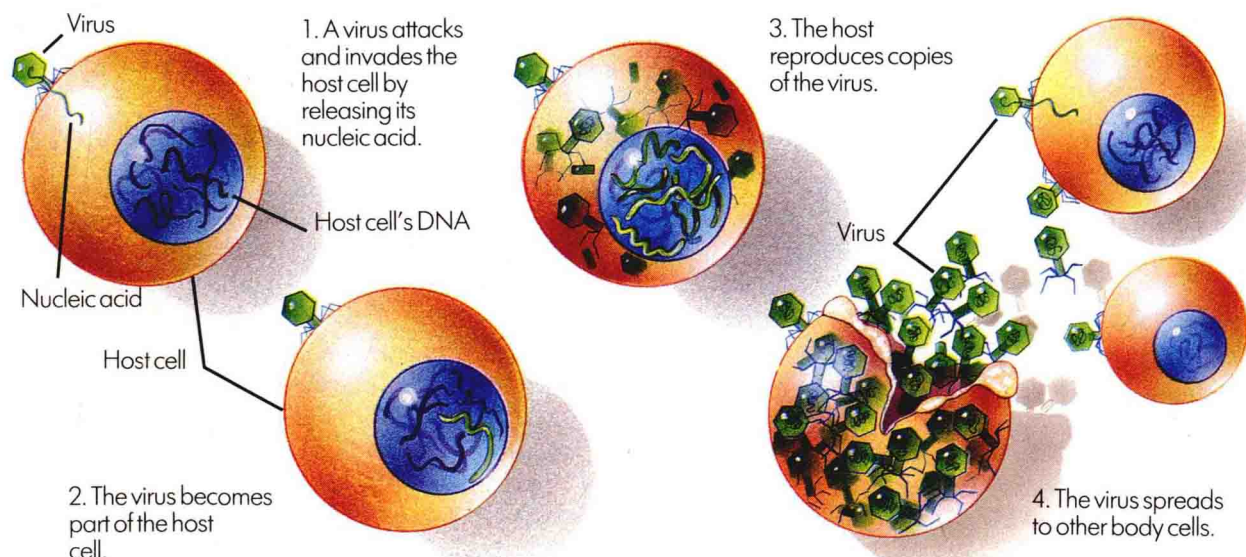
Viruses at Work

All viruses are **parasites**. Parasites are organisms that live and feed on other organisms without contributing to their survival. Sometimes parasites destroy the organisms on which they prey.

As parasites, viruses need living cells to survive and make copies of themselves. Viruses invade particular kinds of cells. Only certain viruses invade animal cells, and then these viruses can attack only specific types of cells. For example, the rabies virus, one virus to which humans are susceptible, attacks only brain cells. The polio virus targets the cells of the brain and spinal cord.

When a virus enters the human body, it attaches itself to a cell wall and releases its nucleic acid, either DNA or RNA, into the cell. That cell then becomes known as the host. The nucleic acid disrupts the host cell's normal activities and causes the cell to begin producing copies of the virus. These new viruses are identical in makeup to the original one. They spread to other body cells, where the process is repeated. Larger and larger numbers of cells are invaded in this way.

When a virus enters a cell, it releases its nucleic acid into the cell and causes it to copy the virus.



HEALTH UPDATE

LOOKING AT THE ISSUES

Magic Johnson

Earvin "Magic" Johnson, one of the best basketball players ever, was only 32 years old when, in a November 1991 news conference, he announced his retirement from the Los Angeles Lakers during his 12th season. Magic had tested HIV-positive after taking a routine insurance blood test. At that time, Magic's doctor, Michael Mellman, advised him to stop his professional basketball career in order to save his strength. However, after competing in the 1992 summer Olympics in Barcelona Spain, Magic signed a contract and rejoined his team. He resigned again in November 1992. Magic said he received the virus through heterosexual intercourse before he was married. Magic's wife and son have tested negative for HIV at this time.

Analyzing Different Viewpoints

ONE VIEW. Some people look up to Magic for his athletic ability. Others admire him because he speaks out about HIV/AIDS awareness and seeks funding for AIDS.

A SECOND VIEW. Others do not view Magic as a hero. The life-style Magic chose was not a good example for those who looked up to him. Because of his actions, he has endangered many lives. The possibility exists that he may infect his wife with HIV.

A THIRD VIEW. Because Magic is infected with HIV, those who believed that AIDS is only a disease of homosexuals will realize that others, even an athlete, can become infected. Magic's infection may cause people who practice behaviors known to transmit HIV to change.

A FOURTH VIEW. Magic was right to quit the Laker's team. He could have infected other players had he received an injury that resulted in bleeding.

Exploring Your Views

1. How do you think Magic should have handled his professional basketball career? How do you think Magic's hero status has changed? Explain.
2. How would you respond to playing a sport with or against someone who is infected with HIV? What would make a difference in the way you feel?
3. How do you think Magic should use his visibility and financial resources to help others infected with HIV or having AIDS?
4. Are there some myths you once believed about HIV infection and AIDS? If so, what were they? What caused you to recognize them as untrue?
5. What rights should professional athletes have to protect themselves from HIV infection?

DID YOU KNOW?

- The United States ranks first worldwide in total reported cases of AIDS.
- States with the largest number of adolescents and adults with AIDS are New York, California, Florida, and Texas. States with the largest number of children under 13 with AIDS include New York, Florida, New Jersey, and California.

HIV at Work

When HIV enters the blood, it attaches itself to T helper cells. HIV injects its genetic material into the DNA of the host cell. The virus causes other cells to destroy T helper cells, which are now mistakenly viewed as pathogens. The body produces antibodies to fight HIV, but they are

ineffective. As HIV reproduces, more and more T helper cells are destroyed. Over time, the body loses so many T cells that the immune system can no longer do its job.

Eventually, when other pathogens enter the body, there are too few T helper cells left to activate B cells into producing antibodies. Therefore, the pathogens that enter the body are able to live and feast on the cells of the body, because the weakened immune system can no longer fight back. The person in this condition is susceptible to many kinds of infections. As a result of these infections, the person will become more and more ill.

Opportunistic infections are diseases that would not do serious harm to a person with a healthy immune system. These infections are called opportunistic, or opportunity-seeking, because they take advantage of the weakened state of a person infected with HIV. Now even a simple cold could result in a life-threatening illness to the person infected with HIV.

THE MANY FORMS OF HIV

Viruses have one of two types of genetic material, DNA (deoxyribonucleic acid) or RNA (ribonucleic acid). Most DNA viruses cause fairly mild infections, such as warts and colds. RNA viruses cause more serious diseases, including polio, rabies, and HIV.

Although HIV shares many characteristics with other viruses, it falls into a special category of RNA viruses called *retroviruses*. Unlike most viruses, a retrovirus contains an enzyme that allows it to build a DNA strand to match the genetic makeup of the cell it invades. HIV, however, is unique and especially deadly. It can hide in the system for years. Further, each time it invades a new T cell, a slight variation, or mutation, can take place. These everchanging forms of HIV build resistance to therapeutic drugs and continue to frustrate researchers, who have not yet been able to develop a vaccine.

LESSON 2 REVIEW

Reviewing Facts and Vocabulary

1. Explain the difference between a virus and a retrovirus.
2. What happens when HIV enters the body?
3. What are opportunistic infections?

Thinking Critically

4. **Analysis.** In what ways is the HIV retrovirus different from most other retroviruses? In what ways is it the same?
5. **Evaluation.** AIDS has been referred to as

“Public Enemy Number One.” What aspects of the disease make this reference a fitting one?

Applying Health Knowledge

6. At your public or school library, read about the history of HIV/AIDS research. Determine how researchers’ understanding of HIV has changed over time, what their current short-range goals are, and whether they expect to conquer HIV before the year 2000.

REVIEW

Reviewing Facts and Vocabulary

1. Write a brief paragraph explaining what AIDS is and how it harms the immune system. In your paragraph, use the following terms: *pathogen*, *lymphocytes*, *virus*, *opportunistic infection*.
2. State three myths about ways HIV is transmitted. State one fact for each myth.
3. Name the three types of barriers your body uses to defend itself from pathogens. Give an example of each type.
4. What role does fever play in fighting infection?
5. What are lymphocytes? Where do lymphocytes multiply?
6. Name three different types of T cells and the jobs they do.
7. Describe the process of phagocytosis. Tell what kinds of cells carry out this process.
8. Define and give examples of natural active and artificial active immunity.
9. How are viruses different from cells?
10. What is a parasite?
11. Which of the body's T cells does HIV target?
12. What is a retrovirus? What problems do retroviruses cause for the host cell?

Thinking Critically

13. **Synthesis.** Explain how having a cut in the skin puts a person at risk of infection.
14. **Analysis.** In what order do the following defenses against pathogens come into play?
 - (a) Immune system attacks pathogens.
 - (b) Saliva neutralizes pathogens.
 - (c) Digestive juices in the stomach destroy pathogens.
15. **Synthesis.** How do vaccines lead to a healthier population?
16. **Synthesis.** Why is it dangerous for a person infected with HIV to be around another person who has the flu?
17. **Evaluation.** What properties of HIV infection make it so frightening?
18. **Evaluation.** What are some ways that public health officials might attempt to curb the AIDS epidemic?

Applying Health Knowledge

19. Contact your city or county public health agency to ask for any printed materials they issue on AIDS. List at least three key facts from the literature you receive.

Beyond the Classroom

20. **Further Study.** Look through newspapers and magazines, gathering any articles you can find on AIDS breakthroughs. Write brief summaries of these articles and assemble them into an illustrated booklet with the title "AIDS: Looking to the Future."
21. **Parental Involvement.** Discuss the list of AIDS myths and facts found in Lesson 1 with your parents. Write down any questions you or they have about the list and look for answers to those questions. Discuss the answers with your parents.

CHAPTER

2

How HIV Is Transmitted

LESSON 1

Who Can Become Infected with HIV?

LESSON 2

How Is HIV Spread?



WHO CAN BECOME INFECTED WITH HIV?

One question many people have asked is, “Where did HIV come from?” Scientists have been unable to give a single answer to this question. Some believe HIV has been around for some time and only recently changed and became more deadly. One common theory is that HIV originated in some far-off corner of the globe and was spread as people traveled.

First Cases of HIV Infection and AIDS

AIDS was first recognized in the United States in 1981. On June 5 of that year, the Centers for Disease Control and Prevention (CDC) in Atlanta, Georgia, issued a brief report linking two separate but equally baffling mini-epidemics. The CDC is a governmental agency that records the incidence of disease in the United States. Both mini-epidemics involved rare diseases.

The first of the two outbreaks was called to the CDC’s attention by a New York City dermatologist. This doctor had recently treated 20 patients whom he diagnosed as having a rare form of cancer that affects only people with a weakened immune system. The second outbreak involving a rare disease erupted in the Los Angeles area. This situation involved 5 cases of a type of pneumonia that arose under similar circumstances.

In addition to the rareness of the diseases, a second link between the two epidemics was that the patients were all male homosexuals. The CDC report was carried throughout the country in newspapers and on television.

Over time, and with additional cases of infection within the homosexual community, many people began to believe that AIDS—as the mysterious affliction had come to be known—struck only homosexuals. Some people even referred to it as the gay plague.

This belief was, of course, wrong. Homosexuals are not the only people who are and have been infected with HIV. People of all races, ages, and sexual orientation can become infected with HIV if they practice behaviors known to transmit HIV.

High-Risk Behaviors and HIV Infection

A **high-risk behavior** is a way of acting that endangers a person and increases his or her chances of becoming ill or injured. Driving or riding in a car without wearing seat belts is a high-risk behavior that can have life-shattering consequences. Riding in a car with someone who has been drinking alcohol is another high-risk behavior that can result in serious injury.

LESSON 1 FOCUS

TERMS TO USE

- High-risk behavior
- Intravenous (IV) drugs

CONCEPTS TO LEARN

- There are specific high-risk behaviors associated with HIV infection.
- High-risk behaviors can be avoided.

DID YOU KNOW?

Through December 1994, the exposure categories of male adolescents and adults with AIDS in the United States include the following:

- sexual intercourse with men 53 percent
- IV drug use 25 percent
- sexual intercourse with men and using IV drugs 7 percent
- hemophilia/blood clotting disorder 1 percent
- heterosexual contact 7 percent
- recipient of blood transfusion, blood components, or tissue 2 percent
- other/undetermined 6 percent

Several high-risk behaviors have been linked with the spread of HIV. Choosing these behaviors increases a person's chances of contracting the virus. The high-risk behaviors are:

- Having sexual intercourse with a person who is infected with HIV. A number of fluids associated with sexual intercourse can transmit HIV.
- Sharing illegal intravenous drugs. Illegal **intravenous**, or **IV**, **drugs** are used by injection of a syringe into a person's vein. A person who sticks an HIV-contaminated needle into his or her veins can contract the virus.
- Using any illegal or dangerous drugs, including alcohol, carries a risk. While non-IV drugs do not spread the virus, they may interfere with a person's ability to think clearly and act responsibly. This, in turn, can lead a person to behave in a way that he or she will regret later on.

ARE TATTOOS SAFE?

Researchers are working around the clock to conquer HIV. Until that day comes, it helps to play it safe and heed the advice of health experts who recommend steering clear of any unnecessary invasion of the skin. One such invasion is getting tattooed. If you have given any thought to getting a tattoo yourself, then give some thought to this: cases of HIV infection from contaminated tattoo needles have been reported. Some people who have gone to get a tattoo have come away with more than they bargained for.

Anyone who has engaged in high-risk behavior should be tested for HIV.

