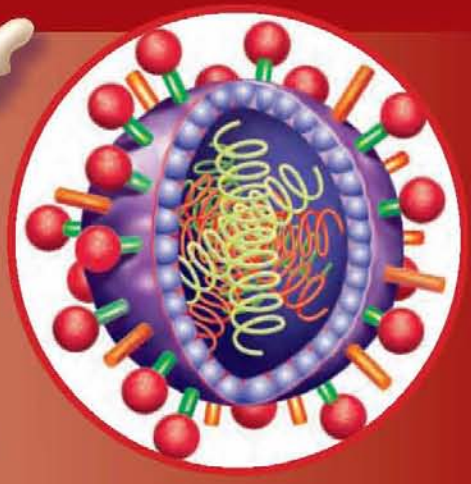
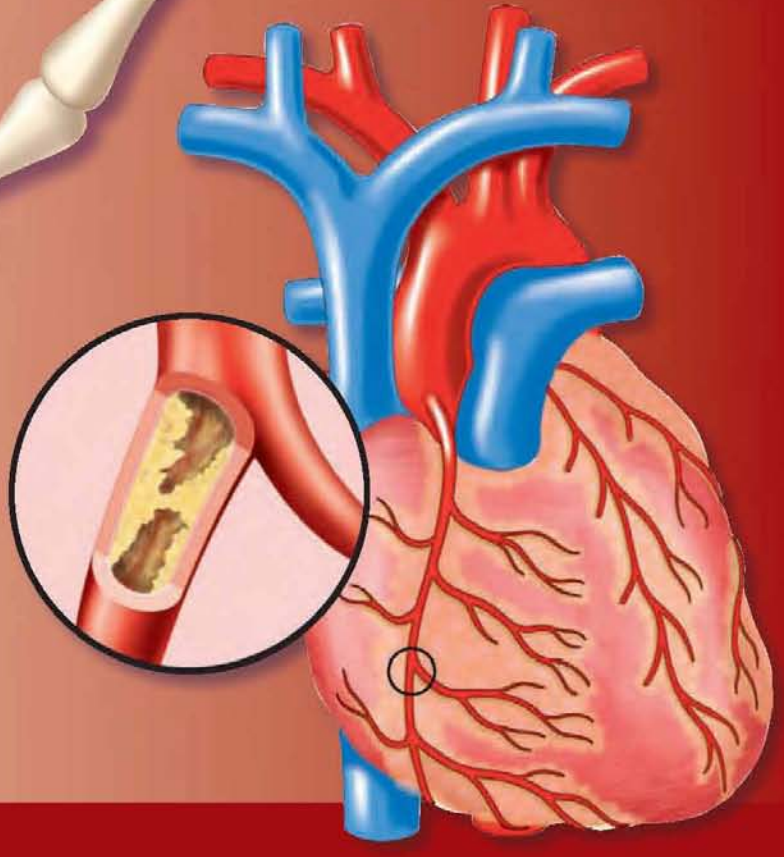
Encyclopedia of DISEASES AND DISORDERS





Antibiotic-resistant infections

Antibiotics were discovered in the 1940s and have been used to successfully treat infections caused by bacteria. For decades, these miracle drugs have prevented serious illness and death from bacterial diseases. Unfortunately, antibiotic use also promotes the development of antibiotic-resistant bacteria. According to the U.S. Centers for Disease Control and Prevention (CDC), almost all significant bacterial infections affecting humans are becoming resistant to commonly prescribed antibiotics.

Doctors can no longer rely on their first or second choice of antibiotics to fight many human infections. Scientists are concerned that physicians will lose these essential infection-fighting tools. The majority of the most serious antibiotic-resistant infections occur in hospitalized people, but these infections are becoming more frequent in healthy people. Public health officials are sounding the alarm about antibiotic resistance because of the emergence of "superbugs" in the last decade. These germs are resistant to many antibiotics, including powerful drugs such as vancomyin, which is reserved by physicians to fight the most stubborn infections.

Causes and risk factors

Antibiotic-resistant infections are caused by bacteria that survive treatment with commonly prescribed antibiotics. When bacteria reproduce, slight changes occur in their genetic material. Some of these changes allow bacteria to evade certain antibiotics.

Each person carries more microorganisms on the skin than there are people in the world. Bacteria that coexist on our skin and in our bodies without causing disease are called healthy bacterial flora. When antibiotic-resistant bacteria develop, they compete with our own flora, becoming a trivial member of our bacterial melting pot. However, in the presence of an antibiotic drug, the resistant bacteria can magnify their population a thousandfold to a millionfold. The resulting infection is harder to treat and often requires a more powerful antibiotic drug.

Both viruses and bacteria cause common infections. However, antibiotics fight only those infections caused by bacteria, not those caused by viruses. Viruses and bacteria are distinct. Bacteria are one of the smallest life-forms and occur as single cells. Many bacteria are not harmful, and some are actually beneficial. Disease-causing bacteria can grow on the skin or inside the body and cause illness. For example, strep throat is caused by bacteria called *Streptococcus pyrogenes*.

KEY FACTS

Description

Hard-to-treat infections caused by bacteria that survive treatment with common antibiotics.

Causes

Repeated and improper use of antibiotics.

Risk factors

In hospital settings, antibiotic use and underlying health conditions. In the community, close contact with people who have antibiotic-resistant infections. Use of antibiotics in livestock.

Symptoms and signs

Bacterial infection that does not improve after treatment with antibiotics.

Diagnosis

Laboratory tests of blood or infected tissues.

Treatments

Laboratory testing determines which antibiotics will be most effective.

Pathogenesis

When bacteria survive treatment with antibiotic, they continue to multiply. The bacterial infection becomes more severe and harder to treat. Doctors must prescribe more powerful and toxic antibiotics.

Prevention

Only take antibiotics for bacterial infections. Take antibiotics as prescribed by your health care provider, and finish the course.

Epidemiology

Antibiotics were discovered in the 1940s. Unfortunately, antibiotic use also promotes the development of antibiotic-resistant bacteria. For example, MRSA was first isolated in the 1960s.

Viruses are even smaller than bacteria. They are mostly genetic material—DNA or RNA—and often have a protective coat surrounding their genes. A virus cannot reproduce outside the body's cells. Viruses invade healthy cells. They use the machinery of the body's cells to make copies of themselves. Typically, newly formed viruses destroy the cell as they leave it to infect new cells. Viruses rather than bacteria are the more frequent culprits of respiratory illnesses such as colds, sore throats, and coughs. Most stuffy noses are caused by viruses called rhinoviruses.

Symptoms

During the early days of a cold or upper respiratory infection, the nose produces clear mucus. The mucus helps wash the germs from the sinuses (air-filled spaces in the skull) and nose. Immune cells then join in to fight the infection, and the mucus changes from clear to a whitish or yellowish color. During recovery from a stuffy nose, the bacteria that live normally in the nose grow back, which can change the mucus to a greenish color, which experts say is normal.

According to the CDC, doctors feel pressure to prescribe antibiotics for respiratory infections. Respiratory infections such as sore throat, cold, and coughs are usually caused by viruses. Tens of millions of antibiotics prescribed in doctors' offices are for viral infections. Using antibiotics for a viral infection offers no benefit to the affected person and could possibly cause harm. Taking unnecessary antibiotics increases the risk of antibiotic resistance developing in bacteria.

Staphylococcus aureus, commonly called staph bacteria, is found on human skin and in the nose. Staph bacteria are one of the most common causes of skin infections in the United States. Most of these skin infections are minor. However, staph bacteria can also cause serious blood infections and pneumonia, which can be fatal. Hospitalized patients are particularly at risk for antibiotic-resistant infections, including infections caused by staph bacteria. Often, these infections are introduced by urinary or intravenous catheters, and can be serious. Certain underlying health conditions increase the risk of infection. Such conditions include diabetes, kidney disease, and immune-system problems. Also, antibiotic use—for example, to prevent infection after surgery—increases a patient's risk of developing a resistant infection. Staph superbugs are often referred to by their abbreviations: for example, MRSA (methicillin-resistant *Staphylococcus aureus*), VRSA (vancomycin-resistant *Staphylococcus aureus*), and VISA (vancomycin-intermediate *Staphylococcus aureus*). MRSA infections are becoming more common in various communities and are affecting healthy people. No longer confined to health care settings, MRSA outbreaks have occurred among children, athletes, and military recruits.

In the last decade, doctors are seeing more cases of antibiotic resistant infections in healthy adults and children. Close contact with people who have antibiotic-resistant infections is an important risk factor in healthy people. In one outbreak among high-school athletes, sharing of towels, sports equipment, and uniforms were important factors in transmitting MRSA from one athlete to another.

The use of antibiotics in livestock on farms is also under scrutiny by government agencies. There appears to be a link to the development of antibiotic resistance in humans, especially when the same class of drugs (for example, fluoroquinolones) are used in both livestock and to treat humans.

Prevention and treatments

To help prevent antibiotic-resistant infections, antibiotics should be taken as prescribed by a health care provider. A course of antibiotics should not be stopped at the first sign of improvement. To help prevent resistant bacteria from gaining an upper hand, it is very important to take every dose of the prescribed antibiotic until it is finished. Antibiotics should not be saved for use at a later time.

Experts on the subject of infections maintain that many bacterial infections get better on their own and that physicians should only prescribe antibiotics when it is likely to benefit the patient. Viral infections, such as cold or flu, do not respond to antibiotics.

Frequent hand washing is one of the easiest ways to reduce transmission of infectious diseases. Sometimes an antibiotic is needed. A health care provider should be consulted if a respiratory illness gets worse or lasts a long time. To treat an antibiotic-resistant infection, clinicians perform laboratory tests to find the antibiotic or combination of drugs that will beat the superbug. Providing clinicians with better tools to distinguish a viral illness from a bacterial infection will help prevent unnecessary antibiotic use.

Mary Quirk

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- Diabetes