Kansas Association For
Family & Community Education

Antibiotics: History, Use, and Abuse

2020 Leader's guide and member handout

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Goals and Objectives

- Participants will gain an understanding of the history of antibiotics, including their discovery, development and improvement.
- Participants will gain an understanding of how antibiotics can be used in preventing and fighting diseases for the betterment of mankind.
- Participants will gain an understanding of how antibiotics can and have been misused and the problems that can happen.

Items needed for presentation

- Leaders guide and member handout
- Antibiotics self-quiz
- cdc.gov has numerous printable handouts.

Community action

- Have an informative booth on antibiotic resistance at a local health fair
- Give a lesson on antibiotic use and abuse to local groups

History, Use, and Abuse of Antibiotics

Antibiotics can be loosely defined as the variety of substances derived from bacterial sources (microorganisms) that control the growth of or kill other bacteria. Synthetic antibiotics, usually chemically related to natural antibiotics, have been produced to accomplish comparable tasks. While antibiotics may only be prescribed by doctors, we need to be aware of some facts about them to insure our health.

How Do Antibiotics Work?

- A bactericidal antibiotic kills the bacteria by interfering with the formation of the bacterium's cell wall or its cell contents. Penicillin, Keflex, Cipro, and Levaquin are commonly prescribed bactericidal antibiotics.
- A bacteriostatic antibiotic stops bacteria from multiplying by interfering with bacterial protein production, DNA replication, or other aspects of cellular metabolism. Tetracyclines and sulphonamides are bacteriostatic antibiotics. Doxycycline and Bactrim are commonly prescribed.

- Broad spectrum antibiotics are effective against a broad range of microorganisms in comparison with narrow spectrum antibiotics which target specific bacteria.
- Antibiotics may be administered orally or by injection.
- Antibiotics can also be classified based on their chemical structure. A similar level of effectiveness, toxicity and side-effects is rendered by the antibiotics of the same structural group.

Early history

- Greeks and Indians used molds and other plants to treat infections.
- In Greece and Serbia, moldy bread was traditionally used to treat wounds and infections.
- Warm soil was used by Russian peasants to cure infected wounds.
- Historical references are made to the use of things as strange as bodily fluids used to treat infections.

Modern history

Although Sir Alexander Fleming is credited with the discovery of Penicillin in 1928, others experimented and recommended treatment with the substance centuries earlier.

1640 England: John Parkington recommended using mold for treatment in his book on pharmacology.
1870's England: Sir John Scott Burdon-Sanderson, Joseph Lister, and John Tyndall made and reported on discoveries using Penicillium glaucium.
1877 France: Louis Pasteur found that bacteria could kill other bacteria (anthrax bacilli).
1897 France: Ernest Duchesne used mold (Penicillium glaucium) to heal typhoid in infected guinea pigs.
1920's England: Sir Alexander Fleming discovered enzyme lysozyme and derived the antibiotic substance penicillin from the Penicillium notatum fungus.
1932 Germany: Gerhard Domagk discovered Sulfonamidochrysoidine (Prontosil).
1940's-1950: Streptomycin, chloramphenicol, and tetracycline were discovered. Selman Waksman, in 1942, use the term "antibiotics" to describe them.

Sir Alexander Fleming and His Discovery of Antibiotics

Alexander Fleming was born in Scotland in 1881. He was educated in London, and joined St, Mary's Medical School, where he did research and later lectured. He served as Captain during World War I and worked in battlefield hospitals in France before returning to become a professor at St. Mary's.

In 1921 he discovered a naturally antiseptic enzyme (lysozyme) in tears and mucus. In 1928 he was experimenting on influenza virus and found that a common fungus, Penicillium notatum, had destroyed staphylococcus bacteria in a culture plate. As he experimented, he found that the mold juice had developed a bacteria-free zone inhibiting the growth of the staphylococci. Newly named penicillin, it was effective even when diluted up to 800 times.

He was knighted in 1944 and received the Nobel Prize in 1945 for his achievements.

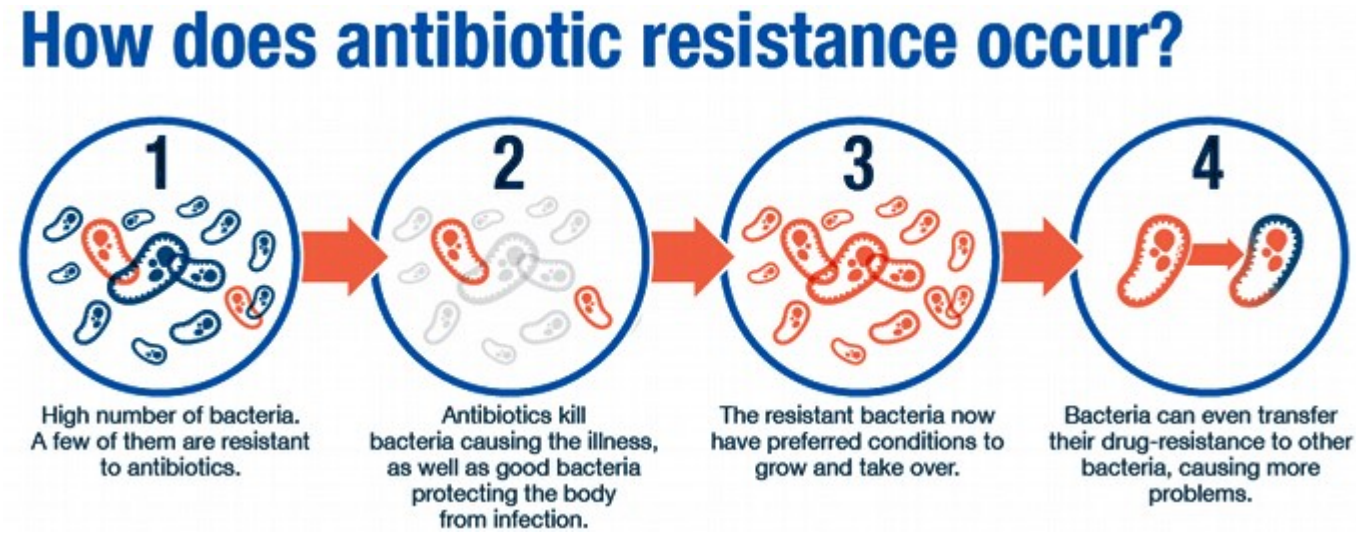
Use and Abuse of Antibiotics

Antibiotics are among the most commonly prescribed drugs used in human medicine, prescribed for a variety of illnesses from strep throat to urinary tract infections. However, up to 50% of all antibiotics prescribed are not needed or not optimally effective as prescribed. Over-prescribing and misuse of antibiotics has contributed to antibiotic resistant bacteria.

Antibiotic resistance is one of the most serious public health problems in the United States and threatens to return us to the time when simple infections were often fatal. Centers for Disease Control and Prevention (CDC) works to improve antibiotic prescribing and use in human health care and educate patients about the importance of appropriate use.

Taking antibiotics helps create resistant bacteria. Contrary to popular belief, your body does not develop an immunity to the antibiotics, the bacteria develop the ability to defeat the drugs designed to kill them.

Antibiotics used in food animals are known to cause resistant bacteria that stay in the animal's digestive system and meat. Animal waste can also contaminate food crops, potentially spreading resistant bacteria to humans.



<u>What Everyone Should Know</u>

- Antibiotics save lives, and when a patient needs antibiotics, the benefits outweigh the risks of side effects and antibiotic resistance.
- Antibiotics are only needed for treating certain infections caused by bacteria. **Antibiotics don't work on viruses. They won't work if you have a cold or flu. Respiratory viruses usually go away in a week or two without treatment.** Antibiotics won't help for some common bacterial infections including most cases of bronchitis, many sinus infections, and some ear infections.
- Anytime antibiotics are used, they can cause side effects. When antibiotics are not needed, they won't help you, and the side effects could hurt you. If you need antibiotics, take them exactly as prescribed. Talk with your doctor if you have questions about the antibiotics or if you develop any side effects.

Side Effects

- Minor side effects from antibiotics include dizziness, nausea, diarrhea, yeast infections.
- Clostridium difficile (C. diff) causes diarrhea that can lead to severe colon damage and death.
- Allergies. People can have severe and life-threatening allergic reactions. CDC reports that about 10% of all U.S. Patients report having an allergic reaction to a penicillin class antibiotic in their past. When evaluated, less than 1% of the population has a true allergy (Type 1, Immunoglobulin E {IgE}). Identifying those who are not truly penicillin-allergic can decrease the unnecessary use of broad-spectrum antibiotics, lowering health care costs and reducing risk for antibiotic resistance.
- Antibiotic-Resistant Bacteria- As quickly as an antibiotic is developed, bacteria are evolving to defeat the drugs designed to kill them. Each year in the United States, at least **2 million people** get infected with antibiotic-resistant bacteria. At least **23,000 people** die as a result. MRSA is an example. Some resistant bacteria can be difficult or impossible to treat and can spread to other people.

What You Can Do

- Be sure you need an antibiotic. Your doctor should responsibly only prescribe one for bacterial infections.
- If you need antibiotics, take them exactly as prescribed. Take all the medication. Don't save some for next time. Safely dispose of unused medications. Don't take antibiotics prescribed for someone else.
- Be aware of side effects and notify your doctor, especially if you experience diarrhea, indicating a possibility of C. diff infection.
- Remember, if you don't need the antibiotic, its side effects can still be harmful.
- If you don't need an antibiotic, the best treatment for your illness may be over-the-counter medication to relieve symptoms.
- Decrease chances of becoming ill by sanitary methods: safe food handling, hand washing, covering coughs, staying home when sick, and getting recommended vaccinations. The CDC recommends proper hand washing with soap over the alternative alcohol-based hand sanitizers that do not eliminate all types of germs. When used, hand sanitizers need to have more than 60% alcohol to be effective.

Antibiotics can be life-saving medicines. Antibiotic resistant bacteria pose a serious threat to human health. By using antibiotics responsibly, we can help reduce that risk.

Reviewed by Tammy Flaming, registered pharmacist, Hillsboro Hometown Pharmacy

Credits and References

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