History, Use and Abuse of

Antibiotics

Leaders Guide

Designed for and Presented in 2018 Oregon FCE State Conference
Oregon Association for Family and Community Education
Pendleton, Oregon

Scott Teeples
Oregon Association for Family and Community Education – FCE Member; 2018-2020 Oregon FCE President; Past Oregon FCE Secretary; Past National FCE Board Member

Patti Malanaphy
Oregon Association for Family and Community Education – FCE Member; 2018-2020 Oregon FCE Secretary; Past Oregon FCE President

History, Use and Abuse of Antibiotics

Agenda:

• Welcome and Introduction	1 minute
• Review Agenda	1 minute
• Review Goals and Objectives	1 minute
• Bio of Presenters	1 minute
• Handout #1 – Antibiotics Introduction Quiz	3 minutes
• Antibiotics Definition	1 minute
• Classifications	2 minutes
• History of Antibiotics	3 minutes
• The Discovery of Antibiotics	3 minutes
• How Do Antibiotics Work?	2 minutes
• How Do Antibiotics Work?	2 minutes
• U.S. Antibiotic Awareness Week	1 minute
• Seven facts you should know to Be Antibiotics Aware	2 minutes
• What Everyone Should Know	2 minutes
• Risks of Antibiotics	2 minutes
• Side Effects	1 minutes
• Using Antibiotics Correctly	2 minutes
• Antibiotics cure bacterial infections, but not viral infections	2 minutes
• Taking antibiotics for viral infections:	2 minutes
• Virsus or Bacteria… what's got you sick	2 minutes
• Know When Antibiotics Are Needed and When They're Not	2 minutes
• To stay healthy and keep others healthy	2 minutes
• Know What to Ask Your Child's Doctor	2 minutes
• Questions about Bacteria, Viruses, and Antibiotics	2 minutes
• Antibiotic Resistance	1 minute
• Antimicrobial Cleaning Agents, Acne Medication, & Probiotics	2 minutes
• Is it really a Penicillin Allergy?	2 minutes
• Final Exam and Conclusion	6 minutes
• Questions and Answers	3 minutes
• Hand Outs – various items	2 minutes
	60 total minutes

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 have or can happen.

Items that may be needed for Presentation

- Antibiotics Leaders Guide
- Various Activities and Handouts
- Pencils or pens for each attendee
- Blank paper for each attendee
- *PowerPoint Presentation on Antibiotics (if needed)
- *Computer
- *PowerPoint projector
- *Screen or wall to project presentation on
- *Computer/projector table
- *Electrical cords/power bars as needed

*only needed if PowerPoint presentation is us

References and Credit Given to:

- Explorable.com (Feb 14, 2010). History of Antibiotics. Retrieved Jul 24, 2018 from Explorable.com: https://explorable.com/history-of-antibiotics
- Centers for Disease Control and Prevention
  CDC 24/7: Saving Lives, Protecting People™
- https://www.cdc.gov
- https://www.cdc.gov/antibiotic-use/community
- https://www.cdc.gov/antibiotic-use/week/promotional-materials/print-products.html

History, Use and Abuse of Antibiotics

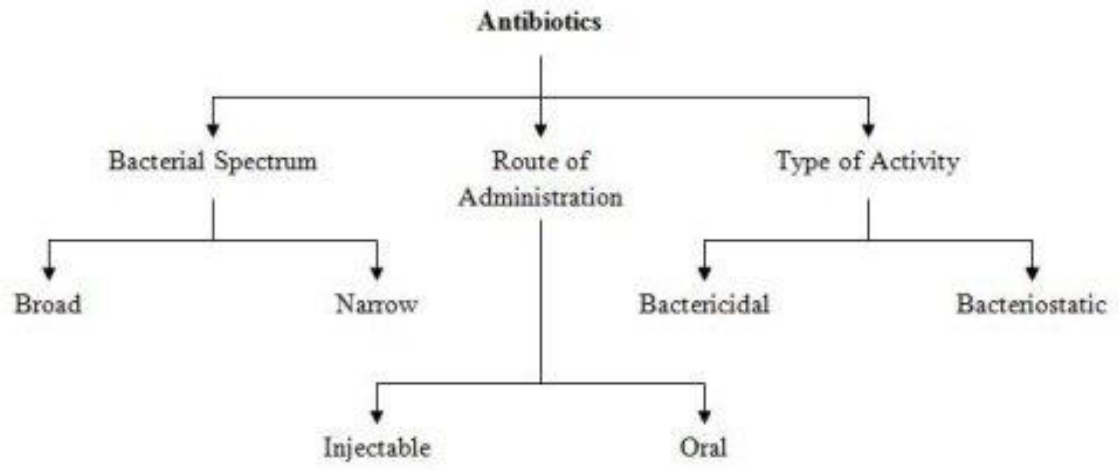
Note: Do Activity # 1 Handout – Antibiotics Self Quiz

Antibiotics Definition

Antibiotics can be loosely defined as the variety of substances derived from bacterial sources (microorganisms) that control the growth of or kill other bacteria. However, Synthetic antibiotics, usually chemically related to natural antibiotics, have since been produced that accomplish comparable tasks.

Classifications

A common scheme of classifications for antibiotics is drawn below:



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 same structural group. Broad spectrum antibiotics are effective against a broad range of microorganisms in comparison to narrow spectrum antibiotics. Bactericidal antibiotics kill the bacteria whereas bacteriostatic antibiotics halt the growth of bacteria.

History of Antibiotics

History of antibiotics can be described in two segments as under:

Early History

During ancient times;

- Greeks and Indians used moulds and other plants to treat infections.
- In Greece and Serbia, mouldy bread was traditionally used to treat wounds and infections.
- Warm soil was used in Russia by peasants to cure infected wounds.
- Sumerian doctors gave patients beer soup mixed with turtle shells and snake skins.
- Babylonian doctors healed the eyes using a mixture of frog bile and sour milk.
- Sri Lankan army used oil cake (sweetmeat) to serve both as desiccant and antibacterial.

Modern History

1640 England: John Parkington recommended using mold for treatment in his book on pharmacology.

1870 England: Sir John Scott Burdon-Sanderson observed that culture fluid covered with mould did not produce bacteria.

1871 England: Joseph Lister experimented with the antibacterial action on human tissue on what he called Penicillium glaucium.

1875 England: John Tyndall explained antibacterial action of the Penicillium fungus to the Royal Society.

1877 France: Louis Pasteur postulated that bacteria could kill other bacteria (anthrax bacilli).

1897 France: Ernest Duchesne healed infected guinea pigs from typhoid using mould (Penicillium glaucium).

1928 England: Sir Alexander Fleming discovered enzyme lysozyme and the antibiotic substance penicillin from the fungus Penicillium notatum.

1932 Germany: Gerhard Domagk discovered Sulfonamidochrysoidine (Prontosil)

Note: During 1940's and 50's streptomycin, chloramphenicol, and tetracycline were discovered and Selman Waksman used the term "antibiotics" to describe them (1942)

Sir Alexander Fleming

Sir Alexander Fleming, a Scottish biologist, defined new horizons for modern antibiotics with his discoveries of enzyme lysozyme (1921) and the antibiotic substance penicillin (1928). The discovery of penicillin from the fungus Penicillium notatum perfected the treatment of bacterial infections such as, syphilis, gangrene and tuberculosis. He also contributed immensely towards medical sciences with his writings on the subjects of bacteriology, immunology and chemotherapy.

Alexander Fleming was born in Loudon, Scotland on 6 August, 1881 in a farming family. He carried on his schooling at Regent Street Polytechnic after his family moved to London in 1895. He joined St. Mary's Medical School and became research assistant to renowned Sir Almroth Wright after he qualified with distinction in 1906. He completed his degree (M.B.B.S.) with gold medal in 1908 from the University of London and lectured at St. Mart till 1914. He served as Captain during the World War I and worked in battlefield hospitals in France. After the war he returned to St. Mary in 1918 and got elected Professor of Bacteriology in 1928.

The Discovery of Antibiotics

"One sometimes finds what one is not looking for"

(Sir Alexander Fleming)

His research and study during his military career inspired him to discover naturally antiseptic enzyme in 1921, which he named lysozyme. This substance existed in tissues and secretions like mucus, tears and egg-white but it did not have much effect on the strongly harmful bacteria. Six years later; as a result of some

intelligent serendipity, he stumbled on discovering penicillin. It was in 1928 when he observed while experimenting on influenza virus that a common fungus, Penicillium notatum had destroyed bacteria in a staphylococcus culture plate. Upon subsequent investigation, he found out that mould juice had developed a bacteria-free zone which inhibited the growth of staphylococci. This newly discovered active substance was effective even when diluted up to 800 times. He named it penicillin.
He was knighted in 1944 and was given the Nobel Prize in Physiology or Medicine in 1945 for his extraordinary achievements which revolutionized the medical sciences.

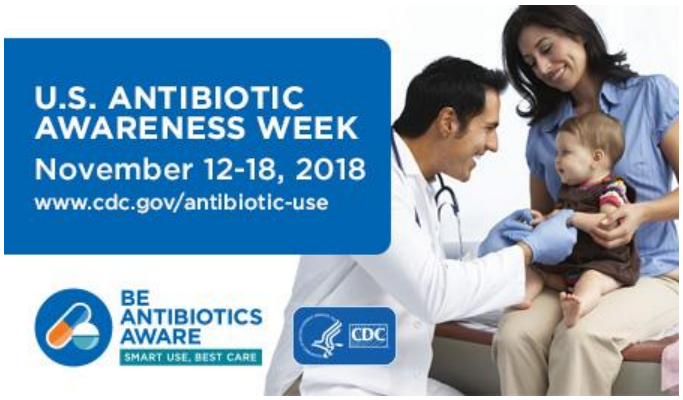
How Do Antibiotics Work?

Various types of antibiotics work in either of the following two ways:

1. A Bactericidal antibiotic kills the bacteria generally by either interfering with the formation of the bacterium's cell wall or its cell contents. Penicillin, daptomycin, fluoroquinolones, metronidazole, nitrofurantoin and co-trimoxazole are some example of Bactericidal antibiotics.
2. A Bacteriostatic antibiotic stops bacteria from multiplying by interfering with bacterial protein production, DNA replication, or other aspects of bacterial cellular metabolism.Some Bacteriostatic antibiotics are tetracyclines, sulphonamides, spectinomycin, trimethoprim, chloramphenicol, macrolides and lincosamides.

Use of Antibiotics

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. CDC works to improve antibiotic prescribing and use in human health care, and educate patients about the importance of appropriate use. When we optimize how we use and prescribe these drugs, we protect patients from harm and combat antibiotic resistance.



U.S. Antibiotic Awareness Week is November 12-18, 2018.

U.S. Antibiotic Awareness Week (formerly "Get Smart About Antibiotics Week") is an annual one-week observance to raise awareness of the threat of antibiotic resistance and the importance of appropriate antibiotic prescribing and use. Join CDC and partners as we celebrate the effort to combat the spread of antibiotic resistance and improve patient safety.

U.S. Antibiotic Awareness Week (USAAW) is an annual observance highlighting the importance of being Antibiotics Aware and the steps everyone can take to improve antibiotic use or prescribing.

Each year in the United States, at least 2 million people become infected with bacteria that are resistant to antibiotics and at least 23,000 people die as a direct result of these infections. Many more will die from complications by an antibiotic-resistant infection.

The use of antibiotics is the single most important factor leading to antibiotic resistance around the world. Antibiotics are among the most commonly prescribed drugs used in human medicine. However, up to 50% of all the antibiotics prescribed for people are not needed or are not optimally effective as prescribed. Antibiotics are also commonly used for promoting growth in food animals, one type of use that is not necessary.

Improving the way healthcare professionals prescribe antibiotics, and the way we take antibiotics, helps keep us healthy now, helps fight antibiotics resistance, and ensures that these life-saving drugs will be available for future generations.

About Antibiotic Prescribing and Use

CDC encourages healthcare professionals, patients, and families to learn more about antibiotic prescribing and use.

Here are seven facts you should know to Be Antibiotics Aware:

1. Antibiotics save lives. When a patient needs antibiotics, the benefits outweigh the risks of side effects or antibiotic resistance.
2. Antibiotics aren't always the answer. Everyone can help improve antibiotic prescribing or use.
3. Antibiotics do not work on viruses, such as colds and flu, or runny noses, even if the mucus is thick, yellow or green.
4. Antibiotics are only needed for treating certain infections caused by bacteria. Antibiotics also won't help some common bacterial infections including most cases of bronchitis, many sinus infections, and some ear infections.
5. An antibiotic will not make you feel better if you have a virus. Respiratory viruses usually go away in a week or two without treatment. Ask your healthcare professional about the best way to feel better while your body fights off the virus.
6. Taking antibiotics creates resistant bacteria. Antibiotic resistance occurs when bacteria develop the ability to defeat the drugs designed to kill them.
7. If you need antibiotics, take them exactly as prescribed. Talk with your doctor if you have any questions about your antibiotics, or if you develop any side effects, especially diarrhea, since that could be a *C. difficile (c. diff)* infection which needs to be treated right away.

What Everyone Should Know

- Antibiotics save lives, and when a patient needs antibiotics, the benefits outweigh the risks of side effects and antibiotic resistance.
- Antibiotics Don't Work on Viruses
- Antibiotics are only needed for treating certain infections caused by bacteria.
- If you have a cold or flu, antibiotics won't work for you.
- Antibiotics won't help for some common bacterial infections including most cases of bronchitis, many sinus infections, and some ear infections.

Risks of Antibiotics

It's important to only take antibiotics for bacterial infections since they can put you or your child at risk for harmful side effects and antibiotic-resistant infections. **1 out of 5 medication-related visits to the ED are from reactions to antibiotics.**

Side Effects

Anytime antibiotics are used, they can cause side effects. When antibiotics aren't needed, they won't help you, and the side effects could hurt you.

Common side effects range from minor to very severe health problems and can include:

- Dizziness
- Nausea
- Diarrhea
- Yeast infections
- More serious side effects can include:
- *Clostridium difficile* infection (also called *C. difficile* or *C. diff*), which causes diarrhea that can lead to severe colon damage and death.
- Allergies
- People can also have severe and life-threatening allergic reactions.
- Antibiotic-Resistant Bacteria
    - 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.
    - Antibiotic resistance occurs when bacteria develop the ability to defeat the drugs designed to kill them.
    - Some resistant bacteria can be harder to treat and can spread to other people.

Using Antibiotics Correctly

When you use antibiotics correctly, you do the best for your health, your family's health, and the health of those around you.

Here are tips for how to use antibiotics correctly.

- Ask if an Antibiotic is Necessary

- **Say YES to antibiotics** when needed for certain infections caused by **bacteria**.
- **Say NO to antibiotics** for viruses**,** such as colds and flu, or runny noses, even if the mucus is thick, yellow or green.
- Antibiotics also won't help for some common bacterial infections including
    - most cases of bronchitis,
    - many sinus infections, and
    - some ear infections.
- When they're not needed, antibiotics won't help you, and the side effects could still hurt you.
- Never pressure your healthcare professional to prescribe an antibiotic.
- 30% of antibiotics are prescribed unnecessarily in doctors' offices and emergency departments in the United States.
- Know What's Got You Sick

Antibiotics cure bacterial infections, but not viral infections such as:

- Colds or flu
- Most coughs and bronchitis
- Most sore throats
- Runny noses, even if the mucus is thick, yellow or green

Taking antibiotics for viral infections:

- Will not cure the infection
- Will not keep other people from getting sick
- Will not make you feel better

Viruses or Bacteria
What's got you sick?

Antibiotics are only needed for treating certain infections caused by bacteria. Viral illnesses cannot be treated with antibiotics. When an antibiotic is not prescribed, ask your healthcare professional for tips on how to relieve symptoms and feel better.

Common Condition	Common Cause			Are Antibiotics Needed?
	Bacteria	Bacteria or Virus	Virus	
Strep throat	✓			Yes
Whooping cough	✓			Yes
Urinary tract infection	✓			Yes
Sinus infection		✓		Maybe
Middle ear infection		✓		Maybe
Bronchitis/chest cold (in otherwise healthy children and adults)*		✓		No*
Common cold/runny nose			✓	No
Sore throat (except strep)			✓	No
Flu			✓	No

* Studies show that in otherwise healthy children and adults, antibiotics for bronchitis won't help you feel better.

BE ANTIBIOTICS AWARE
SMART USE, BEST CARE

To learn more about antibiotic prescribing and use, visit www.cdc.gov/antibiotic-use.

CDC

Know When Antibiotics Are Needed and When They're Not

- If you need antibiotics, take them exactly as prescribed.
- Talk with your doctor if you have any questions about your antibiotics, or if you develop any side effects, especially diarrhea, since that could be *Clostridium difficile* infection (also called *C. difficile* or *C. diff*), which needs to be treated immediately. *C. diff* can lead to severe colon damage and death.
- When antibiotics aren't needed, they won't help you, and the side effects could still hurt you. Side effects range from minor to very severe health problems. When you need antibiotics for an infection, then the benefits of the drug outweigh the risk of side effects.
- Know How to Feel Better
- Respiratory viruses usually go away in a week or two without treatment.
- Sometimes the best treatment for your illness may be over-the-counter drugs to relieve your symptoms.
- Ask your healthcare professional for tips on how to relieve symptoms and feel better while your body fights off the virus.
- Know How to Stay Healthy

To stay healthy and keep others healthy, you can:

- clean hands,
- cover coughs,
- stay home when sick, and
- get recommended vaccines, for the flu, for example.
- Safely Get Rid of Your Medications
- Dispose of Unused Medicines
- Safely throw away leftover medication.
- Never save antibiotics for the next time you may become sick.
- Prevent children from finding and swallowing your medication
- Do not take antibiotics prescribed for someone else. This may delay correct treatment for you, make you even sicker, or cause bad side effects.

Know What to Ask Your Child's Doctor

If your child is sick, here are three important questions to ask your healthcare professional. In children, reactions from antibiotics are the most common cause of medication-related emergency department visits.

1. **What is the best treatment for my child's illness?**
   Your child can feel better without an antibiotic. Respiratory viruses usually go away in a week or two without treatment. Ask your healthcare professional about the best way to feel better while your child's body fights off the virus.
2. **What do I need to know about the antibiotics you're prescribing for my child today?**
   If your doctor says your child needs an antibiotic, ask if it's the one most targeted to treat the infection, while causing the least side effects. Some types of antibiotics, such as fluoroquinolones, have a stronger link to severe side effects such as life-threatening *C. diff* infections. The Food and Drug Administration (FDA) warns healthcare professionals to only prescribe fluoroquinolones when another treatment option is unavailable. These powerful antibiotics are often prescribed even when they are not the recommended treatment.
3. **What can I do to help my child feel better?**
   Pain relievers, fever reducers, saline nasal spray or drops, warm compresses, liquids, and rest may be the best ways to help your child feel better. Your healthcare professional can tell you how to help relieve your child's symptoms.

Questions about Bacteria, Viruses, and Antibiotics

Q: What are bacteria and viruses?
A: Bacteria are single-celled organisms found all over the inside and outside of our bodies. Many bacteria are not harmful. In fact, some are actually helpful, including the majority of bacteria that live in our intestines (guts). However, disease-causing bacteria can cause illnesses such as strep throat. Viruses, on the other hand, are microbes that are even smaller than bacteria and cannot survive outside the body's cells. They cause illness by invading healthy cells.

Q: What is an antibiotic?
A: Antibiotics, also known as antimicrobial drugs, are drugs that fight infections caused by bacteria in both humans and animals. Antibiotics fight these infections either by killing the bacteria or making it difficult for the bacteria to grow and multiply. Antibiotics only treat certain bacterial infections. Antibiotics do not have any effect on viruses.
Any time antibiotics are used, they can cause side effects and lead to antibiotic resistance.

Q: Which infections are caused by viruses and should not be treated with antibiotics?
A: Viral infections should not be treated with antibiotics. Common infections caused by viruses include:

- Colds
- Flu
- Most sore throats

Questions about Antibiotic Resistance

Q: What is antibiotic resistance?
A: Antibiotic resistance occurs when bacteria develop the ability to defeat the drugs designed to kill them. When bacteria become resistant, antibiotics cannot fight them, and the bacteria multiply.

Q: Why should I care about antibiotic resistance?
A: Antibiotic resistance is one of the most urgent threats to the public's health. Antibiotic resistant bacteria can cause illnesses that were once easily treatable with antibiotics to become untreatable, leading to dangerous infections. Antibiotic-resistant bacteria are often more difficult to kill and more expensive to treat. In some cases, the antibiotic-resistant infections can lead to serious disability or even death.

Q: Why are bacteria becoming resistant to antibiotics?
A: Overuse and misuse of antibiotics allows the development of antibiotic-resistant bacteria. Every time a person takes antibiotics, sensitive bacteria (bacteria that antibiotics can still attack) are killed, but resistant bacteria are left to grow and multiply. This is how repeated use of antibiotics can increase the

number of drug-resistant bacteria. Antibiotics are not effective against viral infections like the common cold, flu, most sore throats, bronchitis, and many sinus and ear infections. Widespread use of antibiotics for these illnesses is an example of how overuse of antibiotics can promote the spread of antibiotic resistance. Smart use of antibiotics is key to controlling the spread of resistance.

Q: How do bacteria become resistant to antibiotics?
A: Bacteria can become resistant to antibiotics through several ways. Some bacteria can "neutralize" an antibiotic by changing it in a way that makes it harmless. Others have learned how to pump an antibiotic back outside of the bacteria before it can do any harm. Some bacteria can change their outer structure so the antibiotic has no way to attach to the bacteria it is designed to kill. After being exposed to antibiotics, sometimes one of the bacteria can survive because it found a way to resist the antibiotic. If even one bacterium becomes resistant to antibiotics, it can then multiply and replace all the bacteria that were killed off. That means that exposure to antibiotics provides selective pressure making the surviving bacteria more likely to be resistant. Bacteria can also become resistant through mutation of their genetic material.

Q: How should I use antibiotics to protect myself and my community from antibiotic resistance?
A: Here is what you can do to help prevent antibiotic resistance:

- Dispose of Unused Medicines
- Tell your healthcare professional you are concerned about antibiotic resistance.
- Ask your healthcare professional if there are steps you can take to feel better and get symptomatic relief without using antibiotics.
- Take the prescribed antibiotic exactly as your healthcare professional tells you.
- Safely throw away leftover medication.
- Ask your healthcare professional about vaccines recommended for you and your family to prevent infections that may require an antibiotic.
- Never skip doses.
- Never take an antibiotic for a viral infection like a cold or the flu.
- Never pressure your healthcare professional to prescribe an antibiotic.
- Never save antibiotics for the next time you get sick.
- Never take antibiotics prescribed for someone else.

Q: How can healthcare professionals help prevent the spread of antibiotic resistance?
A: Healthcare professional can prevent the spread of antibiotic resistance by:

- Prescribing an antibiotic only when it is likely to benefit the patient.
- Prescribing an antibiotic that targets the bacteria that is most likely causing their patient's illness when an antibiotic is likely to provide benefit.
- Encouraging patients to use the antibiotic as instructed.
- Collaborating with each other, office staff, and patients to promote appropriate antibiotic use.

Questions about Antimicrobial Cleaning Agents, Acne Medication, and Probiotics

Q: Is it healthier to use antimicrobial-containing products (soaps, household cleaners) than regular products?
A: To date, studies have shown that there is no added health benefit for consumers (this does not include professionals in the healthcare setting) using soaps containing antibacterial ingredients compared with using plain soap. As a result, FDA released a proposed rule in December 2013 to require manufacturers to submit data supporting the efficacy and safety of antibacterial soaps and body washes. This proposed rule does not affect hand sanitizers, wipes, or antibacterial products used in healthcare settings.

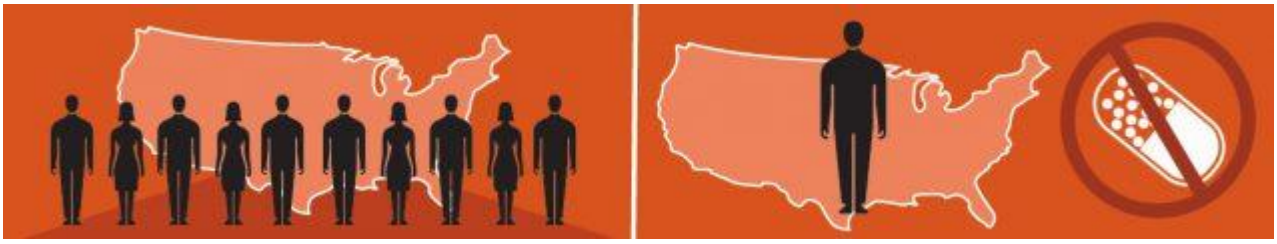
Q: Can antibiotic resistance develop from using acne medication?
A: Yes. Antibiotic use, appropriate or not, contributes to the development of antibiotic resistance. This is true for acne medications that contain antibiotics. Short- and long-term use of antibiotics for treatment or prevention of bacterial infections should be under the direction of a healthcare professional to ensure appropriate use and detection of resistance.

Q: Do probiotics have a role in helping to reduce antibiotic resistance?
A: Probiotics are defined as microorganisms that when administered in sufficient quantities may improve health. There are a variety of probiotics that have been studied for various health benefits. Their role in preventing drug-resistant infections in humans has not been established. CDC is actively researching the subject. Although some studies have shown benefit, the data are not conclusive enough for CDC to issue specific recommendations at this time.
Evaluation and Diagnosis of Penicillin Allergy for Healthcare Professionals

Is it Really a Penicillin Allergy?

Did You Know? 5 Facts About Penicillin Allergy (Type 1, Immunoglobulin E (IgE)-mediated)

1. Approximately 10% of all U.S. patients report having an allergic reaction to a penicillin class antibiotic in their past.
2. However, many patients who report penicillin allergies do not have true IgE-mediated reactions. When evaluated, fewer than 1% of the population are truly allergic to penicillins.
3. Approximately 80% of patients with IgE-mediated penicillin allergy lose their sensitivity after 10 years.
4. Broad-spectrum antibiotics are often used as an alternative to penicillins. The use of broad-spectrum antibiotics in patients labeled "penicillin-allergic" is associated with higher healthcare costs, increased risk for antibiotic resistance, and suboptimal antibiotic therapy.1
5. Correctly identifying those who are not truly penicillin-allergic can decrease unnecessary use of broad-spectrum antibiotics.1
6. 10% of the population reports a penicillin allergy but <1% of the whole population is truly allergic.



Note: Do Activity # 2 Handout – Antibiotics Final Exam (If time allows)

Questions, Answers and Comments

Handout #1 – Antibiotics Introduction Quiz

1. What are Antibiotics?

2. When were Antibiotics first used?

3. What was the approximate date of Antibiotics being used in modern times?

4. Who were some of the early scientist involved in the development of Antibiotics?

5. What are the two ways in which Antibiotics work?

6. What are some good things about Antibiotics?

7. What are some bad things about Antibiotics?

8. What types of diseases does Antibiotics NOT work on?

9. What are some of side effects of Antibiotics?

10. How can Antibiotics be used correctly?

11. How can Antibiotics be used incorrectly?

12. What is Antibiotic Resistance and what causes it?

13. What can we all do to help prevent and stop Antibiotic Resistance?

14. 10% of people claim to be allergic to Penicillin but what is the actual percentage of that are allergic to Penicillin?

Handout #2 – Antibiotics Final Exam

Question #1

Janine believes that Samantha has a bad cold. Concerned that her daughter's symptoms might get worse, Janine takes Samantha to an urgent care clinic. She hopes the doctor will give Samantha a prescription for antibiotics because she believes that will help Samantha feel better fast.

Is Janine correct that antibiotics will treat her daughter's bad cold?

No, Janine is incorrect. Antibiotics do not work on viruses that cause colds and the flu, or runny noses, even if the mucus is thick, yellow, or green. Antibiotics are only needed for treating certain infections caused by bacteria. Even then, antibiotics won't help for some common infections, including most cases of bronchitis, many sinus infections, and some ear infections.

Question #2

Janine talks with the urgent care doctor about Samantha's cold symptoms. She explains that Samantha is very uncomfortable at night when she tries to sleep. Janine tells Dr. Smith that her neighbor's child was sick with a cold and was given antibiotics.

Should Janine expect Dr. Smith to treat Samantha with antibiotics?

No, Janine should not expect antibiotics if her daughter has a cold. Antibiotics save lives, but they aren't always the answer. Illnesses such as colds and the flu are caused by viruses. Since antibiotics don't work on viruses, they won't help. Taking antibiotics will not make Samantha better, but she would be put at risk for possibly severe side effects. Janine should ask Dr. Smith about the best way to help Samantha feel better while her body fights off the virus.

Question #3

Dr. Smith diagnosed Samantha with a cold, so he did not prescribe antibiotics. Frustrated that Dr. Smith won't prescribe antibiotics, Janine remembers that Samantha has some leftover antibiotics from the last time she was sick. She decides to go home and start giving Samantha the leftover antibiotics.

Is it safe for Janine to give Samantha leftover antibiotics?

No, it is unsafe. Since Samantha has a cold, antibiotics aren't needed. They won't help Samantha, and the side effects could still hurt her. Also, anytime antibiotics are used, it leads to antibiotic resistance. Samantha should not take leftover antibiotics from a previous illness because antibiotics should only be taken for the illness and time period prescribed. Taking the wrong medicine may delay correct treatment, allow bacteria to multiply, and cause unwanted or severe side effects. Janine can dispose of Samantha's expired or unused medicine through drug take back programs in her community. Or, she can put them in a plastic bag with dirt, kitty litter, or used coffee grounds and throw them away in the household trash.

Question #4

The reason Janine had leftover antibiotics is because the last time Samantha was sick, Janine stopped giving her the antibiotics when she started feeling better.

Should Janine have given the antibiotics to her daughter exactly as prescribed by the doctor?

Yes, Janine should have given the antibiotics exactly as prescribed. If Samantha needs antibiotics, it is important that Janine give them to her exactly as the doctor prescribed. Janine can talk with Samantha's doctor if she has questions about her antibiotics. Giving Samantha leftover or expired antibiotics could be dangerous.

Question #5

Samantha is still sick after a few days. Janine decides to visit Samantha's pediatrician, Dr. Jones, to get a second opinion. Dr. Jones explains that antibiotics save lives – and when a patient needs antibiotics, the benefits outweigh the risks of side effects or antibiotic resistance. But when antibiotics aren't needed, they won't help and could still hurt Samantha.

Should Janine be concerned about the side effects from antibiotics?

Yes, Janine should be concerned. Common side effects of antibiotics include rashes, dizziness, nausea, diarrhea, and yeast infections. More serious side effects include *Clostridioids difficile* infection (also called *C. difficile* or *C. diff*), which causes diarrhea that can lead to severe colon damage and death. People can also have serious and life-threatening allergic reactions.

Question #6

During the appointment, Dr. Jones explained that antibiotic resistance does not mean the body is becoming resistant to antibiotics. Antibiotic resistance occurs when bacteria develop the ability to defeat the drugs designed to kill them.

Is Janine's doctor correct about antibiotic resistance?

Yes, Janine's doctor is correct. Antibiotic resistance occurs when bacteria no longer respond to the drugs designed to kill them. Antibiotic resistance is one of the most urgent threats to the public's health. If we don't take immediate action to improve antibiotic prescribing and use, we won't have antibiotics to treat life-threatening conditions, including sepsis.

Question #7

Dr. Jones confirms that Samantha has a cold and it will probably go away in a week or two without treatment. Feeling relieved, Janine says she'll stop giving Samantha the leftover antibiotic; but she'll keep them just in case someone else in her family gets sick.

Is it a good idea for Janine to keep the leftover antibiotics?

No, it is not a good idea. Although Janine is making the right decision to stop giving Samantha the leftover medicine, she should never save antibiotics. She and her family should always take them exactly as prescribed. The next time someone feels sick, Janine can ask her doctor how the illness should be treated and get the right medication if any is needed. Also, Janine's family members should not take antibiotics prescribed for Samantha because what's safe for her might not be for someone else. The prescription must be the right antibiotic, at the right dose for the right duration,

and given at the right time. Taking antibiotics prescribed for someone else could cause a bad reaction.

Question # 8

Now understanding more about how antibiotics work, Janine began to wonder if antibiotics kill good bacteria in addition to the bad. Janine calls her mother to ask this question. Her mom tells her that antibiotics only kill the bacteria causing the infection.

Is Janine's mother correct?

No, Janine's mother is incorrect. When you take antibiotics to treat an infection, the antibiotics kill both the bacteria causing the infection and bacteria that keep you healthy. Your body needs bacteria to function normally. Improving the way we take antibiotics helps keep us healthy now, helps fight antibiotic resistance, and ensures that life-saving antibiotics will be available for future generations.

Question #9

While on the phone with her mother, Janine expressed how thankful she was that she didn't have to go to the emergency department with Samantha. Janine's mother agreed and said she read that many children, as well as adults, go to the emergency department because of reactions to antibiotics.

Is Janine's mother correct?

Yes, Janine's mother is correct. Reactions from antibiotics cause one out of six visits to the emergency department. In children younger than six, reactions to antibiotics are the most common reason for medication-related emergency department visits.

Question #10

Before saying goodbye, Janine reassures her mother that Samantha is up-to-date on all her vaccines. Her mother says this is an excellent way to keep Samantha healthy.

Is Janine's mother correct when she says vaccines are an excellent way to keep Samantha healthy?

Yes, Janine's mother is correct. Some of the best ways to stay healthy and keep others healthy are by cleaning your hands, covering your coughs, staying home when you're sick, and getting recommended vaccines.