BUREAU OF EPIDEMIOLOGY
Division of Disease Control
Florida Department of Health
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Florida Schools Get Smart:
KNOW WHEN ANTIBIOTICS WORK

Antibiotic use and resistance: the role of the school nurse in promoting proper antibiotic use and reducing antibiotic resistance.

FLORIDA DEPARTMENT OF HEALTH

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Unit 5. Upper respiratory tract infections (RTI), antibiotic use, and antibiotic resistant infections.

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Florida Department of Health
Division of Disease Control, Bureau of Epidemiology,
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Introduction

This material has been designed as part of the ***Florida Schools Get Smart: Know When Antibiotics Work*** program to assist Florida school nurses to implement a strategy to effectively communicate messages and promote behaviors to use antibiotics properly and thereby decrease antibiotic resistance. The strategy targets students, parents, teachers and school staff.

The basic tool of the program is the leadership role and credibility school nurses have with students and parents. To promote behavioral changes, the program relies on the Health Belief Model (HBM), together with health communication, health promotion and social marketing tools.

This document is organized in three sections and their units. Section One describes the ***Get Smart: Know When Antibiotics Work***, a CDC national campaign, its coverage and influence. The Florida campaign, also described in this section, targets middle and high school students, parents, teachers and staff. This section also includes a rationale and discussion about antibiotic resistance in Florida based on Behavioral Risk Factor Surveillance Survey (BRFSS) findings from 2006. Section Two presents scientific facts on antibiotic use and resistance, upper respiratory tract infections (RTI) and antibiotic use in children. Section Three describes susceptibility and severity issues derived from knowledge, attitudes, practices and beliefs related to antibiotic use, shown by the Florida School Get Smart survey conducted during the first semester of 2007. Health communication messages, recommendations and cues to action frame the role of the school nurses in addressing susceptibility and severity in the school setting. This section also describes the strategy for implementation of the program and offers answers for the most common questions from students, parents and others.

Acknowledgments

As with any statewide program, numerous contributions made this program possible. We therefore want to acknowledge the efforts of many who had a part in participating in the Florida Get Smart survey; advising, creating, providing information, editing and reviewing this material.

CDC Get Smart: Know When Antibiotics Work Campaign

Florida Department of Health:

- Office of Performance Improvement, Marketing and Graphics
- Bureau of Epidemiology
- School Health Services program
- County Health Departments
- School Health Coordinators

Florida Department of Education:

- County School Districts, School Health Coordinators
- County School Districts, Superintendents and Principals

Alliance for the Prudent Use of Antibiotics (APUA)
Food and Drug Administration (FDA)
Nursing and Wellness Program, San Diego Unified School District

All school nurses in Florida

How to use this material

This handbook is intended to help nurses implement the Florida Schools Get Smart program in middle and high schools. To achieve this purpose, training and guidance are provided throughout this manual, web conferences, conference calls, website resources and consultation.

1. School nurses should understand how the Florida program is aligned to the national campaign by reviewing the objectives and goals (Units 1 and 2).
2. School nurses should know the situation in Florida relating to antibiotic use by reviewing the BRFSS findings (Unit 3).
3. Subsequently, school nurses should review the scientific information about antibiotics, antibiotic use, antimicrobials and resistance, and information about specific respiratory tract infections and antibiotic use in children, tailored to meet school nurse information needs (Units 4 and 5).
4. Implementation of the program requires school nurses to know about the perception of level of knowledge, attitudes, practices and beliefs identified in the Florida Get Smart survey. For that reason, the role of school nurses includes communicating messages and cues to action based on the specific findings from that survey. Nurses will be able to address susceptibility and severity using the Health Belief Model framework and implement the program following the basic suggested strategy (Unit 6).
5. The basic strategy and other educational activities can be created and implemented at schools using the information contained in a series of talking points edited as questions and answers about antibiotics and antibiotic resistance developed using plain language crafted for students and parents. Health aids, other health room volunteers, and school staff may benefit from this information as it is complete and simple to understand (Unit 7).
6. The Florida Get Smart program strategy promotes communication with the student who visits a health room because of respiratory infection-like symptoms and parents or guardians of these students. This strategy relies on an evidence-based principle: demand for antibiotics is reduced when health professionals provide quality attention and education at the moment of service[1] (Unit 8).
7. Forms for follow-up and evaluation will be distributed once the program has been established.
8. Appendix A includes information on methicillin-resistant *Staphylococcus aureus* (MRSA), which is an increasing concern among school nurses, school staff, teachers, and parents.
9. The recommended readings section includes a series of readings recommended by experts of the CDC and members of the national campaign.

Unit 1

Get Smart: Know When Antibiotics Work Campaign, a CDC nationwide effort to reduce antibiotic resistance[2, 3]

Learning objective: to describe the national campaign to promote proper use of antibiotics and align its objectives with the Florida program and with school initiatives.

Get smart: Know When Antibiotics Work is a multi-state campaign funded by the CDC. Through this campaign, federal funds are made available to state and local health departments for the development, implementation, and evaluation of local campaigns to promote appropriate antibiotic use.

Objectives of the national campaign

The Get Smart: Know When Antibiotics Work campaign aims to reduce the rate of increase of antibiotic resistance by:

- Promoting adherence to appropriate prescribing guidelines among providers
- Decreasing demand for antibiotics for viral upper respiratory infections among healthy adults and parents of young children
- Increasing adherence to prescribed antibiotics for bacterial upper respiratory infections

Scope of the national campaign

The Get Smart campaign targets five conditions: otitis media, sinusitis, pharyngitis, bronchitis, and the common cold, because such upper respiratory infections account for three-quarters of all antibiotics prescribed by office-based physicians. If antibiotics were always being prescribed appropriately, increases in resistance could be seen as inevitable and unavoidable. However, antibiotics are often used inappropriately. Even though prescribing rates have declined, current data suggest that, for all ages combined, more than 10 million courses of antibiotics are prescribed each year for viral conditions that do not benefit from antibiotics.

Target audiences

The target audiences for the national campaign include patients and providers since knowledge, attitudes, skills, and behaviors of both patients and providers contribute to antibiotic demand, prescribing, and use.

Unit 2

Florida Schools Get Smart: Know When Antibiotics Work Program

Learning objective: to understand the rationale, scope, goals, and objectives of the Florida program to promote proper use of antibiotics and reduce antibiotic-resistant infections in the community setting.

Florida Schools Get Smart: Know When Antibiotics Work is a statewide program carried out in public schools. The goals of the program are to reduce the emergence of resistant infections through the promotion of appropriate use of antibiotics, to decrease the demand for antibiotics for viral upper respiratory infections, and to increase compliance to prescribed antibiotics by parents, students, teachers, and school staff.

In Florida as elsewhere, students under 17 years old have the highest rates of upper respiratory tract infections (RTI). In the past four years RTI have ranked within the ten principal outpatient visit and discharge diagnoses for children zero to 17 years old. The most common diagnoses are otitis media, diseases of tonsils and adenoids, bronchitis, and unspecified RTI. All fall within the scope of the national campaign.

Florida school health services programs provided more than two million nursing assessments, more than three million consultations with parents and/or school staff, and approximately 135,000 health education classes. School classrooms and health rooms clearly provide a prime location for the provision of health education messages.

The Florida program provides training for school nurses and educational material for target populations. The direction of the program is based on the knowledge, attitudes, practices (KAP), and beliefs that parents, students, and other school staff hold related to antibiotic use. The Florida Schools Get Smart survey of school nurses captured this information.

Campaign resources and materials

Posters, brochures, postcards, and fact sheets will be available to students, teachers and parents at schools. A web site with information for school nurses, parents and students is available http://www.doh.state.fl.us/disease_ctrl/epi/FGS/FL_GetSmart.html

Materials

Q&A fact sheet

"Runny nose" & "Otitis media" targets students and parents of middle schools.

Posters

"Snort. Sniffle. Sneeze. No antibiotics please"
target students, parents and school staff of middle and high schools.

Poster

"Warning: antibiotics don't work for viruses like cold and the flu"
targets high school students, parents, and school staff.

Poster

"Self-medication with antibiotics can harm your health"
targets Spanish speaking students and families.

Brochure

"Snort. Sniffle. Sneeze. No antibiotics please"
targets parents and school staff of middle schools.

Brochure

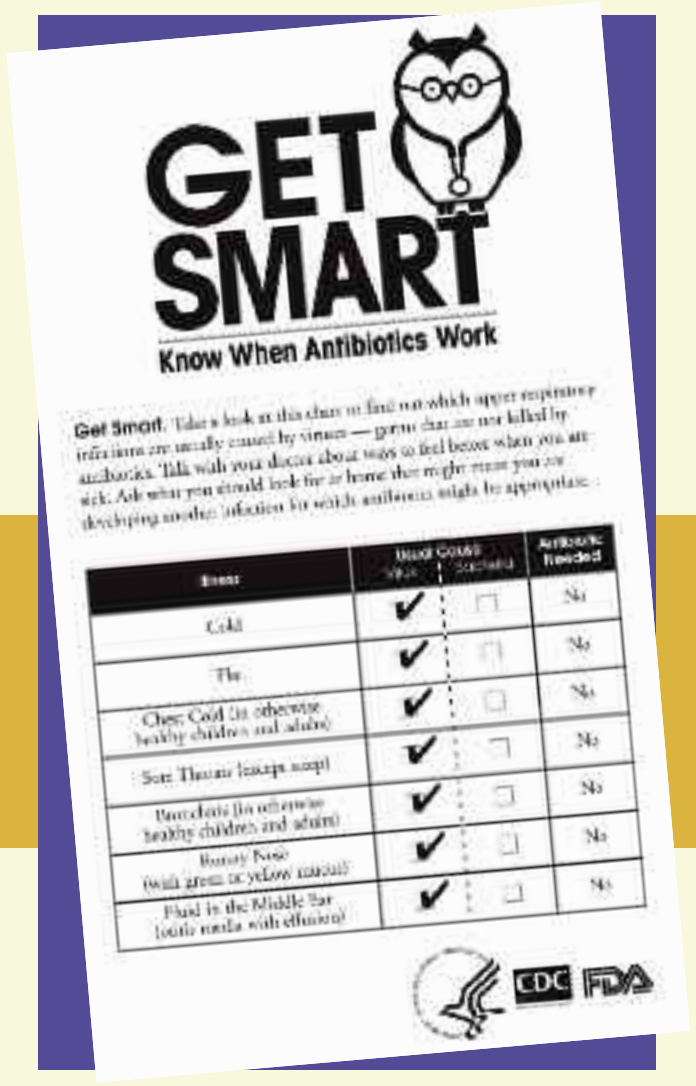
"Cold or Flu. Antibiotics don't work for you"
targets parents and staff of
middle and high schools.

Brochure

"Sometimes, the remedy is worse than the disease"
targets Spanish-speaking students and families.

Postcard

"Virus and Bacteria"
targets students, parents and staff of middle and high schools.



Antibiotic use in Florida

Learning objective: to examine the available information for Florida communities regarding antibiotic use and antibiotic resistance awareness.

Florida Behavorial Risk Factor Surveillance Survey (BRFSS)
The BRFSS is a random sample telephone survey, run by the Florida Department of Health, which takes place every year and covers thousands of households in Florida. Respondents are all at least 18 years old.

Findings from the 2006 survey have been used to demonstrate the need for education about antibiotic use, and to develop a program in Florida to target middle and high school students from different ethnic groups. The BRFSS findings were analyzed for households with children. In general, the survey has shown that, among people older than 18 years who have children in their household, respondents with low levels of education and members of ethnic minority groups were less informed. These findings motivate the implementation of a program to target first those people with less than a high school education (middle and some high school), high school graduates and members of ethnic minorities.

In total, 41% of respondents believe incorrectly that antibiotics are good medication for colds. 61% of those who have less than a high school education have this mistaken belief, 54% of high school graduates, 34% of those who had some college or technical school, and 24% of college graduates. In addition, 61% of blacks believe incorrectly that antibiotics are good medication for colds, 49% of Hispanics, and 33% of whites. This evidence supports a program to include students from middle and high schools in the Florida Schools Get Smart program.

In total 49% of respondents have heard about antibiotic resistance, 28% of those who have less education than high school have heard about this, as have 32% of high school graduates, 56% of those who have had some college or technical school and 69% of college graduates. 58% of whites have heard about antibiotic resistance, 39% of Hispanics, and 33% of blacks. This evidence supports a program to introduce the concepts of proper antibiotic use and antibiotic resistance in the selected schools.

In total, 20% of respondents said that healthcare providers have discussed antibiotic resistance when prescribing antibiotics.

11% of respondents who have less than a high school education said that their healthcare providers have discussed antibiotic resistance when prescribing antibiotics, 15% of high school graduates have had such a discussion, as have 29% of those who have some college or technical school and 69% of college graduates.

23% of white respondents said that healthcare providers have discussed antibiotic resistance when prescribing antibiotics, as have 16% of Hispanics, and 14% of blacks. This evidence also supports a program in middle and high school to educate students and parents on proper antibiotic use and antibiotic resistance.

Unit 4

Facts about antibiotic use, antimicrobials and antibiotic resistance[4]*

Learning objective: to review information about antibiotics, resistance mechanisms, and antibacterials.

Significant increases in bacteria resistant to antibiotics have occurred as a consequence of antibiotic use. There is a direct relationship between changes in antimicrobial use and changes in prevalence of resistance; in addition, colonization with resistant organisms increases proportionally to the duration of antibiotic treatment. Studies have shown this association in children. Children colonized with penicillin-resistant strains of pneumococci were more likely to have received a beta-lactam antibiotic within 30 days, and younger children from suburban residences, with increased exposure to antibiotics, were more likely to have invasive pneumococcal infection with penicillin-resistant strains.[5] The CDC estimates that from 2000 to 2001, more than 1.8 million courses of antibiotics were prescribed in the U.S. to children younger than 15 years old for upper respiratory tract infections and in general more than 10 million courses are prescribed each year for viral conditions.[6]

What is an antibotic?
An antibiotic is a naturally produced or synthetically made chemical substance used to kill or inhibit the growth of bacteria.

How do antibiotics work?
Antibiotics are classified into two groups based on their mechanism of action: bacteriostatic and bacteriocidal. Bacteriostatic drugs inhibit the bacteria growth and multiplication capacity, allowing the individual's immune system to eliminate the bacteria. Bacteriocidal drugs kill the bacteria. Both types of antibiotics disrupt the bacterial cell functions by attacking the outer bacterial cell wall or its inner membrane, or interfering with vital or reproductive chemical processes inside the bacteria.

How are antibiotics used?
Antibiotics are used in human and veterinary medicine to treat bacterial infections, and prophylactically prior to surgical or invasive medical procedures. Antibiotics are also used in the food industry, to increase growth in certain food animals, and as pesticides to control bacterial infections in food crops.

What is antibiotic resistance?
Antibiotic resistance occurs when bacteria counteract the effects of antibiotics, rendering the antibiotics ineffective for killing or controling bacterial growth; consequently, bacteria become resistant and grow in the presence of what should be therapeutic levels of an antibiotic of choice.

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*The Alliance for the Prudent Use of Antibiotics has granted permission to use information from http://www.tufts.edu to create this section.

Why do bacteria become resistant to antibiotics?
Antibiotic resistance is a natural phenomenon. When an antibiotic is used, bacteria that can resist that antibiotic have a greater chance of survival than those that are "susceptible." Susceptible bacteria are killed or inhibited by an antibiotic, resulting in greater survival of resistant strains of bacteria, which then reproduce.

Some resistance occurs without human action, because bacteria can produce and use antibiotics against other bacteria, leading to a low level of natural selection for resistance to antibiotics. However, the current higher levels of antibiotic-resistant bacteria are attributed to the overuse and abuse of antibiotics.

How do bacteria become resistant?
Some bacteria are naturally resistant to certain types of antibiotics. Generally, bacteria may become resistant in two ways: 1) by a genetic mutation or 2) by acquiring resistance from another bacterium. Mutations, rare spontaneous changes of the bacteria's genetic material, are thought to occur in about one in one million to one in 10 million cells. Different genetic mutations yield different types of resistance. Some mutations enable the bacteria to produce enzymes that inactivate antibiotics, while other mutations eliminate the cell target that the antibiotic attacks. Still others close up the entry ports that allow antibiotics into the cell, and others activate pumping mechanisms that export the antibiotic back outside so it never reaches its target.

Disease-causing microbes antagonize antibiotics by interfering with their mechanism of action. For example, penicillin kills bacteria by attaching to their cell walls, then destroying a key part of the wall. The wall falls apart, and the bacterium dies. Resistant microbes, however, either alter their cell walls so penicillin can't bind or produce enzymes that dismantle the antibiotic.

In another scenario, erythromycin attacks ribosomes, structures within a cell that enable it to make proteins. Resistant bacteria have slightly altered ribosomes to which the drug cannot bind. The ribosomal route is also how bacteria become resistant to the antibiotics tetracycline, streptomycin, and gentamicin.

Bacteria can acquire antibiotic resistance genes from other bacteria in several ways. By undergoing a simple mating process called "conjugation," bacteria can transfer genetic material, including genes encoding resistance to antibiotics (found on plasmids and transposons) from one bacterium to another. Viruses are another mechanism for passing resistance traits between bacteria. The resistance traits from one bacterium are packaged into the head portion of the virus. Virus particals then inject the resistance traits into any new bacteria they attack. Bacteria also have the ability to acquire naked, "free" DNA from their environment.

Any bacteria that acquire resistance genes, whether by spontaneous mutation or genetic exchange with other bacteria, have the ability to resist one or more antibiotics. Because bacteria can collect multiple resistance traits over time, they can become

antibiotics tetracycline, streptomycin and gentamicin.

How does antibiotic resistance spread?
Genetically, antibiotic resistance spreads through bacteria populations both "vertically," when new generations inherit antibiotic resistance genes, and "horizontally," when bacteria share or exchange sections of genetic material with other bacteria. Horizontal gene transfer can even occur between different bacterial species. Environmentally, antibiotic resistance spreads as bacteria themselves move from place to place. People can pass resistant bacteria to others, for example, by coughing or contact with unwashed hands.

Can bacteria lose their antibiotic resistance?
Yes, antibiotic resistance traits can be lost, but this reverse process occurs slowly. If the selective pressure that is applied by the presence of an antibiotic is removed, the bacterial population can gradually revert to a population of bacteria that responds to antibiotics.

Why is antibiotic resistance a public health problem?
Antibiotics are called “societal drugs,” since antibiotic resistance can pass from bacterium to bacterium, and resistant bacterial infections can pass from person to person. Thus, antibiotic use and antibiotic resistance can eventually affect an entire community.

Why is antibiotic resistance an ecological problem?
When antibiotics are used in humans or animals, approximately 80 - 90% of the ingested antibiotics are not broken down, but pass through the body intact and enter the environment as waste. Thus, they retain their ability to affect bacteria and promote antibiotic resistance even after they enter the soil or water as a waste product.

Do people become resistant to antibiotics?
No, this is a common misconception. People may exhibit allergic reactions to antibiotics, but they are not resistant to them. It is the bacteria themselves, not the infected host, which become resistant.

How serious is the problem of antibiotic resistance?
Antibiotic resistance is found all over the world and has become a serious problem in the treatment of disease. While the real magnitude of the problem is unknown, the monetary cost of treating antibiotic-resistant infections worldwide is estimated to be billions of dollars per year. Some experts predict that, as resistance to antibiotics is increasing at a faster pace than it can be controlled, the future will resemble the pre-antibiotic era. Others are more optimistic that research and careful drug management can reverse the trend if global efforts are focused on recognizing and controlling it.

Are antibiotics regulated?
Some institutions, such as hospitals, have ‘Antibiotic Policy’ guidelines and antibiotic

review committees, to ensure that antibiotic use in their institution is rational and does not contribute to the antibiotic resistance problem.

Governmental oversight of antibiotics requires a doctor's prescription before a patient is allowed to purchase an antibiotic. Antibiotics have also been sold over the Internet, a commerce mechanism with little governmental oversight that reaches across national borders.

Furthermore, food animals (animals raised for human consumption) are often given long-term low levels of antibiotics to promote growth. This antibiotic use represents a large fraction of the total antibiotic use in the industrialized world. Several governments restrict which antibiotics can be used for food animals, with the goal of preserving the most powerful antibiotics for treating human disease.

Can the effectiveness of existing antibiotics be preserved?

To preserve the potency of existing antibiotics, overall antibiotic use must be decreased. Physicians, pharmacists, and the general public must avoid careless use of these valuable drugs. Antibiotics must be prescribed only for bacterial infections and in the proper dose for the correct amount of time. Narrow spectrum drugs should be chosen by doctors whenever possible to avoid destroying populations of beneficial bacteria along with the disease-causing bacteria. Heavy use of the latest antibiotic can lead to the emergence of resistance in as little as two years.

Can new antibiotics be developed?

The epidemic of resistant bacteria has spurred renewed interest in discovering new antibiotics. The process of producing a new antibiotic, however, is long and expensive, requiring approximately 10 years and $300 million to bring a new antibiotic to market. Many efforts to find novel drugs in fungi and soil result in compounds that are the same as, or very similar to, previously discovered antibiotics. Thus, resistance eventually develops to these new antibiotics as well.

Can antibiotic resistance be overcome?

One approach taken by scientists to combat antibiotic resistance is to strengthen the action of existing antibiotics by modifying them so the bacterial enzymes that cause resistance cannot attack them. Alternately, "decoy" molecules can be used along with the antibiotic, so that the bacterium's resistance enzyme attacks the decoy molecule rather than the antibiotic. Decoy molecules such as clavulanic acid or sulbactam are already in use for blocking the beta-lactamase enzymes that destroy the penicillin family of drugs.

An alternative approach to the antibiotic resistance problem is to interfere with the mechanisms that promote resistance, rather than to attempt to kill the bacteria. For example, interfering with the duplication or movement of a bacterium's genetic

material would eliminate the transfer of resistance genes between bacteria.

What is an antibacterial?
An antibacterial is an agent that interferes with the growth and reproduction of bacteria. Antibacterials are now most commonly described as agents used to disinfect surfaces and eliminate potentially harmful bacteria. Unlike antibiotics, they are not used as medicines for humans or animals, but are found in products such as soaps, detergents, health and skincare products, and household cleaners.

How are antibacterials classified?
Antibacterials may be divided into two groups according to their speed of action and residue production. The first group contains those that act rapidly to destroy bacteria, but quickly disappear (by evaporation or breakdown) and leave no active residue behind (referred to as *non-residue-producing*). Examples of this type are the alcohols, chlorine, peroxides, and aldehydes. The second group consists mostly of newer compounds that leave long-acting residues on the surface to be disinfected and thus have a prolonged action (referred to as *residue-producing*). Common examples of this group are triclosan, triclocarban, and benzalkonium chloride.

How common are antibacterials in consumer products?
Alcohols, chlorine and peroxides have been used for many decades in healthcare and cleaning products. Within the past two decades, the residue-producing antibacterials, once used almost exclusively in healthcare institutions, have been added to increasing numbers of household products, particularly soaps and cleaning agents. More recently, triclosan has been bonded into the surface of many different products with which humans come into contact, such as plastic kitchen tools, cutting boards, highchairs, toys, bedding, and other fabrics.

Is the use of antibacterial agents regulated in the US?
The U.S. Food and Drug Administration (FDA) regulates antibacterial soaps and antibacterial substances that will either be used on the human body or in processed food, including food wrappers, and agents added to water involved in food processing.

If a substance is not intended for use on or in the human body, it is registered by the U.S. Environmental Protection Agency (EPA) under the Federal Insecticide, Fungicide, and Rodenticide Act. Substances are registered either as public health or as non-public health antimicrobial agents.

What is the difference between bacteriostats, sanitizers, disinfectants, and sterilizers?
The EPA classifies public health antimicrobials as bacteriostats, sanitizers, disinfectants, and sterilizers based on how effective they are in destroying microorganisms. Bacteriostats inhibit bacterial growth in inanimate environments. Sanitizers are substances that kill a certain percentage of test microorganisms in a given time span. Disinfectants destroy or irreversibly inactivate all test microorganisms, but not

necessarily their spores. Sterilizers destroy all forms of bacteria, fungi, and other microorganisms and their spores. Disinfectants can be further categorized as broad or limited-spectrum agents. A broad-spectrum disinfectant destroys both gram-negative and gram-positive bacteria. A limited-spectrum disinfectant must clearly specify the specific microorganisms against which it works.

How beneficial are antibacterials?
Antibacterials are effective in killing bacteria, but there is considerable controversy surrounding their health benefits. The non-residue producing agents have been used for many years and continue to be effective agents for controlling disease organisms in a wide variety of healthcare and domestic settings. When used under strict application guidelines, the residue-producing agents have proven effective at controlling bacterial and fungal infection in clinical settings such as hospitals, nursing homes, neonatal nurseries, and other healthcare facilities where there may be a high risk of infection.

A few consumer products have demonstrated effectiveness for specific conditions: antibacterial toothpaste helps control periodontal (gum) disease; antibacterial deodorants suppress odor-causing bacteria; and antidandruff shampoos help control dandruff. However, to date, there is no evidence to support claims that antibacterials provide additional health benefits when used by the general consumer.

Do antibacterials create resistant bacteria?
Because of their rapid killing effect, the non-residue producing antibacterial agents are not believed to create resistant bacteria. Resistance results from long-term use at low-level concentrations, a condition that occurs when consumers use residue-producing agents such as triclosan and triclocarban. Until recently, it was accepted that these agents did not affect a specific process in bacteria, and thus it was unlikely that resistant bacteria could emerge. However, recent laboratory evidence indicates that triclosan inhibits a specific step in the formation of bacterial lipids involved in the cell wall structure. Additional experiments found that some bacteria can combat triclosan and other biocides with export systems that can also pump out antibiotics. It was demonstrated that these triclosan-resistant mutants were also resistant to several antibiotics, specifically chloramphenicol, ampicillin, tetracycline, and ciprofloxacin.

Some resistance to antibacterials has been found where these agents are used continuously (as in the hospital and food industry). At the present time, however, this modest increase in resistance has not yet created a clinical problem.

Can the widespread use of antibacterial agents lead to more resistant bacteria?
Many scientists feel that this is a potential danger. So far, studies of antibacterial use in home products such as soap, deodorant, and toothpaste have not shown any detectable development of resistance.

Are there other concerns about the use of antibacterial agents?
Yes, experts believe that the use of these agents creates a false sense of security that may cause individuals to become lax in their hygiene habits. Antibacterial use should not be considered an alternative to good hygiene, except where good hygiene practices are impossible.

It should always be remembered that most bacteria are harmless and in many cases, even beneficial. Very few bacteria actually cause disease. Antibacterials are not discriminating. Constant use of disinfecting agents tends to disrupt the normal bacteria that act as barriers against invading pathogens. This may cause shifts in bacterial populations and create a "space" for disease-causing bacteria to enter and establish infection.

Are there other effective cleaning methods to prevent disease spread?
For most purposes, washing with regular soap and rinsing with running water, followed by thorough drying, is still considered the best way of preventing disease transmission. This is especially important after using the toilet, changing a diaper, emptying a diaper pail, cleaning the toilet, or handling raw meat or poultry.

Several common traditional agents are effective against a wide range of disease-causing organisms. These include 70% solutions of ethyl or isopropyl alcohol, 10% solution of household bleach and hydrogen peroxide. Unlike triclosan and other long-acting agents, these products destroy multiple cell components at once rather than attacking a specific bacterial process.

When are antibacterials useful?
While there is no evidence that the routine use of antibacterials confers a health benefit, they are useful where the level of sanitation is critical and additional precautions need to be taken to prevent spread of disease. Thus, antibacterials are important in hospitals, day care centers, and healthcare facilities, as well as other environments with high concentrations of infectious bacteria. In the home environment, they may be needed for the nursing care of sick individuals with specific infections, or for those whose immune systems have been weakened by chronic disease, chemotherapy or transplants. Under these circumstances, antibacterials should be used according to protocol, preferably under the guidance of a healthcare professional.

Unit 5

Upper respiratory tract infections (RTI), antibiotic use and antibiotic resistant infections

Learning objectives: to review the relationship between upper respiratory infections, antibiotic, use and the emergence of antibiotic resistance. To review the principles for rational antibiotic use for upper respiratory infections in children.

In general, a very large numbers of RTIs are treated every year with antibiotics whether or not they are caused by bacterial infections.[7] This excessive use of antibiotics has contributed to the emergence and spread of antibiotic-resistant bacteria in the community.[8, 9] In addition, attitudes and practices related to antibiotic use contribute to increasing this problem.

Information from the National Ambulatory Medical Care Survey (NAMCS) has revealed that, in 1998, 45 million antibiotic prescriptions were given for respiratory infections, and 55% were unlikely to have been of bacterial etiology. For example, 46% of patients with the common cold or nonspecific RTI received a broad-spectrum antibiotic.[10]

The CDC has estimated that antibiotic prescribing for upper respiratory infections could be reduced by more than 40% because tens of millions of courses of antibiotics are prescribed inappropriately each year for upper respiratory infections.

Principles for rational use of antibiotics and upper respiratory infections in children[11]

Despite the fact that school nurses do not prescribe antibiotics in the school setting, they are often first to see children and school staff with acute conditions, communicate with students' parents, and provide recommendations to them and to other school staff. For this reason, we have adapted the principles from the CDC and American Academy of Pediatrics (AAP) to assist school nurses in providing information on upper respiratory infections and the proper use of antibiotics. The following principles are not intended to discourage parents from seeking medical care for their ill children. School nurses should encourage parents to obtain information about antibiotics, complete treatment courses and reduce unnecessary demand for antibiotics for their children and themselves.

Common cold or viral rhinosinusitis or non-specific upper respiratory tractinfection (RTI)[12]

Principles:

1. Antimicrobial agents should not be given for the common cold.
2. Mucopurulent rhinitis (thick, opaque, or discolored nasal discharge) frequently accompanies the common cold. It is not an indication for antimicrobial streatment unless it persists for more than 10 to 14 days.

Rhinosinusitis and mucopurulent rhinitis are usually caused by viral infections, for which

antimicrobials are not recommended. Antibiotics are potentially harmful in this situation, because they increase the risk of colonization with organisms resistant to standard antimicrobial therapy. Although a large majority of physicians realize that antimicrobial therapy will not accelerate resolution of a cold, antimicrobials are often prescribed to prevent bacterial complications, in spite of the lack of supportive evidence. Mucopurulent rhinitis is part of the natural course of viral rhinosinusitis, and is not an indication for antibiotics.

Most children will suffer between three and eight colds per year. The common cold (viral rhinosinusitis) is most commonly caused by rhinoviruses and corona viruses. Each year there are outbreaks caused by different viruses, such as respiratory syncytial virus, influenza virus, corona virus, rhinovirus, and parainfluenza 1, 2, and 3 viruses, interspersed with endemic infections caused by respiratory adenovirus. Viral rhinosinusitis begins with the inoculation of virus onto the nasal, oral, or conjunctival mucosa, followed by infection of the local respiratory epithelium. The acute illness is characterized by rhinorrhea, sore throat, cough, and fever. These initial symptoms are caused by cellular damage and inflammatory response. Nasal stuffiness and throat irritation are followed within a few hours by sneezing and rhinorrhea, often accompanied by systemic complaints such as low-grade fever, malaise, headache, anorexia, and myalgias. Cough occurs in 60% to 80% of viral rhinosinusitis. One to three days after the onset of illness, nasal secretions become thicker and mucopurulent because they contain desquamated epithelial cells, white cells, and bacteria that normally colonize the upper respiratory tract.

The duration of illness ranges from two to seven days. Cough (in up to 31% of patients) and nasal discharge (35%), can persist in children and adolescents for two weeks. Many children will have sequential episodes of viral rhinosinusitis with little time for improvement between episodes.

Acute Otitis Media (AOM)[13]

1. Antibiotics are not recommended for the initial treatment of otitis media with effusion (OME). Treatment may be indicated if bilateral effusions persist for three months or more.
2. Antibiotics are indicated for treatment of acute otitis media (AOM). Diagnosis requires documented middle ear infection and signs or symptoms of acute local or systemic illness. Physicians minimize antibiotic side effects by giving parents of select children the option of fighting the infection on their own for 48-72 hours, then starting antibiotics if they do not improve. Approximately 80% of children with AOM get better without antibiotics. Children whose ear infections are not treated immediately with antibiotics are not likely to develop a serious illness.

The mainstay of pain management for AOM is medications such as acetominophen and ibuprofen, not antibiotics. Analgesics are most important in the first 24 hours after diagnosis, especially before the child's bedtime. Fortunately, by 24 hours about 60% of

children feel better, rising to 80-90% within a few days. Antibiotics do not relieve pain in the first 24 hours, and have only a small effect after that.

Each course of antibiotic given to a child for AOM can make future ear infections more difficult to treat. The result is an increase in the use of a larger range of, and generally more expensive, antibiotics. In addition, the benefit of antibiotics for AOM is small on average, and must be balanced against the potential harm of therapy. About 15% of children who take antibiotics suffer from diarrhea or vomiting and up to 5% have allergic reactions, which can be serious or life threatening. Resistant bacteria in a child can be passed to siblings, other family members, neighbors, and peers in group-care or school settings.

Sinusitis[14]

1. Sinusitis is diagnosed only in the presence of prolonged nonspecific upper respiratory signs and symptoms (e.g. rhinorrhea and cough without improvement for >10-14 days), or more severe upper respiratory tract signs and symptoms (e.g. fever, facial swelling, facial pain).
2. Initial antibiotic treatment of acute sinusitis should be with the most narrow-spectrum agent that is active against the likely pathogens.

Pharyngitis[15]

1. Most sore throats are caused by viral agents. Clinical findings alone do not adequately distinguish strep vs. non-strep pharyngitis. However, prominent rhinorrhea, cough, hoarseness, conjunctivitis, or diarrhea suggest a viral etiology. Most cases with clinical signs of Strep, like exudate and adenopathy, are viral.
2. Antibiotics should not be given to a child with pharyngitis in the absence of diagnosed group A streptococcal infection, which is diagnosed by a physician through an antigen test in conjunction with clinical and epidemiological findings.
3. Antigen tests (rapid Strep kits) or culture should be positive before beginning antibiotic treatment.
4. A penicillin remains the drug of choice for treating group A streptococcal pharyngitis.
5. Prompt penicillin treatment of confirmed group A streptococcal pharyngitis prevents rheumatic fever, a rare, but serious complication.

Cough illness / bronchitis[16]

1. Cough illness/bronchitis in children rarely warrants antibiotic treatment.
2. Antibiotic treatment for prolonged cough (>10 days) may occasionally be warranted.
3. Antibiotic treatment of upper respiratory infections does not prevent bacterial complications such as pneumonia.
4. Antibiotics are not recommended for cough <10-14 days in well-appearing

children without physical signs of pneumonia.

5. Treatment with erythromycin (a macrolide) may be warranted in a child older than five years when mycoplasma or pertussis is suspected. If pertusis is suspected, it should be confirmed by PRC or culture.

Cough illness/bronchitis is principally caused by viral pathogens. Airway inflammation and sputum production are non-specific responses and do not imply a bacterial etiology. Antibiotics are recommended only for suspected pneumonia, based on fever with focal exam, infiltrate on chest x-ray, tachypnea, and ortoxic appearance. Prolonged cough (>10-14 days without improvement) may suggest specific illnesses (e.g. sinusitis) that warrant antibiotic treatment.

Recommendations for providers endorsed by the CDC and American Academy of Pediatrics (AAP)[17]

The CDC and the AAP have recommended that providers:

- Explain that unnecessary antibiotics can be harmful; tell parents that based on the latest evidence, unnecessary antibiotics can be harmful by promoting resistant organisms in their child and the community.
- Explain that bacterial infections can be cured by antibiotics, but viral infections never are. Explain that treating viral infections with antibiotics to prevent bacterial infections does not work.
- Build cooperation and trust. Convey a sense of partnership and don't dismiss the illness as "only a viral infection."
- Provide educational materials, and explain when the risks of antibiotics outweigh the benefits.
- Recommend home-care and non-pharmacological treatment or treatment with analgesics and decongestants, if appropriate.
- Emphasize the importance of adequate nutrition and hydration.
- Explain the expected normal time course of the illness and tell parents to contact their doctor if symptoms persist or worsen.

Unit 6

Role of the school nurse in promoting proper antibiotic use and reducing antibiotic resistance

Learning objective: to define the role of the school nurse and scope of work using the HBM for behavioral change to promote proper antibiotic use.

The findings from the Florida Get Smart survey* of school nurses provided information to design a strategy framed by the HBM, which emphasizes three main components: personal susceptibility, severity of a condition, and reduction of the threat through personal action.[18] Guided by school nurses, individuals in the school setting will take action to reduce antibiotic resistance if they consider themselves or their loved ones susceptible to acquiring an antibiotic resistant infection. Parents, students, teachers, and school staff will perceive severity if they believe that misuse of antibiotics and resistant infections have potentially serious consequences. Individuals will engage in behavioral change if they identify a course of action that is available and beneficial in reducing either their susceptibility or the severity of the antibiotic resistant infections, and if they perceive that anticipated barriers to taking the action are outweighed by its benefits.

Students, parents, teachers, and school staff should receive information and participate in educational strategies that trigger willingness to use antibiotics properly, decrease the demand for antibiotics for viral upper respiratory infections, and increase adherence to prescriptions. The Florida Get Smart survey showed that two-thirds of schools nurses have provided information or education on the proper use of antibiotics to students, parents, teachers, and staff, but less than half of them have provided education on antibiotic resistance. For that reason, education is necessary. The implementation of a strategy for behavioral change is made possible because school nurses believe in the importance of providing information and education to parents in the first place, as well as to teachers, school staff, and students.

Addressing susceptibility in the school setting

To promote behavioral changes, individuals - in this case students, parents, staff, and teachers - should believe they are susceptible to antibiotic resistant infections. A role for school nurses is to help students, parents, and school staff to reach a desirable level of awareness through information and education, so students and other school staff perceive that they are at risk for developing resistant infections when misuse of antibiotics occurs. Once awareness is raised, a cue to action should lead to new or better practices regarding antibiotic use.

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*To better fashion an effective campaign, the FDOH conducted a survey of school nurses. The Florida Schools Get Smart survey asked about perception of the knowledge, attitudes, practices, and beliefs held by parents, teachers, school staff, and students regarding antibiotic use and antibiotic resistance.

Several factors influence the likelihood of antibiotic misuse and may lead to antibiotic resistant infections. Such factors include overall knowledge on the topic, beliefs, attitudes, and practices.[19, 20] The following findings from the Florida Schools Get Smart survey are relevant to demonstrating likelihood of antibiotic misuse. This section presents situations relevant to possible antibiotic misuse, messages to create awareness or recommendations to address the situations, and cues to action to offer students, parents, and other school staff to promote changes on behaviors and better practices. The recommendations on management of viral infections target individuals with no underlying health conditions.

Lack of information and education increases the risk of inappropriate actions, therefore providing information and education on a regular basis will contribute to reducing misuse.

The Florida Schools Get Smart survey showed that parents understand the following aspects regarding antibiotics: the reason why antibiotics are prescribed to their children, prescription labels, general indications for antibiotics, instructions from healthcare providers, and how to use their child's prescribed antibiotics. There is still a group of parents with poor knowledge and understanding who are at risk. Despite this moderate level of knowledge, in the majority of cases, parents do not provide a written authorization that correctly explains diagnosis, dose, and side effects of antibiotics prescribed for their children.

Message:
The school nurse can provide and reinforce correct information about common upper respiratory infections, possible methods of treatment, and the facts about antibiotic use. As a result, community health literacy regarding indications for antibiotic use may improve among students, parents, and school staff.

Cue to action:
Provide feedback on the written authorization. Recommend that parents read or complete the written authorization with information from the "patient prescription information" sheet provided by pharmacists when dispensing antibiotics. Encourage parents to ask healthcare providers if antibiotics are right for them or their children.

An inadequate level of knowledge is not the only aspect influencing the risk of misuse. Misconceptions about antibiotics, and the nature of respiratory infections and their manifestations also increase the likelihood of antibiotic misuse.

A common misconception about antibiotics is that they can cure all infections, and that antibiotics are a good medication for colds. Antibiotics are believed to improve symptoms from common colds and flu, to prevent more serious illnesses when a child has a cold, and to limit the transmission of the disease to others. Presumably, concepts of communicable diseases and antibiotic use are well incorporated into the general public's knowledge. However, the concept of the nature of infectious diseases and the

distinction between a viral and a bacterial origin has been wrongly generalized; consequently, antibiotics are believed to work for germs including viral conditions, assuming that they are similar to bacterial infections

Message:
Provide clear and repetitive messages regarding the ineffectiveness of antibiotics for cold and flu and educate the target population on differentiation of germs, bacteria and viruses, and then on antibiotic indications emphasizing that:

- Antibiotics do not work against colds or flu, which are caused by viruses.
- Most sore throats are caused by viruses. One exception is strep throat, which is caused by bacteria. A throat culture or rapid test can diagnose strep throat and what antibiotic will be effective.
- Coughs and bronchitis are almost always caused by viruses. However, if symptoms last for more than two weeks, or if the individual has a lung condition, bacteria may be the cause of symptoms.
- There are different types of ear infections. Some require antibiotics, others do not.

Cue to action:
Provide information on non-pharmacological management of viral upper respiratory infections and indications for over-the-counter medications for colds.

Survey respondents reported found that parents know that, in general, antibiotics have side effects. However, they did not know about other effects such as the likelihood of developing hard-to-treat infections when taking unneeded antibiotics, or that misuse of antibiotics can lead to antibiotic-resistant bacteria.

Message:
Antibiotic resistance is an undesirable result following antibiotic use. Overuse or misuse of antibiotics can lead to decreased effectiveness in individuals and the community.

Unnecessary antibiotics can be harmful. Taking antibiotics may cause bacteria to become resistant. People who have taken antibiotics recently are more susceptible to infections with resistant bacteria and may pass them on to family members and friends.

Cue to action:
Provide individuals with information about the consequences of unnecessary demand for antibiotics and recommendations for proper use of antibiotics to reduce the risk of developing antibiotic resistant infections.[21]

The concept that green or yellow nasal discharge is an indication for antibiotics has been shown to be wrong. In the past, health professionals were taught that mucopurulent discharge was an indication for antibiotics, and many incorporated it into their practices. However, green or yellow nasal discharge is not always an indication for antibiotics; in fact, it is a common manifestation of upper respiratory infections of viral

origin.

Message:

While the school nurse cannot provide a medical diagnosis, the nurse will be able to provide guidance on how students, parents, and school staff should respond to various types of symptoms. For instance, green or yellow nasal discharge does not always get better using antibiotics. Symptoms such as yellow or green mucus do not necessarily mean that there is a bacterial infection. Sinus infections may be caused by bacteria or viruses. Antibiotics should only be used for a severe infection, or one that lasts more than two weeks, since those may be caused by bacteria.

Cue to action:

Instruct individuals about non-pharmacological management of nasal secretions using saline nasal spray, hydration, and over the counter medications (OTC) to alleviate symptoms. Also, inform students, parents, and school staff of symptoms that will require immediate medical attention.

Parents' overall knowledge regarding antibiotic-resistant infections, antibiotic-resistant bacteria or methicillin-resistant *Staphylococcus aureus* (MRSA) is poor.

Message:

Inform and educate students, parents, and other school staff about antibiotic-resistant infection, including MRSA and their consequences (see Appendix A).

Cue to action:

Provide students, parents, and school staff with information on steps to prevent antibiotic-resistant infections and MRSA in the school setting and home.

The survey asked about engagement on antibiotic use practices that lead to antibiotic misuse and resistance. Awareness of the extent and consequences of these practices will increase perceived susceptibility.

The survey showed that parents, staff, and teachers request antibiotics for self-diagnosed infections. Students were less likely to engage in this behavior.

Message:

Wrongly self-diagnosed infections lead to an increased demand for antibiotics from healthcare providers leading to antibiotic misuse and resistance.

Cue to action:

Provide information and education regarding management of acute upper respiratory infections from viral origin, and warning signs of complications. Recommend not calling or going to the doctor expecting antibiotics or demanding them. For viral infections, taking medicines to alleviate the symptoms, and allowing the bodys' own immune system to fight infection, is more effective. Colds and acute upper respiratory infections do not require antibiotics. Common respiratory symptoms that last more that 10 to 14

days require a physician consultation and antibiotic if bacterial origin is confirmed.
The survey asked about engagement in inappropriate practices related to antibiotic use. School nurses report that in the majority of cases, students do not complete their treatment with antibiotics. The survey did not ask for the causes or circumstances, but it clearly showed this common practice. In addition, many parents frequently keep antibiotics at home for a future illness; parents treat their children without physician supervision, and stop their children's antibiotic treatment when they feel better. School nurses have found that parents give children antibiotics when they are not needed. Similar practices were described among teachers and school staff. In comparison to the student-parent group, teachers and staff are more likely to take antibiotics that have not been prescribed for them.

Message:
Emphasize the following positive practices when antibiotics are prescribed: take all doses as directed, complete the course of treatment even if feeling better, discard leftover antibiotics, take only antibiotics that have been prescribed for the person. In addition, explain the rationale for these recommendations stating that using only part of a prescription could allow bacteria to develop resistance or to re-infect. A healthcare provider should evaluate each person each time they are sick.

Cues to action:
Provide information to make sure that students and parents understand how to take an antibiotic. Invite them to dispose of all leftover antibiotics and teach measures to manage viral infections and recognition of complications.

Efforts to reduce antibiotic-resistant infections should be complemented with other measures to prevent and control infections. The survey asked about handwashing and hygiene policies, use of hand sanitizer, disinfection of surfaces, letters to parents on flu prevention and students' immunization record checks and follow up. School nurses perceived compliance with such practices as fair to excellent.

Addressing severity in the school setting
Parents, students, teachers and school staff must believe that using antibiotics improperly and acquiring a resistant infection leads to severe consequences. In general, information and education should increase awareness of likelihood to develop hard-to-treat infections that come from taking unneeded antibiotics, school or work absenteeism, increased cost, longer convalescence and recurrent infections. Also, nurses should address the severity of the consequences from methicillin-resistant *Staphylococcus aureus* (MRSA) infections in students or family members.

Addressing benefits in the school setting
Students, parents, teachers and school staff must believe that engaging in preventive behaviors will reduce the threat of having a resistant infection.

Addressing barriers in the school setting

Some beliefs parents hold become barriers. Parents may demand a prescription of antibiotics for an upper respiratory tract infection (RTI) in their child, because they believe that taking antibiotics means a child can return to school sooner. It is troublesome to take time off from work when the child has an RTI, and because the child was treated with antibiotics previously for the same problem. Factual information

will help parents to overcome these barriers.

Unit 7

Talking points

Learning objective: to provide scientific information in plain language to communicate effectively to students, parents, and other school staff.

Answering questions on antibiotic and antibiotic resistance from students, parents, teachers, and school staff.[22, 23]

The following section provides plain language answers to the most common questions related to antibiotics and resistance.

Questions about antibiotic resistance

What are germs?
Germs are living forms not visible to the naked eye, for example bacteria and viruses.

What are bacteria?
Bacteria are a type of germ or small organism that are not visible to the naked eye. Bacteria live all around us - in drinking water, food, soil, plants, animals, and in humans. Most bacteria do not harm us, and some are useful because, for example, they can help us digest food. However, many bacteria are capable of causing severe infections.

What are antibiotics?
Antibiotics are medicines used to treat and prevent diseases caused by bacteria. In general, antibiotics kill or stop reproduction of bacteria. They are also called antimicrobials.

What are antibiotic-resistant bacteria?
Antibiotic-resistant bacteria are bacteria that are no longer killed by commomly used antibiotics. these bacteria resist the effects of antibiotics and multiply and spread.

What is antibiotic resistance?
Antibiotic resistance occurs when bacteria cannot be killed by antibiotics. Many bacteria have developed resistance to certain antibiotics. If this continues, over time, some returning infections may have to be treated with different and stronger antibiotics and eventually no antibiotic will be effective in killing the bacteria.

Antibiotic resistance is not a new problem. For example, 60 years ago, doctors found bacteria resistant to penicillin, the first antibiotic used.

How do bacteria become resistant to antibiotics?
Bacteria become resistant to antibiotics by changing their structure so the antibiotic no

longer works, or by developing ways to inactivate the antibiotic. Bacteria can also develop resistance to antibiotics naturally, and did so before the development of commercial antibiotics.

How does antibiotic resistance happen?
Antibiotic resistance results from genetic action. Bacteria acquire genes conferring resistance in any of three ways.

Bacterial genetic material may change (mutate) spontaneously. Drug-resistant tuberculosis arises this way.

One bacterium may take up genetic materials (DNA) from another bacterium. Pencillin-resistant gonorrhea results from transformation in this way.

Most alarming, however, is resistance acquired from a small circle of genetic material or DNA called a plasmid, which can flit from one type of bacterium to another. A single plasmid can provide many different resistances.

Why do bacteria become resistant to antibiotics?
Bacteria can become resistant to antibiotics because antibiotics are used excessively, used for infections not caused by bacteria (for example, viral infections), or not taken exactly as prescribed.

What are the differences between bacteria and viruses?
Bacteria and viruses are different types of germs. Bacteria are microscopic single-celled living organisms not visible to the human eye. Viruses are a structure of genetic material and are even smaller than bacteria. Viruses can only live and reproduce by infecting another living cell. Both human cells and bacteria can be infected by viruses. Most biologists do not consider viruses to be living things, but instead, infectious particles. Antibiotic drugs attack bacteria, *not* viruses.

What infections are caused by bacteria and what infections are caused by viruses?
Common viral infections are colds, the flu, most sinus infections, coughs, bronchitis, and most sore throats. In fact, only 15% of sore throats are caused by the bacterium Group A Streptococcus, which results in "strep throat." Common bacterial infections include strep throat, urinary tract infections, and E. coli diarrhea. Antibiotics cure bacterial infections, but never viral infections.

How can I develop an antibiotic-resistant infection?
A person can develop an antibiotic-resistant infection when infected by resistant bacteria or after having taken antibiotics.

Why should I care about antibiotic-resistance?
Improper use of antibiotics can cause more frequent and possibly more severe illness for you and your family. Antibiotic misuse is bad for your community and society at large

by increasing the numbers of bacteria that are hard to treat. In fact, according to the CDC, all significant bacterial infections in the world are becoming resistant to the antibiotic treatments of choice. Antibiotic-resistant infections have significant consequences; for example, increased risk of death, prolonged hospital stays, complications, more visits to the doctor, significant cost, a longer illness, and treatment with more expensive and toxic antibiotics. The CDC estimates that each year nearly two million people in the U.S. acquire an infection while in a hospital, resulting in 90,000 deaths. More than 70% of the bacteria that cause these infections are resistant to at least one of the antibiotics commonly used to treat them.

What is making antibiotic resistance a bigger problem?

People do things that make antibiotic resistance a bigger problem, for example, people:

- Take antibiotics that the doctor gave to somebody else.
- Buy antibiotics without a prescription in a place other than a drug store.
- Keep antibiotic leftovers at home to use later.
- Stop taking the antibiotic treatment when feeling better.
- Take antibiotics for diseases that do not get better with antibiotics, for example for a cold or for pain.

People take antibiotics when they do not need them because they believe incorrectly that:

- Antibiotics are a good medication for colds or that antibiotics will make them feel better when they have a cold or flu.
- Antibiotics will help them to get better faster.
- When they have a cold, antibiotics prevent other diseases that are much worse.
- They do not spread diseases if they are taking antibiotics.
- Antibiotics cure all infections.
- Antibiotics are very safe.
- Antibiotics will relieve green or yellow secretions from the nose.

How can I reduce antibiotic resistance?

Do not use antibiotics when you have a viral infection. When you are prescribed antibiotics for a bacterial infection, take them as directed. Also, you can reduce your chances of an infection by frequently washing your hands with soap and water. Colds and the flu do not benefit from antibiotics, therefore do not request antibiotics to treat viral illnesses.

Following the prescription exactly as prescribed is also important. You should not skip doses or stop taking an antibiotic as soon as you feel better; you should complete the full course of the medication. Otherwise, the drug may not kill all the infectious bacteria, allowing the remaining bacteria to become resistant. While some antibiotics must be taken for 10 days or more, others are FDA-approved for a shorter course of treatment; some can be taken for as few as three days.

Another concern to some health experts is the use of antibacterial soaps, detergents,

lotions, and other household items, because there is no evidence that support a public health benefit. Antibacterial products should be reserved for the hospital setting, for sick people coming home from the hospital, and for those with compromised immune systems.

Even though a virus may cause my illness, what harm can it do to take an antibiotic?
Taking antibiotics when they are not needed contributes to the serious problem of antibiotic resistance. If you take antibiotics unnecessarily, you may contribute to the development of antibiotic resistance. If you become sick and your bacteria are resistant to your prescribed antibiotic, your illness lasts longer and you may have to make return office and pharmacy visits to find the right drug to kill the germ. For more serious infections, it is possible that you would need to be hospitalized or could even die if the infection could not be stopped. Also, while the resistant bacteria are still alive, you act as a carrier of these germs, and you could pass them to others.

If antibiotics will not help me, what will?
There are many over-the-counter products available to treat the symptoms of your viral infection. These include cough suppressants, which will help control coughing, and decongestants to help relieve a stuffy nose. Read the label and ask your pharmacist or doctor if you have any questions about which will work best for you.

When should I take antibiotics?
Take antibiotics when your health care provider prescribes them for bacterial illnesses such as strep throat.

Antibiotics are prescribed for illnesses caused by bacteria, not by viruses. The common cold and flu are caused by viruses, not by bacteria. Antibiotics do not work against viruses.

When should you not take antibiotics?
Most upper respiratory infections are caused by viruses, germs that are not killed by antibiotics. Talk with your doctor about ways to feel better when you are sick. Ask what you should look for that might mean you are developing another infection for which antibiotics might be appropriate.
Antibiotics are not usually needed for the following illnesses:

- Cold
- Flu
- Chest cold (in otherwise healthy children and adults)
- Sore throats (except confirmed strep)
- Bronchitis (in otherwise healthy children and adults)
- Runny nose (with green or yellow mucus)
- Fluid in the middle ear (otitis media with effusion)

What is the proper dosage?

When used properly, antibiotics are a powerful medication to stop bacterial diseases. Prudent use includes taking antibiotics only for diagnosed bacterial infections and following the precise directions on the prescription. Prescriptions are written to cover the time needed to help your body fight all the harmful bacteria. If you stop your antibiotic early, the bacteria that have not yet been killed can restart an infection.

Leftover antibiotics are not a complete treatment, and they will not work to kill all your disease-causing bacteria. Taking partial doses can allow for the bacteria that are resistant to persist. Always talk to your doctor because your symptoms may not be caused by bacteria. If you do have another bacterial infection, a complete dose of the appropriate antibiotic is needed to kill all the harmful bacteria.

Are antibiotics safe?
Yes, antibiotics taken as prescribed are generally safe and effective at combating bacterial infections. Some people may be allergic to certain antibiotics, but can usually take other antibiotics, if needed. However, all medications can have side effects.
Antibiotics may alter the effectiveness of other medications and cause side effects or allergic reactions.

Antibiotics can kill most of the bacteria in your body that are sensitive to them, including helpful bacteria. By destroying the bacterial balance, it may cause stomach upsets, diarrhea, vaginal infections, or other problems.

(The following information should be used at the discretion of the school nurse and complying with the sexual education policies of each school district).

Antibiotics often lead to a vaginal yeast infection. Because antibiotics kill the normal bacteria in the vagina, yeast grow rapidly causing itching, burning, pain during sex, and vaginal discharge. Also, antibiotics may reduce the efficacy of birth control pills.

As with other medications, some antibiotics may be transmitted to a fetus, and may cause harm. Therefore, pregnant or nursing women should never take antibiotics without doctor's order.

How does a physician decide which antibiotic to prescribe?
Physicians examine patients and consider their symptoms in order to decide if they should prescribe an antibiotic and, if so, which one. Physicians can also take a culture or a rapid test to see if bacteria are causing a particular illness, such as a throat culture to determine the presence of "strep throat." For hospital infections and some community-acquired infections, the doctor will obtain an "antimicrobial susceptibility report" that indicates which types of antibiotic drugs are useful for the particular bacteria recovered from the infection. If the cause of the infection is unclear, but suspected to be due to bacteria, the doctor may prescribe a broad-spectrum antibiotic that is useful for controlling a wide variety of bacterial types.

When I start feeling better can I stop taking the antibiotic?
No, you should take all the medication your healthcare provider prescribed. Your prescription is written to cover the time needed to eliminate the harmful bacteria. If you stop taking the antibiotic early, the bacteria that are still alive are more likely to be resistant and can restart an infection, or be passed on to other people. Incomplete treatment with antibiotics can result in the development and spread of resistant bacteria.

Can I save antibiotics for the next time I am sick?
No, taking incomplete doses of antibiotics or taking antibiotics for infections caused by viruses will not make you feel better, and may make you more likely to get sick from

resistant bacteria in the future.

Answering questions from Spanish-speaking students and families

¿Qué es resistencia a los antibióticos?
Resistencia a los antibióticos ocurre cuando las infecciones por bacterias no se peden controlar y acabar. Las bacterias son más fuertes y resistentes que el medicamento.

Los antibióticos son medicamentos que matan o detienen los gérmenes llamados bacterias.

¿Qué son los virus y las bacterias, son diferentes?
Las bacterias y los virus son llamados en general gérmenes, pero son muy diferentes. Las bacterias causan enfermedades o infecciones que se curan con antibióticos. Los virus causan enfermedades que no se curan con antibióticos, pero las personas no lo saben y creen que los antibióticos curan todas las enfermedades.

Los virus causan:

- Resfriados
- Tos
- Dolor de garganta
- La gripe
- Sinusitis
- Bronquitis
- Infecciones del oído

¿Qué sucede si tomo antibióticos para un resfriado o para la tos?
Resfriados y tos son causados frecuentemente por virus, en este caso tomar antibióticos no es una buena idea porque los antibióticos no actúan contra los virus. El antibiótico no la ayudará y le puede causar daño. Cada vez que una persona toma un antibiótico aumenta las posibilidades de que las bacterias que están en su cuerpo logren resistir sus efectos y en el futuro puede enfermarse gravemente con una infección que no responde a los antibióticos.

¿Qué puedo hacer para evitar las infecciones resistentes a los antibióticos?

- No pida antibióticos cuando su médico le dice que no son necesarios.
- No tome antibióticos si tiene resfriado, tos o gripe.
- Tómese los antibióticos en la forma en que se lo indique su médico.
- No deje de tomar el medicamento cuando se sienta mejor. Tómese todas las dosis.
- No utilice restos de antibióticos y no guarde antibióticos que no consumió.
- No tome los antibióticos que le recetaron a otra persona.

Unit 8

Florida Schools Get Smart program, strategy for implementation

Learning objective: to explain the main components of the program implementation strategy.

One-on-one model for education of students and their parents

The patient-provider interaction is the basic framework to implement the program. It assumes that communication is the most basic and powerful tool,[24] and that school nurses have achieved an excellent and unique level of credibility and trust in which the relationship with parents and students has been crafted.

Ear, nose, and throat symptoms such as ear aches, sore throats, and nose bleeds accounted for 11.67% of the common health problems motivating visits to health rooms in schools with Comprehensive School Health Services; respiratory conditions such as asthma, bronchitis, and anaphylaxis accounted for 2.86% of the visits to comprehensive health rooms in schools in Florida. This means that 14.5% of visits to health rooms may provide opportunities to inform and educate students and parents on proper antibiotic use. During the 2005-2006 school year, there were approximately 4.1 million visits to school health rooms.

The strategy includes:

a. Participate in the training to obtain information about the program, antibiotic use and resistance, and guidance for implementation. The training includes two sections, - Get Smart I and II.

b. Display informational posters and make brochures and fact sheets available in the health room or other strategic place where students, parents, and school staff will see them.

c. Distribute the postcard "Virus and Bacteria."

d. Communicate with students, parents, and school staff.

- Basic strategy: communicate with the ill students and school staff that require services at the health room, especially to those who have febrile and respiratory symptoms, as well as those who receive antibiotics.
- Communicate with parents of sick students, and when administration of antibiotics is requested.
- Provide information on proper use of antibiotics and recommendations to manage non-bacterial respiratory infections.
- Encourage parents to take children to the doctor and to talk to the doctor about antibiotics.

e. Provide feedback or follow up on written authorizations to administer antibiotics to students at schools. School nurses should give parents feedback on completeness of the information required in the authorization.

Also,suggest to parents and guardians that they review and keep the

information from prescription bottle labels and from the patient prescription information sheet provided by pharmacies when dispensing antibiotics. Encourage students to read the information, and ask questions.

f. Create different strategies or activities based on time availability, student preferences and school and teacher support.

g. Record in a log the number of students, parents, and other school staff to whom you provide information. Record the method used to distribute the educational material.

h. Request information regarding other strategies or curricula to implement at school.

Appendix A

Community associated - methicillin resistant *Staphylococcus aureus* (CA-MRSA) skin and soft tissue infections (SSTIs) in the community: information for school nurses [25, 26]

Learning objective: to provide information to help school nurses to educate students, parents, teachers, and school staff and to address CA-MRSA in school settings.

MRSA are *S. aureus* strains that have acquired resistance to the antibiotics methicillin, oxacillin, nafcillin, cephalosporins, imipenem, and/or other beta-lactam antibiotics. Community-associated MRSA (CA-MRSA) refers to a MRSA infection with onset in the community in an individual with no risk factors (recent hospitalization, surgery, residence in a long-term care facility, dialysis, or presence of invasive medical devices).

Manifestations

CA-MRSA should be suspected in any SSTIs compatible with methicillin-susceptible *Staphylococcus aureus* (MSSA), specifically furuncles (abscessed hair follicles or "boils"), carbuncles (coalesced masses of furuncles), and abscesses. MRSA skin lesions are frequently confused with spider bites by both patients and clinicians, even in areas of the country where spiders capable of causing necrotic skin lesions are not endemic. The severity of MRSA SSTIs varies from mild superficial infections to deeper soft-tissue abscesses requiring incision and drainage and administration of parenteral antibiotics.

Population at risk and factors for transmission

Population at risk includes children and young adults, and individuals from racial minority groups or low socioeconomic status. Transmission of MRSA occurs among inmates in correctional facilities, competitive sports participants, military recruits, day care attendees, and men who have sex with men. Factors that facilitate the spread of infection include crowding, frequent skin-to-skin contact between individuals, participation in activities that result in compromised skin surfaces, sharing of personal items that may become contaminated with wound drainage, difficulty to maintain personal cleanliness and hygiene, limited access to healthcare, and frequent antibiotic exposure.

Culture and antimicrobial susceptibility

Clinicians are encouraged to collect specimens for culture and antimicrobial susceptibility testing from all patients with abscesses or purulent skin lesions. In an outbreak, cultures should be obtained from all new-onset cases, at least until the

susceptibility pattern of the outbreak strain has been determined.

Therapy

Incision and drainage

Incision and drainage constitutes a primary therapy for furuncles and other abscesses in individuals with no systemic signs of infection. For small furuncles not amenable to incision and drainage or collection of material for culture, moist heat may be satisfactory to promote drainage.

Antimicrobial combined with incision and drainage

For some patients with purulent skin lesions, empiric antimicrobial therapy may be administered in addition to incision and drainage, at the physician's discretion, or because of lack of response to initial treatment with incision and drainage alone. When empiric antimicrobial therapy is provided, local susceptibility data should be used to guide treatment. A beta-lactam agent is still a reasonable option for first-line therapy in a patient with mild to moderate illness and no significant co-morbidities if the local prevalence of methicillin-resistance among community S. aureus isolates is low.

Antimicrobials with activity against MRSA

Several antimicrobial agents are alternatives to beta-lactams for outpatient treatment of SSTIs when an oral regimen with activity against MRSA is desired. These include clindamycin, tetracyclines (doxycycline and minocycline), trimethoprim-sulfamethoxazole (TMP-SMX), rifampin (used only in combination with other agents), and linezolid.

Treatment limitations

Because of the presence of resistance or the potential for rapid development of resistance, some antimicrobial agents are not optimal choices for the empiric treatment of SSTIs possibly caused by MRSA. These include fluoroquinolones (Ciprofloxacin, levofloxacin moxifloxacin and gatifloxacin) and macrolides/ azalides (Erythromycin, clarithromycin)

Parenteral antimicrobial

Intravenous antimicrobial agents are appropriate for patients with severe staphylococcal infections, particularly patients requiring hospitalization. Vancomycin remains a first-line therapy for severe infections possibly caused by MRSA. Other intravenous agents are clindamycin, daptomycin, linezolid, quinopristin-dalfopristin, tigecycline, and TMP/SMX.

Colonization / decolonization

Colonization is the presence of S. aureus in an individual with growth and multiplication, but without tissue invasion or damage. MRSA commonly colonizes the anterior nares.

In general, nasal colonization with S. aureus has been identified as a risk factor for infection, however, few data are available on the association between MRSA colonization and infection in the community. MRSA colonization also occurs at sites

other than the nose (e.g., pharynx, axilla, rectum, and perineum).
Decolonization has been used in MRSA outbreaks in community settings. It includes various combinations of topical and systemic antimicrobial agents and antiseptic body washes. However, appropriate decolonization regimens (agents and administration schedules) have not been established for community settings.

Infection Control

Standard infection control precautions should be observed. Hand hygiene (handwashing or using alcohol hand gel) should be emphasized after touching body fluids or contaminated items (whether or not gloves are worn), between patients, and when moving from a contaminated body site to a clean site on the same patient.

Outbreaks

If an outbreak of cases is suspected or confirmed, the county health department must be notified.

Public Education

Key prevention messages for individuals with skin and soft tissue infections and their close contacts

1. Keep wounds that are draining covered with clean, dry, bandages.
2. Clean hands regularly with soap and water or alcohol-based hand gel (if hands are not visibly soiled). Always clean hands immediately after touching infected skin or any item that has come in direct contact with a draining wound.
3. Maintain good general hygiene with regular bathing.
4. Do not share items that may become contaminated with wound drainage, such as towels, clothing, bedding, bar soap, razors, and athletic equipment that touches the skin.
5. Launder clothing that has come in contact with wound drainage after each use and dry thoroughly.
6. If you are not able to keep your wound covered with a clean, dry bandage at all times, do not participate in activities where you have skin-to-skin contact with other persons (such as athletic activities) until your wound is healed.
7. Clean equipment and other environmental surfaces with which multiple individuals have bare skin contact with an over the counter detergent/disinfectant that specifies *Staphylococcus aureus* on the product label and is suitable for the type of surface being cleaned.
8. People who cannot maintain adequate hygiene and keep wounds covered with clean, dry bandages should be excluded from activities where close contact with others occurs, such as athletic practice, until their wounds are healed.

Addressing MRSA in schools settings

- Contamination with MRSA can occur whenever there are body fluids being exchanged. Universal precautions are adequate to prevent MRSA exposure.
- Wash common used objects with detergent and disinfect with a diluted bleach solution.
- Students who have MRSA wound or skin infections should follow wound care precautions.
- Promote good hygiene and frequent hand washing.

Prevention measures for school athletic departments

Participants in competitive sports that involve physical contact, skin damage, and sharing of equipment or clothing can be at risk for MRSA. It is important for schools to implement prevention measures.

- Maintain clean facilities and adequate supplies of soap and towels.
- Establish routine cleaning schedules for shared equipment.
- Encourage good hygiene, including showering and washing with soap after all practices and competitions.
- Discourage sharing of towels and personal items (e.g., clothing or equipment).
- Train athletes and coaches in first aid for wounds and recognition of wounds that are potentially infected.
- Encourage athletes to report skin lesions and encourage coaches to assess athletes regularly for skin lesions.
- Instruct athletes to cover all wounds. If a wound cannot be covered adequately, exclude players from practice and competition until the lesion is

healed or can be covered adequately.

Recommended Readings

CDC Antibiotic Resistance Efforts

Emmer CL, Besser RE: Combating antimicrobial resistance: intervention programs to promote appropriate antibiotic use. Infect Med 19:160-173, 2002.

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Knowledge, Attitude, and Practice Studies

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Larson E, Lin SX, Gomez-Duarte C: Antibiotic use in Hispanic households, New York City. Emerg Infect Dis 9:1096-1102, 2003.

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Community Level Interventions

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Perz JF, Craig AS, Coffey CS, et al: Changes in antibiotic prescribing for children after a community-wide campaign. JAMA 287:3103-3109, 2002.

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http://www.sandi.net/depts/nursing_wellness/resources.html