



Centers for Disease Control and Prevention

CDC 24/7: Saving Lives. Protecting People.™

Due to the lapse in government funding, only web sites supporting excepted functions will be updated unless otherwise funded. As a result, the information on this website may not be up to date, the transactions submitted via the website may not be processed, and the agency may not be able to respond to inquiries until appropriations are enacted.

Updates regarding government operating status and resumption of normal operations can be found at <http://www.usa.gov>.

Diseases/Pathogens Associated with Antimicrobial Resistance

A growing number of disease-causing organisms, also known as pathogens, are resistant to one or more antimicrobial drugs. A wide range of pathogens—including the bacteria that cause tuberculosis, the viruses that causes influenza, the parasites that cause malaria, and the fungi that cause yeast infections—are becoming resistant to the antimicrobial agents used for treatment. This page contains links to further information about some of the organisms and diseases associated with antimicrobial resistance.

Bacteria



***Acinetobacter* (/ncidod/dhqp/ar_acinetobacter.html)**

Acinetobacter [asz-in-ée-toe-back-ter] is a group of bacteria commonly found in soil and water. While there are many types or “species” of *Acinetobacter* and all can cause human disease, *Acinetobacter baumannii* [asz-in-ée-toe-back-ter boe-maa-nee-ie] accounts for about 80% of reported infections.

Outbreaks of *Acinetobacter* infections typically occur in intensive care units and healthcare settings housing very ill patients. *Acinetobacter* infections rarely occur outside of healthcare settings.



Anthrax (<http://emergency.cdc.gov/agent/anthrax/>)

Anthrax is a serious disease caused by *Bacillus anthracis*, a bacterium that forms spores. Anthrax most commonly occurs in wild and domestic mammalian species, but it can also occur in humans when they are exposed to infected animals or to tissue from infected animals or when anthrax spores are used as a bioterrorist weapon. Some strains of *B. anthracis* may be naturally resistant to certain antibiotics and not others. In addition, there may be biologically mutant strains that are engineered to be resistant to various antibiotics.



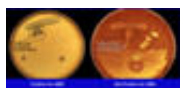
Campylobacter (</nczved/divisions/dfbmd/diseases/campylobacter/>)

Campylobacter is estimated to cause over 1.3 million infections and 76 deaths in the United States each year. Many of these infections are foodborne. *Campylobacter* infections can result in long-term consequences, such as arthritis or a type of paralysis called Guillain-Barré syndrome. Young children, older adults, and persons with weakened immune systems are most likely to have severe illnesses. An increasing percentage of human *Campylobacter* isolates are resistant to fluoroquinolones, a class of drugs that is important for treating severe infections. [More about Campylobacter » \[PDF – 114 pages 4.18mb\]](http://www.cdc.gov/drugresistance/threat-report-2013/pdf/ar-threats-2013-508.pdf#page=61) (<http://www.cdc.gov/drugresistance/threat-report-2013/pdf/ar-threats-2013-508.pdf#page=61>)



Gonorrhea (</std/Gonorrhea/arg/default.htm>)

Gonorrhea is a sexually transmitted disease (STD). Gonorrhea is caused by *Neisseria gonorrhoeae*, a bacterium that can grow and multiply easily in the warm, moist areas of the reproductive tract. The bacterium can also grow in the mouth, throat, eyes, and anus. Antimicrobial resistance in *N. gonorrhoeae* remains an important challenge to controlling gonorrhea; gonococcal strains may be resistant to penicillins, tetracyclines, spectinomycin, and fluoroquinolones.



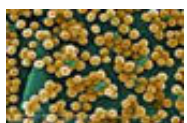
Group B streptococcus (</groupbstrep/index.html>)

Group B *Streptococcus* (group B strep) is a type of bacteria that causes illness in newborn babies, the elderly, and adults with other illnesses, such as diabetes or liver disease. Group B strep has shown confirmed resistance to certain antibiotics.



Klebsiella pneumoniae (/ncidod/dhqp/ar_kp.html)

Klebsiella [kleb–see–ell–uh] is a type of Gram-negative bacteria that can cause different types of healthcare-associated infections, including pneumonia, bloodstream infections, wound or surgical site infections, and meningitis. Increasingly, *Klebsiella* bacteria have developed antimicrobial resistance, most recently to the class of antibiotics known as carbapenems. (</hai/organisms/cre/index.html>) *Klebsiella* bacteria are normally found in the human intestines (where they do not cause disease). They are also found in human stool (feces). In healthcare settings, *Klebsiella* infections commonly occur among sick patients who are receiving treatment for other conditions. Patients whose care requires devices like ventilators (breathing machines) or intravenous (vein) catheters, and patients who are taking long courses of certain antibiotics are most at risk for *Klebsiella* infections. Healthy people usually do not get *Klebsiella* infections.



Methicillin-resistant *Staphylococcus aureus* (MRSA) (</mrsa/>)

Methicillin-resistant *Staphylococcus aureus* (MRSA) is a type of bacteria that is resistant to certain antibiotics. These antibiotics include methicillin and other more common antibiotics such as oxacillin, penicillin, and amoxicillin. Serious or life-threatening occurrences of

"Staph" infections, including MRSA, occur most frequently among persons in hospitals and healthcare facilities (such as nursing homes and dialysis centers) who have weakened immune systems.

- [MRSA and food products \(organisms/mrsa-and-food-products.html\)](#)



***Neisseria meningitidis* (/meningitis/index.html)**

One of the leading causes of bacterial meningitis in children and young adults in the United States is the bacterium *Neisseria meningitidis*. Meningitis caused by this bacterium is known as meningococcal disease. During 2007-2008 the first reported cases of fluoroquinolone-resistant *Neisseria meningitidis* were [reported \(/mmwr/preview/mmwrhtml/mm5707a2.htm\)](#) in the United States



***Salmonella, non-typhoidal serotypes* (/nczved/divisions/dfbmd/diseases/salmonellosis/)**

An estimated 1.2 million cases of salmonellosis occur in the United States every year. Many of these infections are foodborne. Not all cases of salmonellosis are diagnosed or reported, but about 23,000 persons are hospitalized and 450 die each year from this illness. Young children, older adults, and persons with weakened immune systems are most likely to have severe illnesses. Antibiotics are used for cases where the bacteria have spread from the intestines. Increasing resistance to clinically important antimicrobial agents, including cephalosporins, presents a challenge for treatment of *Salmonella* infections. [More about Salmonella, non-typhoidal serotypes » \[PDF – 114 pages 4.18mb\] \(/drugresistance/threat-report-2013/pdf/ar-threats-2013-508.pdf#page=71\)](#)



***Shigella* (/nczved/divisions/dfbmd/diseases/shigellosis/)**

Shigellosis is an infectious disease caused by a group of bacteria called *Shigella*. The *Shigella* germ is actually a family of bacteria that can cause diarrhea in humans. Persons with mild infections usually recover quickly without antibiotic treatment. However, appropriate antibiotic treatment kills *Shigella* bacteria, and may shorten the illness by a few days. Some *Shigella* bacteria have become resistant to antibiotics. This means some antibiotics might not be effective for treatment. [More about Shigella » \[PDF – 114 pages 4.18mb\] \(/drugresistance/threat-report-2013/pdf/ar-threats-2013-508.pdf#page=75\)](#)



***Streptococcus pneumoniae* (/ncidod/dbmd/diseaseinfo/drugresisstreppneum_t.htm)**

Streptococcus pneumoniae is a leading cause of serious illness among young children worldwide and is the most frequent cause of pneumonia, bacteremia, sinusitis, and acute otitis media (AOM). Widespread overuse of antibiotics contributes to emerging drug resistance.




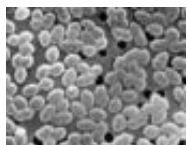
Tuberculosis (/tb/)

"TB" is short for tuberculosis. TB disease is caused by a bacterium called *Mycobacterium tuberculosis*. TB bacteria can become resistant to the medicines used to treat TB disease. Multidrug-resistant TB (MDR TB) is TB that is resistant to at least two of the best anti-TB drugs, isoniazid and rifampicin. Extensively drug-resistant TB (XDR TB) is a relatively rare type of MDR TB. XDR TB is defined as TB that is resistant to isoniazid and rifampin, plus resistant to any fluoroquinolone and at least one of three injectable second-line drugs.



Typhoid Fever (/ncidod/dbmd/diseaseinfo/typhoidfever_t.htm)

Typhoid fever is a life-threatening illness caused by the bacterium *Salmonella* Typhi. Typhoid fever can be prevented and can usually be treated with antibiotics. However, increasing resistance to available antimicrobial agents, including fluoroquinolones, presents a challenge for treatment. [More about Typhoid Fever »](#)  [PDF – 114 pages 4.18mb] (/drugresistance/threat-report-2013/pdf/ar-threats-2013-508.pdf#page=73)



Vancomycin-resistant Enterococci (VRE) (/ncidod/dhqp/ar_vre.html)

Enterococci are bacteria that are normally present in the human intestines and in the female genital tract and are often found in the environment. These bacteria can sometimes cause infections. Vancomycin is an antibiotic that is often used to treat infections caused by enterococci. In some instances, enterococci have become resistant to this drug and thus are called vancomycin-resistant enterococci (VRE). Most VRE infections occur in hospitals.



Vancomycin-Intermediate/Resistant Staphylococcus aureus (VISA/VRSA) (/ncidod/dhqp/ar_visavrsa.html)

VISA and VRSA are specific types of antimicrobial-resistant staph bacteria. While most staph bacteria are susceptible to the antimicrobial agent vancomycin some have developed resistance. VISA and VRSA cannot be successfully treated with vancomycin because these organisms are no longer susceptible to vancomycin. However, to date, all VISA and VRSA isolates have been susceptible to other Food and Drug Administration (FDA) approved drugs.

Viruses



Influenza (/flu/about/qa/antiviralresistance.htm)

Influenza (the flu) is a contagious respiratory illness caused by influenza viruses. In the United States, four antiviral drugs are FDA-approved for use against influenza: amantadine, rimantadine, zanamivir and oseltamivir. Samples of viruses collected from around the United States and worldwide are studied to determine if they are resistant to any of the four FDA-approved influenza antiviral drugs.

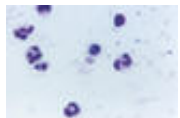
Fungi



Candida (/nczved/divisions/dfbmd/diseases/candidiasis/)

Candida is a type of fungal infection that encompasses superficial infection (oral thrush, vaginitis) to systemic and possibly life-threatening diseases that are mostly found in greatly immunocompromised persons, such as cancer, transplant, and AIDs patients. Symptoms may vary. Infection of the vagina or vulva may cause severe itching, burning, soreness, irritation, and discharge. Most ca Candida is a type of fungal infection that encompasses superficial infection (oral thrush, vaginitis) to systemic and possibly life-threatening diseases that are mostly found in greatly immunocompromised persons, such as cancer, transplant, and AIDs patients. Symptoms may vary. Infection of the vagina or vulva may cause severe itching, burning, soreness, irritation, and discharge. Most candidial infections are treatable and result in minimal complications such as redness, itching and discomfort, though complication may be severe or fatal if left untreated in certain populations. Candidiasis is commonly treated with antimycotics—the antifungal drugs commonly used to treat candidiasis are topical clotrimazole, topical nystatin, fluconazole, and topical ketoconazole. *Candida may* develop resistance to antimycotic drugs, such as fluconazole, one of the drugs that is often used to treat candidiasis. Recurring infections may be treatable with other anti-fungal drugs, but resistance to these drugs may also develop.

Parasitic



Malaria (/malaria/)

Malaria is a mosquito-borne disease caused by a parasite. People with malaria often experience fever, chills, and flu-like symptoms. The development of resistance to drugs poses one of the greatest threats to malaria control and has been linked to recent increases in malaria morbidity and mortality. Antimicrobial resistance has been confirmed in only two of the four human malaria parasite species, *Plasmodium falciparum* and *P. vivax*.

These images and many more are available for download from the [Public Health Image Library \(PHIL\)](http://phil.cdc.gov/phil/) (<http://phil.cdc.gov/phil/>)

Page last reviewed: September 30, 2013

Page last updated: September 30, 2013

Content source: [Centers for Disease Control and Prevention](#)

[National Center for Emerging and Zoonotic Infectious Diseases \(NCEZID\)](#)

[Division of Healthcare Quality Promotion \(DHQP\)](#)

Centers for Disease Control and Prevention 1600 Clifton Rd. Atlanta, GA 30333, USA
800-CDC-INFO (800-232-4636) TTY: (888) 232-6348 - [Contact CDC-INFO](#)

