

Antibiotics

Introduction

Antibiotics are medications used to treat, and in some cases prevent, bacterial infections.

They can be used to treat relatively mild conditions such as acne as well as potentially life-threatening conditions such as pneumonia (a type of lung infection)

How do I take antibiotics?

Doses of antibiotics can be provided in several ways:

oral antibiotics – tablets, pills and capsules or a liquid that you drink

topical antibiotics – creams, lotions, sprays or drops

injections of antibiotics – they can be given as an injection, or an infusion through a drip, directly into the blood or a muscle

How the antibiotic is given will depend on the type of infection. Topical antibiotics are often used to treat skin infections while oral antibiotics can be used to treat most types of mild to moderate infections in the body. Antibiotic injections are usually reserved for more serious infections and are often given in hospital.

It is essential to finish taking a prescribed course of antibiotics, even if you feel better, unless a healthcare professional tells you otherwise. If you stop taking an antibiotic part way through a course, the bacteria can become resistant to the antibiotic (see below).

Types of antibiotics

There are now hundreds of different types of antibiotics but most of them can be broadly classified into six groups. These are outlined below.

Penicillin

Penicillin is widely used to treat certain infections such as skin infections, chest infections and urinary tract infections.

Some widely used types of penicillin include:

amoxicillin

flucloxacillin

Around 1 in 15 people will have an allergic reaction after taking penicillin and a very small number of people will develop a severe allergic reaction (anaphylaxis).

It's important to let your doctor or the health professional treating you know if you think you may be allergic to penicillin.

Another problem with penicillin is that some strains of bacteria have become resistant to it because it has been so widely used.

Cephalosporins

Cephalosporins are broad-spectrum antibiotics, which means they are effective in treating a wide range of different types of infections including more serious infections, such as:

septicaemia – infection of the blood

pneumonia

meningitis – infection of the outer protective layer of the brain and spinal cord

Examples of cephalosporins include:

cefalexin

cefixime

If you are allergic to penicillin you may also be allergic to cephalosporins.

Aminoglycosides

Aminoglycosides are a type of antibiotic that used to be widely prescribed until it was found that they could cause both damage to hearing and the kidneys. Because of this, they tend now to be used only to treat very serious illnesses such as meningitis.

Aminoglycosides break down quickly inside the digestive system so they have to be given by injection or as ear or eye drops. The most widely used aminoglycoside is called gentamicin.

Tetracyclines

Tetracyclines are another type of broad-spectrum antibiotic that can be used to treat a wide range of infections.

They are commonly used to treat severe acne and a condition called rosacea, which causes flushing of the skin and spots.

Macrolides

Macrolides are a type of antibiotic that can be particularly useful in treating lung and chest infections.

They can also be a useful alternative for people with a penicillin allergy or to treat penicillin-resistant strains of bacteria.

Examples of macrolides include:

erythromycin

spiramycin

Fluoroquinolones

Fluoroquinolones are the newest type of antibiotic. They are broad-spectrum antibiotics that can be used to treat a wide range of infections.

Examples of fluoroquinolones are:

ciprofloxacin

norfloxacin

Side effects

Most antibiotics don't cause problems for people who take them and serious side effects are rare. The most common reported side effects of antibiotics are:

vomiting

feeling nauseous

indigestion

diarrhoea

Considerations and interactions

Some antibiotics are not suitable for people with certain medical conditions, or for women who are pregnant or breastfeeding. You should only ever take antibiotics that are prescribed to you – never 'borrow' them from a friend or family member.

Some antibiotics can also react unpredictably with other medications and the oral contraceptive pill. It is therefore important to read the information leaflet that comes with your medication carefully.

Antibiotic resistance

Health organisations across the world are trying to reduce the use of antibiotics, especially for conditions that are not serious. This is to try to combat the problem of antibiotic resistance, which is when a strain of bacteria no longer responds to treatment with one or more types of antibiotics.

Antibiotic resistance can occur in several ways.

Strains of bacteria can mutate (change) and, over time, become resistant to a specific antibiotic. The chance of this increases if a person does not finish the course of antibiotics as some bacteria may be left to develop resistance.

Also, antibiotics can destroy many of the harmless strains of bacteria that live in and on the body. This allows resistant bacteria to multiply quickly and replace them.

The overuse of antibiotics in recent years has played a major part in antibiotic resistance. This includes using antibiotics to treat minor conditions that would have got better anyway.

It has led to the emergence of so-called 'superbugs'. These are strains of bacteria that have developed resistance to many different types of antibiotics. They include:

meticillin-resistant *Staphylococcus aureus* (MRSA)

Clostridium difficile (C. diff)

the bacteria that cause multi-drug-resistant tuberculosis (MDR-TB)

These types of infections can be serious and challenging to treat, and are becoming an increasing cause of disability and death across the world.

For example, the World Health Organization (WHO) estimates that there are around 150,000 deaths due to MDR-TB each year.

The biggest worry is that there may emerge new strains of bacteria that are effectively untreatable by any existing antibiotics.

There are already signs of this with the emergence of a type of bacteria called New Delhi metallo-beta-lactamase (NDM-1), which appears to be highly resistant to treatment.

Uses of antibiotics

Antibiotics are no longer routinely used to treat infections for a number of important reasons:

many infections are caused by viruses so antibiotics are not effective even if the infection is bacterial, the use of antibiotics is unlikely to have much benefit in terms of speeding up the healing process and can cause unpleasant side effects

the more antibiotics are used to treat trivial conditions the more likely they are to become ineffective in treating more serious conditions because of antibiotic resistance

For example, antibiotics are now no longer routinely used to treat chest infections, ear infections in children and sore throats.

Your doctor will only prescribe antibiotics to treat:

conditions that are not especially serious but are unlikely to clear up without the use of antibiotics, such as moderately severe acne

conditions that are not especially serious but could spread to other people if not promptly treated, such as the skin infection impetigo or the sexually transmitted infection chlamydia

conditions where there is evidence that using antibiotics would significantly speed up the recovery time, such as a kidney infection

conditions that carry a risk of causing more serious complications, such as cellulitis (an infection of the deeper layer of the skin) or pneumonia (lung infection)

Antibiotics may also be recommended for people who are more vulnerable to the harmful effects of infection. This may include:

people aged over 75 years

people with heart failure

people who have to take insulin to control their diabetes
people with a weakened immune system – either due to an underlying health condition such as HIV or as a side effect of certain treatments such as chemotherapy

Intravenous antibiotics

Intravenous antibiotics (injections or infusions of antibiotics directly into the blood or, less commonly, the muscles) are usually only required to treat more serious bacterial infections, such as:

bacterial meningitis

septicaemia (blood poisoning)

infection of the outer layer of the heart (endocarditis)

(some cases of) MRSA infection

an infection that develops inside a bone (osteomyelitis)

Antibiotics to prevent infection

There are several circumstances in which you may be given antibiotics as a precaution to prevent, rather than treat, an infection. This is known as antibiotic prophylaxis.

For example, antibiotic prophylaxis is normally recommended if you are having surgery on a certain part of the body that is known to carry a high risk of infection or that could lead to devastating effects if it were to become accidentally infected.

For example, it may be used if you are going to have:

some types of eye surgery – such as cataract surgery or glaucoma surgery

breast implant surgery

pacemaker surgery

surgery to remove the gall bladder

surgery to remove the appendix

Your surgical team will be able to tell you if you require antibiotic prophylaxis.

Antibiotic prophylaxis may also be recommended if you have a bite or wound that has a high chance of becoming infected, for example because it has come into contact with soil or faeces.

There are also several medical conditions that make people particularly vulnerable to infection, meaning antibiotic prophylaxis is necessary. For example, people with the blood disorder sickle cell anaemia often have to take antibiotics for the rest of their lives as their spleen does not work properly. (The spleen plays an important role in filtering out harmful bacteria from the blood.)

Considerations

Some important considerations associated with the six main classes of antibiotics are listed below.

Penicillin

Do not take penicillins if you have had a previous allergic reaction to them. Patients with a history of allergies, such as asthma, eczema or hay fever, are at higher risk of developing a serious allergic reaction (anaphylactic shock) to penicillins. However, such reactions are rare.

Patients who are allergic to one type of penicillin will be allergic to all (the allergy is related to the basic penicillin structure).

Penicillin may not be suitable if you:

have severe kidney disease

have liver disease

are pregnant or breastfeeding (see below)

Most penicillins can be used during pregnancy and breastfeeding in the usual doses. However, the safe use of phenoxymethylpenicillin during pregnancy has not been definitely established. It should not be used during pregnancy unless clearly needed.

Phenoxymethylpenicillin passes into breast milk, so it should be used with caution in women who are breastfeeding as even small amounts can cause an allergic reaction in a susceptible baby.

Penicillins that are combined with clavulanic acid should not be used during pregnancy and breastfeeding unless absolutely necessary. These

penicillins include co-amoxiclav (brand name Augmentin) and tazobactam (brand name Tazocin).

Tell your healthcare professional if you are pregnant or breastfeeding so they can prescribe the most suitable antibiotic for you.

Cephalosporins

If you have had a previous allergic reaction to penicillin you may also be allergic to cephalosporins.

Cephalosporins may not be suitable if you have kidney disease. If the professional in charge of your care does decide to prescribe cephalosporins it will probably be at a lower dose.

You should never take a cephalosporin if you have acute porphyria, which is a genetic condition that can cause skin and nerve problems.

Cephalosporins are thought to be safe to take during pregnancy but, as a precaution, they are only ever used if the benefits of treatment are thought to outweigh potential risks.

Cephalosporins are not recommended for women who are breastfeeding.

Aminoglycosides

Aminoglycosides are normally only used to treat life-threatening conditions such as meningitis, as they can cause kidney damage in people with pre-existing kidney disease.

It is unclear whether aminoglycosides are safe to use during pregnancy.

Your doctor will advise you.

Tetracyclines

The use of tetracyclines is not usually recommended (unless absolutely necessary) in the following groups:

people with kidney disease

people with liver disease

people with the autoimmune condition lupus, which can cause skin problems, joint pain and swelling, and fatigue (feeling tired all the time)

children under the age of 12
pregnant or breastfeeding women

Macrolides

You should not take macrolides if:

you have porphyria

you have a heart rhythm disorder (or you are at risk of developing a heart rhythm disorder) such as atrial fibrillation, where the heart beats abnormally fast

You should not take a type of macrolide called telithromycin if you have myasthenia gravis, which is an uncommon condition that causes muscle weakness.

If you are pregnant or are breastfeeding, the only type of macrolide you can take is erythromycin (Erymax, Erythrocin, Erythroped or Erythroped A). Erythromycin can be used at the usual doses throughout your pregnancy and while you are breastfeeding.

Other macrolides should not be used during pregnancy unless there is no suitable alternative.

Fluoroquinolones

Fluoroquinolones are not recommended for children as there is a risk that the medications can interfere with children's physical growth.

Fluoroquinolones are not suitable for women who are pregnant or breastfeeding.

Side effects of antibiotics

Tetracyclines and sensitivity to light

Tetracyclines can make your skin sensitive to sunlight as well as artificial sources of light such as sun lamps and sunbeds.

You should avoid prolonged exposure to bright light while taking tetracyclines.

The most common side effects of antibiotics affect the digestive system. These occur in around 1 in 10 people.

Side effects of antibiotics that affect the digestive system include:

being sick

feeling sick

diarrhoea

bloating and indigestion

abdominal pain

loss of appetite

These side effects are usually mild and should pass once you finish your course of treatment.

If you experience any additional side effects other than those listed above you should contact your doctor or the doctor in charge of your care for advice.

Antibiotic allergic reactions

Around 1 person in 15 has an allergic reaction to antibiotics, especially penicillin and cephalosporins. In most cases the allergic reaction is mild to moderate and can take the form of:

a raised itchy skin rash (urticaria or 'hives')

coughing

wheezing

tightness of the throat, which can cause breathing difficulties

These mild to moderate allergic reactions can usually be successfully treated by taking a medication known as antihistamines.

In very rare cases (estimated to be somewhere between one and five in 10,000) an antibiotic can cause a severe and potentially life-threatening allergic reaction known as anaphylaxis.

Initial symptoms of anaphylaxis are often the same as above and can lead to:

a rapid heartbeat

increasing breathing difficulties due to swelling and tightening of the neck

a sudden intense feeling of apprehension and fear

a sharp and sudden drop in your blood pressure, which can make you feel light-headed and confused

unconsciousness

Anaphylaxis is a medical emergency and, without prompt treatment, can be life-threatening. Dial for an ambulance if you think that you or someone you know is experiencing anaphylaxis.

Interactions with other medicines

Antibiotics can sometimes interact with other medicines or other substances. This means that the effects of one of the medicines can be altered by the other.

Some of the more common interactions are listed below. However, this is not a complete list.

If you want to check that your medicines are safe to take with your antibiotics, ask your doctor or local pharmacist. You should also always carefully read the patient information leaflet that comes with your medicine.

Combined oral contraceptives

Some antibiotics, such as rifampicin and rifabutin (which can be used to treat tuberculosis and meningitis) can reduce the effectiveness of the combined oral contraceptive pill. Other antibiotics do not have this effect.

If you are prescribed rifampicin or rifabutin, you may need to use an additional form of contraception, such as condoms, while taking the antibiotic. Speak to your doctor or nurse for advice.

Medications

Some of the medications you may need to avoid or seek advice on if taking a specific class of antibiotic are outlined below.

Penicillin

It is usually recommended that you avoid taking penicillin at the same time as a medication called methotrexate, which is used to treat some types of cancers and severe autoimmune conditions such as the skin

condition psoriasis. This is because combining the two medications can cause a range of unpleasant and sometimes serious side effects.

You may experience a skin rash if you take penicillin and a medication called allopurinol, which is used to treat gout.

Cephalosporins

Cephalosporins may not be suitable to take if you are also taking blood-thinning medications such as heparin and warfarin.

If you need treatment with cephalosporins, you may temporarily have to stop taking the blood-thinning medication.

Aminoglycosides

The risk of damage to your kidneys and hearing is increased if you are taking one or more of the following medications:

antifungals – used to treat fungal infections

cyclosporin – used to treat autoimmune conditions such as Crohn's disease and given to people who have had an organ transplant

diuretics – used to remove water from the body

muscle relaxants

However, the risk of kidney and hearing damage has to be balanced against the benefits of using aminoglycosides to treat life-threatening conditions such as meningitis.

Tetracyclines

You should check with your doctor or pharmacist before taking a tetracycline if you are currently taking any of the following medications:

vitamin A supplements

retinoids such as acitretin, isotretinoin and tretinoin used to treat severe acne

blood-thinning medication

diuretics

kaolin-pectin and bismuth subsalicylate used to treat diarrhoea

medicines to treat diabetes such as insulin

atovaquone used to treat pneumonia

antacids used to treat indigestion and heartburn

sucralfate used to treat ulcers

lithium used to treat bipolar disorder and severe depression

digoxin to treat heart rhythm disorders

methotrexate

strontium ranelate used to treat osteoporosis
colestipol or colestyramine used to treat high cholesterol
ergotamine and methysergide used to treat migraines

Macrolides

It is highly recommended that you do not combine a macrolide with any of the following medications (unless directly instructed to by your GP), as the combination could cause heart problems:

terfenadine, astemizole and mizolastine – which are all antihistamines used to treat allergic conditions such as hay fever
amisulpride – used to treat episodes of psychosis
tolterodine – used to treat urinary incontinence
simvastatin – used to treat high cholesterol

Fluoroquinolones

You should check with your doctor before taking a fluoroquinolone if you are currently taking any of the following medications:

theophylline, which is used to treat asthma and also found in some cough and cold medicines

the non-steroidal anti-inflammatory drug (NSAID) painkillers such as ibuprofen

ciclosporin

probenecid used to treat gout

clozapine used to treat schizophrenia

ropinirole used to treat Parkinson's disease

tizanadine used to treat muscle spasms

glibenclamide used to treat diabetes

cisapride used to treat indigestion, heartburn, vomiting or nausea

tricyclic antidepressants, such as amitriptyline, steroid medications (corticosteroids)

Some fluoroquinolones can intensify the effects of caffeine (a stimulant found in coffee, tea and cola), which could make you feel irritable, restless and cause problems falling asleep (insomnia).

Finally, you may need to avoid taking medication that contains high levels of minerals or iron as this can block the beneficial effects of fluoroquinolones. This includes:

antacids

zinc supplements

some types of multivitamin supplements

Missed or extra doses

Take antibiotics as directed on the packet or the patient information leaflet that comes with the medicine, or as instructed by your GP or pharmacist.

Missed dose

If you forget to take a dose of your antibiotics, take that dose as soon as you remember and then continue to take your course of antibiotics as normal.

However, if it is almost time for the next dose, skip the missed dose and continue your regular dosing schedule. Do not take a double dose to make up for a missed one.

If you have to take two doses closer together than normal, there is an increased risk of side effects.

Accidentally taking an extra dose

Accidentally taking one extra dose of your antibiotic is unlikely to cause you any serious harm.

However, it will increase your chances of experiencing side effects such as pain in your stomach, diarrhoea and feeling or being sick.

Accidentally taking more than one extra dose

Frequently asked questions

Why should antibiotics not be used to treat coughs and colds?

All colds and most coughs and sore throats are caused by viruses. Antibiotics do not work against viral infections.

How should I treat my cold?

The best way to treat most colds, coughs or sore throats is to rest and drink plenty of fluids.

Colds can last about two weeks and may end with a cough that brings up phlegm. There are many over-the-counter remedies to ease the symptoms, for example paracetamol. Ask your pharmacist for advice. If the cold lasts more than three weeks, or you become breathless or have chest pains, or if you already have a chest complaint, see your doctor.

But what about my children? They're always getting coughs and colds.

It is common for children to get coughs and colds, especially when they go to school and mix with other children. Ask your pharmacist for advice. If the symptoms persist and you are concerned, see your doctor, but do not expect to be prescribed antibiotics.

What is antibiotic resistance?

Bacteria can adapt and find ways to survive the effects of an antibiotic. They become antibiotic resistant, which means that the antibiotic no longer kills the bacteria.

The more we use an antibiotic, the more likely it is that bacteria will become resistant to it. Some bacteria that cause infections in hospitals, such as MRSA, are resistant to several antibiotics.

Why can't other antibiotics be used instead?

Other antibiotics can be used, but they may not be as effective and they may have more side effects. Eventually, the bacteria will become resistant to them too.

Only two new types of antibiotics have been found in the past 30 years and there is no guarantee that new ones will be discovered.

How can antibiotic resistance be avoided?

By using antibiotics carefully, we can slow down the development of resistance. It is not possible to stop it completely, but slowing it down

stops resistance spreading and buys some time to develop new types of antibiotics.

What can I do about antibiotic resistance?

You should only use antibiotics when it is appropriate to do so. We now know that most coughs and colds get better just as quickly without antibiotics.

When antibiotics are prescribed, the complete course should be taken to get rid of the bacteria completely. If the course is not completed, some bacteria may be left to develop resistance.

So when will I be prescribed antibiotics?

Your doctor will only prescribe antibiotics when you need them, for example, for a kidney infection or pneumonia. Antibiotics may be life-saving for infections such as meningitis. By using them only when necessary, they are more likely to work when we need them in future.