DermNet NZ

Authoritative facts about the skin from the New Zealand Dermatological Society Incorporated.

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Antibiotics

Antibiotics are chemical compounds used to kill or inhibit the growth of bacteria. Strictly speaking, antibiotics are a subgroup of organic anti-infective agents that are derived from bacteria or moulds that are toxic to other bacteria. However, the term antibiotic is now used loosely to include anti-infectives produced from synthetic and semisynthetic compounds.

The term antibiotic may be used interchangeably with the term antibacterial. However, it is incorrect to use the term antibiotic when referring to antiviral, antiprotozoal and antifungal agents.

History of antibiotics

Penicillin was the first antibiotic used successfully in treating bacterial infections. Sir Alexander Fleming first discovered it in 1928, but its potential for treatment against infections wasn't recognised until over a decade later when Ernst B Chain, Sir Howard Florey and Norman Heatley produced enough purified penicillin to treat patients with. By the 1950s a large number of antibiotics were being discovered and manufactured for the treatment of diseases caused by infecting bacteria. Over the last 50 years antibiotics have transformed the patterns of disease and death.

Classification of antibiotics

Antibiotics can be classified in several ways. The most common method classifies them according to their chemical structure as antibiotics sharing the same or similar chemical structure will generally show similar patterns of antibacterial activity, effectiveness, toxicity and allergic potential.

Class (chemical structure)	Mechanism of action	Examples
B-lactam antibiotics • Penicillins • Cephalosporins • Carbapenems	Inhibit bacterial cell wall synthesis	Penicillins • Penicillin G • Amoxicillin • Flucloxacillin Cephalosporins • Cefoxitin • Cefotaxime • Ceftriaxone Carbapenem • Imipenem
Macrolides	Inhibit bacterial protein synthesis	• Erythromycin • Azithromycin • Clarithromycin
Tetracyclines	Inhibit bacterial protein synthesis	• Tetracycline • Minocycline • Doxycycline

		• Lymecycline
Fluoroquinolones	Inhibit bacterial DNA synthesis	• Norfloxacin • Ciprofloxacin • Enoxacin • Ofloxacin
Sulphonamides	Blocks bacterial cell metabolism by inhibiting enzymes	• Co-trimoxazole • Trimethoprim
Aminoglycosides	Inhibit bacterial protein synthesis	• Gentamicin • Amikacin
Imidazoles	Inhibit bacterial DNA synthesis	• Metronidazole
Peptides	Inhibit bacterial cell wall synthesis	• Bacitracin
Lincosamides	Inhibit bacterial protein synthesis	• Clindamycin • Lincomycin

Uses of antibiotics

Antibiotics only work against infections caused by bacteria. Bacterial infections are much less common than viral infections. Most coughs and colds are of viral origin so antibiotics should not be prescribed for these. Antibiotics should only used when absolutely necessary, because:

- There is increasing resistance of bacteria to treatment
- Resistant bacteria are selected out by the use of antibiotics
- Antibiotics may have serious adverse effects in some people

Some common bacterial infections that do require antibiotic therapy include:

- Staphyloccal skin infections, e.g. impetigo (school sores)
- Streptococcal skin infections, e.g. cellulitis
- Most ear and sinus infections
- “Strep throat” – sore throat caused by Streptococcus

If these infections remain untreated, the resulting disease may be serious and even fatal.

In severe bacterial infections where patients may be hospitalized, often an intravenous broad-spectrum antibiotic (one that is active against many different bacteria) is given to start treatment. As soon as laboratory tests confirm the infecting bacteria, the antibiotic should be changed to one that is active against specific bacteria. After 48 hours of intravenous treatment, if there is clinical improvement, the patient may be switched to an oral form of the antibiotic.

Antibiotic resistance

The overuse and inappropriate use of antibiotics has led to antibiotic resistance. Bacteria that were once susceptible to antibiotics have developed ways to survive the drugs that were meant to kill or weaken them. This is also known as antibacterial resistance or drug resistance. Some diseases such as tuberculosis, gonorrhoea and childhood bacterial ear infections, that were once easily treated with antibiotics are now again becoming difficult to treat as bacteria have become resistant to these drugs. About 70% of bacteria that cause infections in hospitals are resistant to at least one of the antibiotics most commonly used to treat infections. Methicillin (meticillin)

resistant *Staphylococcus aureus* (MRSA) is a particular problem for patients with skin diseases, ulcers and surgical wounds.

Doctor responsibility	Patient responsibility
• Only prescribe antibiotics if bacterial infection present • Prescribe the approved dose and duration or as recommended by experts • Educate patient about the importance of completing their course of antibiotics as instructed	• Understand that not all infections are bacterial and that not all bacterial infections will clear on antibiotics (e.g. folliculitis) • Take antibiotics exactly as instructed, i.e.: with or without food etc. • Ensure you finish the course of antibiotics

Side effects

Antibiotics are associated with many side effects. Some side effects are class related but most reactions are specific to the agent in that individual.

Some common problems with antibiotics are listed below:

- Allergy to certain antibiotics or classes of antibiotics, e.g. penicillin allergy
- Many antibiotics cause gastrointestinal problems, e.g. diarrhoea, vomiting, nausea
- Antibiotics kill not only their targets but other useful micro-organisms that live in and on our body (flora) to prevent other diseases, e.g. oral and/or vaginal thrush
- A variety of skin rashes can occur, which may be mild (e.g. hives) or devastating (e.g. toxic epidermal necrolysis).

Related information

References:

- Antibiotics - emedicine Consumer Health

On DermNet NZ:

- Bacterial skin infections
- Methicillin (meticillin) resistant *Staphylococcus aureus*

Other websites:

- MedlinePlus: Antibiotics

Books about skin diseases:

See the DermNet NZ bookstore

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DermNet does not provide an on-line consultation service.
If you have any concerns with your skin or its treatment, see a dermatologist for advice.