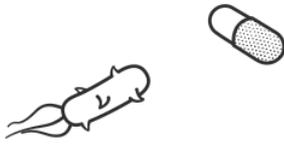


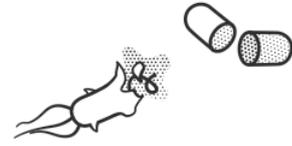
How antibiotics work



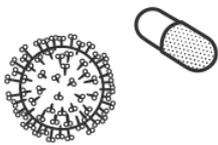
Bacteria have their own metabolism and can multiply themselves. They possess structures such as a protective cell wall, cytoplasm that contains their genetic material and a "machinery" to produce proteins.



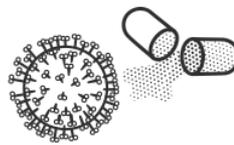
Antibiotics attack exactly these cell structures, depending upon the class of antibiotics at different places. Many substances damage the cell wall, others prevent the production of proteins on the inside.



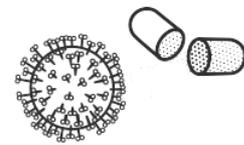
Important cell structures are damaged under the effect of antibiotics and vital processes are stopped. Therefore the bacteria die or cannot multiply themselves.



Viruses consist mostly of their genetic material, which is enclosed in a cover of proteins. They have neither an independent metabolism nor can they multiply themselves independently. For this purpose, they need the cells of their host.



As they do not have an independent metabolism and as their structure is completely different as compared to that of bacteria, antibiotics are not effective against them.



Antibiotics cannot damage the structure of a virus and destroy it, neither can they prevent its multiplication. Hence viruses can continue to infect further host cells without any interruption even under antibiotic treatment.

What effect do antibiotics have?

Antibiotics have revolutionized medicine without any doubt and saved many lives till today. Whether scarlet fever, tuberculosis, syphilis, typhoid or meningitis - only by the introduction of these medicines in the 1930s and 1940s, the bacterially induced infections could become treatable. Antibiotics kill bacteria or prevent their multiplication. There is a series of different antibiotic classes with respectively more substances, which have their own effective spectrum. That means that every antibiotic helps against certain pathogenic agents and not against other pathogenic agents. On the one hand, it depends on the respective weak points of the substance, on the other hand, it is also linked to the fact that the bacterial types are partially different from each other in their structure and metabolism. Therefore it is important to use not just any, but a suitable antibiotic while treating infections.

What are antibiotic – resistant pathogenic agents?

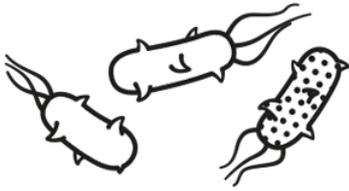
One speaks of antibiotic-resistant pathogens, when a bacteria is insensitive against antibiotics or against a class of antibiotics. The parts of the genetic material, which give the organisms this property are called resistance genes. Some bacteria are naturally equipped with them. In order to adjust well to the conditions in their surrounding, these extremely adaptable life forms can also acquire resistance factors and pass them on to other bacteria. If a bacteria possesses or receives many such factors, a multiresistant pathogen (MRE) develops. Basically an antibiotic-resistant organism is not any more disease - producing (pathogenic) than its non-resistant cognate. If such a pathogenic agent, however, causes infection, then it cannot be treated with the antibiotics against which it has become resistant.

What are antibiotics not capable of?

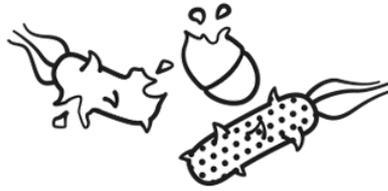
Antibiotics are indispensable in the treatment of bacterial infections, however, they do not have any effect against viral infections. Viruses possess neither a cell wall nor the required machinery to produce proteins and not even their own metabolism. In order to procreate and multiply, they plant their genetic information in foreign cells, whose genotype they reprogramm. Thus as the antibiotics do not find any weak point to attack, they are not effective against viruses. This means that antibiotic treatment in viral infections i.e. typical common colds, neither reduces the duration of illness nor relieves the symptoms. Luckily this is not a problem because the immune system usually fights against these pathogenic agents successfully even without medicines.

Antibiotic resistances in general; and in particular, the multiresistant pathogens are spreading more and more. Therefore, antibiotics that often act as life-saving in the case of bacterial infection are increasingly at a risk of losing the battle. The development of antibiotic resistances is a very natural process caused by genetic changes. Every use of antibiotics can lead to this process being promoted and accelerated. Only the sensitive bacteria will die during the treatment, but the resistant bacteria will survive the treatment and they can multiply without any restriction. Hence it is important to use antibiotics only when it is really necessary.

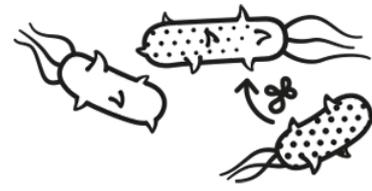
How do antibiotic resistances develop?



Mutation
Bacteria can multiply to double their count in 20 minutes. This quick multiplication naturally leads to changes in genetic information. Resistance genes can develop due to these random mutations, which then weaken the effect of a particular antibiotic or disable it completely.

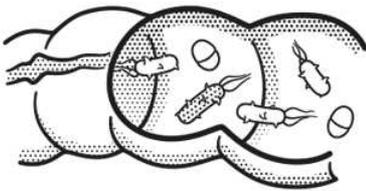


Selection
Antibiotics cause a so-called selection of bacteria. Bacterial strains that are sensitive towards antibiotics are inhibited in their growth or killed. As against this, the resistant bacteria remain unaffected and can multiply themselves without any restriction.



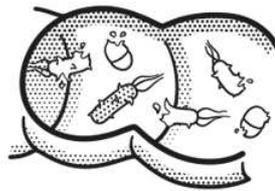
Transfer
Bacteria can pass on their resistance genes to other bacteria. This transfer takes place both within a bacterial species as well as between organisms of different species. If a bacteria is resistant against many antibiotics, then it is a multiresistant pathogen.

The development of resistant pathogens in the intestine



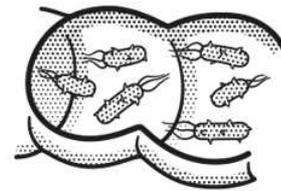
How do resistant bacteria develop in my intestine?

The intestinal flora naturally contains bacteria that are resistant against antibiotics. Resistant bacteria can be transferred from one person to another and in this way, they can reach the intestine from outside.



What happens when you take antibiotics?

Bacteria that are sensitive to the administered antibiotic die with this treatment or they cannot multiply. However the resistant bacteria survive the treatment.



What are the consequences of this selection?

The resistant bacteria occupy the niches in the intestinal flora that have become free and thus spread further and pass on their resistance gene to other bacteria. If a multiresistant pathogen triggers an infection, then the patient can be no longer treated with different antibiotics.

What are the side effects of antibiotics?

It is the same with antibiotics as with all other medications: No effect without side effects. The undesired effects differ from substance to substance. There is one thing common in all active substances. They do not discriminate between "bad" and "good" bacteria. This means that even those bacteria that belong to the normal intestinal flora and that are responsible for the digestion, die under the treatment. Therefore in an antibiotic treatment, a variety of organisms in the intestine are lost, at least temporarily. Due to these changes many gastrointestinal symptoms arise, such as diarrhea, flatulence, nausea, vomiting, loss of appetite and stomach ache, which are the side effects of antibiotics. Even the vaginal flora can be also affected in women, which increases the risk of mycotic infections of the vagina. Further possible side effects are, for example, allergic reactions with rash and itching, headache or giddiness. Most patients tolerate antibiotics well, yet these medicines should only be taken when absolutely necessary.

Prevent antibiotic resistances - This is what you can do

In order to maintain the effectiveness of the available antibiotics, it is absolutely necessary to handle these important medicines with responsibility. You can contribute by implementing the following measures:

- Do not take antibiotics on your own.
- Do not pass on the antibiotics to other people even if their symptoms appear similar to yours.
- Take antibiotics as per prescription. Even if you start feeling better, do not discontinue the treatment.
- Maintain the specified times of taking the antibiotics. It ensures that the level of the active agent remains constantly high.
- Take the antibiotic with water. Milk as well as fruit juices can adversely affect the absorption and effect of many preparations.