



Federal Ministry
of Education
and Research



Small pathogens – great danger

Why research on functional antibiotics is so important



Antibiotics – omnipresent in medicine

One can hardly imagine a treatment for bacterial infectious diseases that does not involve antibiotics – whether it is for a gastro-intestinal disease, scarlet fever or tuberculosis. But antibiotics are not as reliable as they used to be. More and more bacteria are becoming resistant to established antibiotics. The result is that antibiotics no longer work.

A large number of antibiotics are available for the treatment of bacterial infections today. They prevent the growth of or kill bacteria using diverse mechanisms. Here one must bear in mind that the more frequently bacteria come into contact with a certain antibiotic, the more likely they are to become resistant to that antibiotic.

We talk about multi-resistant germs in cases where bacteria develop resistances to multiple antibiotics. These germs are particularly dangerous. Existing antibiotics are virtually powerless to deal with



“ Communicable diseases are the most common causes of death world wide. The growing threat by bacteria that are resistant to antibiotics aggravates the problem. Therefore, the Federal Ministry of Education and Research (BMBF) funds research projects that help to identify the causes of development and spread of these resistances. ”

Johanna Wanka

Prof. Dr. Johanna Wanka
Federal Minister of Education and Research

them. The result is a longer and significantly more severe course of illness, which can be fatal. Multi-resistant bacteria are becoming an increasing problem in hospitals in particular. One of such dangerous multi-resistant hospital germ is the multi- or methicillin-resistant *Staphylococcus aureus*, MRSA.



Why are antibiotic resistances on the increase?

Bacteria develop antibiotic resistances through changes in their genetic make-up. One reason for the increase in resistant bacteria is the rapid spread of new resistance genes. These contain information for mechanisms by which bacteria can counter the effect of antibiotics. The resistance genes can be exchanged between bacteria. In addition, antibiotics are used too frequently and often unnecessarily, not only in medicine but also in animal production, for example. We now know that resistant bacteria can even be passed on to human beings through contact with animals or via animal food products.

Facts, please!

- Bacteria can be transmitted from animals, or animal food products such as milk, to humans. Experts call this “zoonoses”.
- Also, bacteria that are resistant to antibiotics can be transmitted from animals to humans, and vice versa.
- The BMBF-funded ‘German Research Platform for Zoonoses’ promotes national and international scientific exchange, as well as networking between human and veterinary medicine.

For further information please visit www.zoonosen.net



Research for functional antibiotics

Research into antibiotic resistances is a key responsibility of the BMBF. This is why the BMBF is funding research into a large number of topics ranging from the mechanisms and spread of resistances to the development of new innovative therapies. Research policy also focuses on the prevention of infectious diseases and the responsible use of antibiotics, in order to ensure that antibiotics remain effective for as long as possible.

Did you know?

- Bacteria help in the search for new antibiotics.
- There is an urgent need for new antibiotics, because the currently used agents are more frequently encountering multi-drug-resistant bacteria, against which they are ineffective.
- In the ongoing search for novel drugs, previously unknown soil bacteria have shown great potential as a source of new active substances. Teixobactin, for instance, is a highly interesting agent. It causes bacteria to break by attacking their outer wall. Initial experiments in mice were successful.
- Teixobactin can be used against the bacterium *Staphylococcus aureus*, which causes serious wound infections. Further research and development is necessary before this potential new antibiotic can be utilised in health care.

Source: The German Center for Infection Research (DZIF)

The BMBF together with the Federal Ministry of Health and the Federal Ministry of Food and Agriculture published the German Antibiotic Resistance Strategy (DART) back in 2008. Various BMBF funding priorities contribute to the implementation of DART.

The German Centre for Infection Research, DZIF, which was initiated by the BMBF, also provides an important contribution. It has been uniting leading German experts in infection research since 2012. Its aims include the development of new strategies to deal with the spread of antibiotic-resistant bacteria and research into candidate substances for novel antibiotics.



Drug-resistant bacteria are life-threatening

- Bacteria that are resistant to antibiotics can be found everywhere. Healthy people often do not even realise that they have been infected with such microorganisms. Their immune system successfully fights them.
- If persons are already weakened by other illnesses or surgery, their immune system is not able to successfully ward off infections. Then, antibiotics play a vital role.
- If bacteria are resistant against several antibiotics - experts refer to these as multi-resistant bacteria –common antibiotics are ineffective.
- About 25,000 deaths per year result from multi-resistant bacteria in Europe alone. In the USA, around 23,000 are estimated.
- Research confirms: the best protection against infections is thorough hand-washing – at home and, most importantly, in hospitals.

Source: The Robert Koch Institute (www.rki.de)

Global cooperation – working together to achieve our goal

The international community has recognised the risk posed by antibiotic-resistant germs. It is now a matter of collectively and resolutely tackling this global threat. Antimicrobial resistances are therefore a priority of the German G7 Presidency in 2015.



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