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Poultry meat is never sterile: kitchen hygiene also protects against antibiotic-resistant bacteria

The use of antibiotics in animals raised for meat production and antibiotic resistance are topics dealt with intensively by several institutions, including the German Federal Institute for Risk Assessment (BfR). In response to enquiries from the public about antibiotic-resistant bacteria in and on poultry meat, the BfR provides information on possible health risks, the importance of kitchen hygiene, and the development of the rates of antibiotic use in animals raised for meat production. This information and more regarding antibiotic resistance can be found on the BfR website: https://www.bfr.bund.de/de/a-z_index/antibiotikaresistenz-61681.html.

Fresh meat is not a sterile food. Bacteria, including antibiotic-resistant bacteria, are always present in and on poultry meat. If the meat is cooked or roasted to a sufficient temperature, the bacteria are killed. If kitchen hygiene is poor, however, they can spread to foods that are not cooked before consumption, such as salad or bread. As a result, *Salmonella* and *Campylobacter* as well as certain types of *Escherichia (E.) coli* can lead to gastrointestinal illnesses. However, most types of *E. coli* are “normal intestinal inhabitants” that do not directly lead to illness.

With regard to the development of antibiotic use in animals raised for meat production, the BfR’s most recent annual report, conducted for 2022, shows that the amount of antibiotics used in the animal groups covered, including chickens and turkeys raised for meat production, has decreased by 12 percent overall compared to the previous year. The frequency of treatment has also decreased. However, the frequency of treatment in chickens raised for meat production is the highest compared to all other animal populations studied. In addition, bacteria from chickens raised for meat production have the highest rates of antibiotic resistance.

The occurrence of bacteria, including antibiotic-resistant bacteria, in and on chicken and other poultry meat is common. The competent authorities regularly report on this in Zoonosis Monitoring Reports (German Federal Office of Consumer Protection and Food

Safety [BVL] zoonosis monitoring website:

https://www.bvl.bund.de/EN/Tasks/01_Food/01_tasks/02_OfficialFoodControl/06_ZoonosesMonitoring/ZoonosesMonitoring_node.html).

If the meat is cooked through sufficiently, these bacteria are killed (70 °C for at least two minutes in the centre). Furthermore, raw meat and ready-to-eat food should be consistently kept separate from each other. Hands, kitchen utensils, and preparation surfaces should be thoroughly cleaned after contact with raw animal-based foods and before preparing other foods. Poor kitchen hygiene can lead to the transfer of bacteria to other foods that are not cooked prior to consumption, such as salad or bread. The consequences depend on the species and properties as well as the amount of the bacteria transferred as well as on the individual characteristics of the person consuming the food in question.

Salmonella and *Campylobacter* can cause gastrointestinal illnesses of varying severity. They are the most common pathogens of bacterial intestinal diseases for people in Germany and the EU. This is independent of the pathogens' resistance to antibiotics. In the case of *Escherichia (E.) coli*, different bacterial strains have different effects. Some types of *E. coli* can cause intestinal diseases in humans. However, most types are "normal intestinal inhabitants" that do not directly lead to disease. They can, however, lead to what is known as bacterial colonisation. This means that the bacteria are integrated into the bacterial population in the intestine. Here, they may be able to pass on their resistance properties to other bacteria. It is not known how often bacteria originating from poultry succeed in doing this.

Bacteria are generally specialised for certain host animal species, including humans, to which they are evolutionarily adapted. For example, domestic chickens have a higher body temperature than humans, which makes the integration of bacteria in humans more difficult. They also differ in regards to many other properties of the digestive system. For this reason, bacteria find it difficult to assert themselves against the existing intestinal flora.

There are two main ways to reduce the occurrence of resistant bacteria on chicken meat. The first is to further reduce the still very high rates of use of antibiotics in chickens raised for meat production. The second is to improve slaughter hygiene so that the bacteria are not transferred from the animals to the meat.

Importance of husbandry conditions

Zoonosis monitoring programmes have examined the importance of animal husbandry conditions. Their observations have shown that bacteria from organic farming of chickens raised for meat production have lower resistance rates than those from conventional farms. The same applies to turkeys and dairy cattle. A corresponding difference was also shown for bacteria from turkey meat¹. The prevalence of bacteria detected on organically produced meat (bacterial count per gram of meat) was not compared. The *Campylobacter* bacterium was detected more frequently on organically produced turkey meat than on conventionally produced meat². In addition to the presence of certain bacteria in the animals, the level of bacterial contamination in the meat is heavily dependent on hygiene conditions during slaughter.

¹ <https://pubmed.ncbi.nlm.nih.gov/36289940/>

² <https://pubmed.ncbi.nlm.nih.gov/32678987/>

Antibiotic use in animals raised for meat production in numbers

Since 2023, the BfR has had the task of annually assessing data on antibiotic use with regard to its potential significance for consumer health protection. Analyses specifically focused on the development of the frequency of treatment and the consumption quantities of antimicrobial substances in calves, cattle, piglets and pigs, chickens, and turkeys raised for meat production. The annual report for 2022 shows that, of the animal groups covered, the frequency of treatment is highest in chickens raised for meat production. However, the frequency of treatment and the amounts consumed decreased compared to the previous year. In comparison to 2021, the total amount of antibiotics consumed by the animal groups analysed fell by 12 %. The decline in consumption quantity per animal and day was most pronounced in piglets and chickens raised for meat production (-12 % each), followed by turkeys raised for meat production (-8 %), calves raised for meat production (-5 %), and pigs raised for meat production (-3 %). The population-wide frequency of treatment also fell. The sharpest decline was seen in pigs raised for meat production (-8 %). There was also a further decline in treatment frequency in chickens raised for meat production (-4 %), turkeys raised for meat production (-3%) and calves and pigs raised for meat production (-2 % each).

Further information on the BfR website

Questions and answers on the effects of the use of antibiotics in livestock farming
<https://www.bfr.bund.de/cm/349/questions-and-answers-on-the-effects-of-the-use-of-antibiotics-in-livestock-farming.pdf>

Treatment frequency and antibiotic consumption quantities 2022
<https://mobil.bfr.bund.de/cm/349/treatment-frequency-and-antibiotic-consumption-quantities-2022.pdf>

Protection against foodborne infections in private households
<https://www.bfr.bund.de/cm/364/protection-against-foodborne-infections.pdf>

ZooNotify: New data portal makes the occurrence of zoonosis pathogens and their resistances visible
<https://www.bfr.bund.de/cm/349/zoonotify-new-data-portal-makes-the-occurrence-of-zoonosis-pathogens-and-their-resistances-visible.pdf>

About the BfR

The German Federal Institute for Risk Assessment (BfR) is a scientifically independent institution within the portfolio of the Federal Ministry of Food and Agriculture (BMEL) in Germany. The BfR advises the Federal Government and the States ('Laender') on questions of food, chemicals and product safety. The BfR conducts independent research on topics that are closely linked to its assessment tasks.

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