

Antibiotics in honey

Factsheet 3: Why antibiotic in food is harmful: creating resistance and indomitable superbugs

What is antibiotic resistance and how serious is the problem?

Antibiotic resistance is the ability of a microorganism to withstand the effects of an antibiotic. When a bacterium is exposed to an antibiotic, it starts making changes in its DNA to withstand the medicine's effect. Once it acquires a specific antibiotic gene, it passes it on to its next generation and also from one type of bacteria to another. If a bacteria carries several resistant genes, it is called multi-resistant or a superbug.

Antibiotic resistance is a matter of top global concern. The US Centers for Disease Control and Prevention has described it as "one of the world's most pressing health problems...because the number of bacteria resistant to antibiotics has increased in the last decade". The World Health Organization (WHO) has identified antibiotic resistance as "one of the three greatest threats to human health".

The overuse of antibiotics has been indicted as one key reason for this problem.

But is there a link between antibiotics used in animals and our bodies?

Antibiotic residues consumed along with edible tissues like milk, meat, eggs and honey can produce resistance in bacterial populations in the consumers. Antibiotics are used in animals not only to treat or prevent diseases, but also to promote growth. The types of antibiotics used in animals are frequently the same as, or closely related to, those used in humans.

The WHO, jointly with the Food and Agriculture Organization (FAO), has identified links between antibiotic use in animals and the emergence of mainly food-borne bacteria, which are resistant to important antibiotics used in treating infectious diseases in humans.

What is the evidence of antibiotic use in animals and antibiotic resistance?

In recent years, evidences have emerged of an association between use of antibiotic agents in animals and antibiotic resistance among bacteria isolated from humans. An outbreak of human nalidixic acid-resistant *Salmonella typhimurium* DT104 infection in Denmark was traced to a pig farm. Another outbreak of the same infection, reported in the UK, was traced to a dairy farm where fluoroquinolones had been used on the cattle a month before the outbreak. In the US, there was a marked increase in the proportion of domestically acquired *Campylobacter* infections that were fluoroquinolone-resistant, following the first approved use of fluoroquinolones in animals in 1995.

What steps have been taken to ensure that antibiotics licensed for humans should not be used in animals?

The WHO has recommended that antibiotics which are licensed in human medicine should not be used any more as growth promoters in animals. Since the European Union (EU) imposed a ban, studies from Denmark, Germany and Italy have shown a significant reduction in vancomycin-resistant *enterococci* bacteria from poultry and poultry derived food products. Some EU member states (such as Denmark) have with insignificant or no consequences either on disease rates in animals or on meat market prices, voluntarily suspended the use of all growth promoters, irrespective of their significance to human health.

What are the challenges of combating antibiotic resistance?

The major challenge in fighting antibiotic resistance lies in the development and implementation of methods for their prudent use. There is also no method for safety assessments of antibiotics intended for animal use. There is a significant difference between traditional chemical residue-based determination of safety of animal drugs and the determination of safety in the context of antibiotic resistance. Given this uncertainty, countries are increasingly taking the precautionary position to ban the use of antibiotics as growth promoters.

What are the chronic health effects of the antibiotics tested by the CSE?

Oxytetracycline (Tetracycline) is a broad-spectrum antibiotic used to treat a variety of infections and is used as growth promoter in animals. Symptoms of chronic exposure to oxytetracycline include blood changes (leucocytosis, atypical lymphocytes, lung congestion, toxic granulation of granulocytes and thrombocytopenia purpura). Liver injury and delayed blood coagulation may also occur. It can damage calcium-rich organs such as teeth and bones and sometimes cause nasal cavities to erode. Children under 7 years of age may develop a brown discoloration of the teeth. Infants of mothers treated with OTC during pregnancy may develop discoloration of the teeth. Some other chronic effects of oxytetracycline include increased sensitivity to the sun, wheezing and asthmatic attack. Toxicological studies indicate that this drug is not mutagenic, carcinogenic, or teratogenic¹.

Erythromycin (Macrolide) is effective against many gram-positive organisms and is useful in the treatment of *staphylococcal* infections in animals and humans. Exposure to erythromycin (especially long courses at antimicrobial doses, and also through breastfeeding) has been linked to an increased probability of pyloric stenosis in young infants, a condition that causes severe vomiting in the first few months of life. Erythromycin is a reproductive hazard (teratogen) with chronic exposure. Cardiac malformation was observed in infants of women who had taken erythromycin in their early pregnancy.

Enrofloxacin (Fluoroquinolone) causes chromosomal aberrations as evaluated in cultures of human peripheral lymphocytes from eight healthy donors. These, exposed to the enrofloxacin or its major metabolite ciprofloxacin, suggested a genotoxic effect of the two antibiotics. It is also associated with increased photosensitivity. The Food and Drug Administration's Center for Veterinary Medicine has proposed to withdraw approval for

¹ <http://www.inchem.org/documents/jecfa/jecmono/v27je06.htm>

use of the fluoroquinolone antimicrobial, enrofloxacin, in poultry based not on the drug's direct toxicity, but on potential for increasing human pathogen resistance².

Chloramphenicol (Amphenicol), or CAP, is a bacteriostatic antimicrobial previously used in veterinary medicine. It has been found to be potentially carcinogenic, which makes it an unacceptable substance for use on any food-producing animals, including honey bees. The US, Canada, and the EU, as well as many other countries, have completely banned the usage of CAP in the production of food. It is toxic to blood, kidney and liver. Repeated or prolonged exposure to chloramphenicol can lead to target organ damage and bone marrow toxicity (MSDS). The most serious effect of chloramphenicol is aplastic anaemia which is idiosyncratic (rare, unpredictable, and unrelated to dose), generally fatal and could presumably be triggered by residues. Several reports document human fatalities resulting from ophthalmic preparations containing chloramphenicol, with total exposure doses that could be achieved from food residues.

Ampicillin (Penicillin) is widely used in cattle, swine, honey bees and poultry to treat infections and as feed or drinking water additives to prevent some diseases. Workers from an antibiotic-producing factory developed asthma and eosinophilia on inhalation of ampicillin and related substances. Ampicillin may cause recurrent cholestatic hepatitis. Repeated contact may cause allergic reactions, asthmatic attack, exfoliative dermatitis, anemia, thrombocytopenia, thrombocytopenic purpura, eosinophilia, leukopenia, and agranulocytosis³.

² : <http://www.fda.gov/cvm/Documents/baytrilDDL.pdf>

³ http://www.druglib.com/druginfo/ampicillin/side-effects_adverse-reactions/.