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Antibiotics Used in Poultry Livestock and Drug Resistance Problems

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Abstract

Antibiotics are drugs that treat bacterial infections. They are widely used around the world, but using antibiotics inappropriately can lead to antibiotic resistance which is now a global concern. Antibiotic resistance happens when germs like bacteria and fungi develop the ability to defeat the drugs designed to kill them. That means the germs are not killed and continue to grow, making infections harder to treat and increasing the risk of disease spread, severe illness and death.[1] Around the world, about 700,000 people die from drug-resistant infection each year.If this situation still goes on and nothing has changed, it is predicted that in 2050, there will be ten million people who die from the drug resistant infections.[2] Antibiotic resistance genes can be transmitted to other bacteria and to humans by many ways. This research is about the use of antibiotics unnecessarily in poultries which can then be transmitted to humans via the food chain. By studying from many research papers and reading many reliable articles can give a lot of information about the use of antibiotics in chicken farms. It is found that many farms still use antibiotics in poultries inappropriately. Sometimes, antibiotics are given to poultries to prevent the disease or to promote growth but this leads to antibiotic resistance. When consumers eat meat or chicken eggs, the antibiotic resistance genes are transmitted to people. Therefore, farmers should use antibiotics in the right way and use them as little as possible when necessary. On the other hand, consumers should be more careful about choosing the meat to eat.

Keywords: Antibiotics in poultries, Antibiotics, Antibiotics detected in meat, Antimicrobial resistance

Introduction

Antibiotics are drugs used to treat bacterial infections by killing the bacteria or by making it hard for the bacteria to grow and multiply.[3] Antibiotics save lives but their use can contribute to the development of resistant germs. Drug resistance is the reduction in effectiveness of a meditation such as an antimicrobial or an antineoplastic in treating a disease or condition. Drugs that were once used to cure the condition are not effective anymore.[4] Antibiotic Resistance occurs when bacteria change over time and **no longer respond to medicines** making infections harder to treat and increasing the risk of disease spread, severe illness and death. As a result of drug resistance, antibiotics and other antimicrobial medicines become ineffective and infections become increasingly difficult or impossible to treat.[5] Nowadays antibiotics resistance has become a serious global concern because about 700,000 people die from drug-resistant infection each year.If this situation still goes on and nothing has changed, it is predicted that in 2050, there will be ten million people who die from the drug resistant infections.[2]

There are mainly two causes that can lead to the antibiotics resistance which are the bacterial factors , this occur naturally when bacteria evolve their genes to resist antibiotics, and the human factor, this is when people use antibiotics inappropriately in the daily life, such as taking antibiotics to treat infections that may not be caused by bacteria or taking antibiotics not as strictly as prescribed.

Another big problem that is caused by humans is that people give animals antibiotics to promote growth or to prevent the animal from getting the infections, which can lead to the antibiotic resistance in the animal and finally pass through the genes to humans via the food chain. [6]

As mentioned, antibiotics resistant genes can pass from the meat to people and our environment. In farms, antibiotics are used in animals to promote growth and prevent the animals from getting diseases, but if they are used inappropriately, antibiotic resistance genes can occur.

These resistant bacteria then multiply and become the dominating population and as such, are able to transfer the genes responsible for their resistance to other bacteria. Resistant bacteria can be transferred from poultry products to humans via consuming or handling meat contaminated with pathogens. Once these pathogens are in the human system,they could colonise the intestines and the resistant genes could be shared or transferred to the endogenous intestinal flora, jeopardising future treatments of infections caused by such organisms.[6] Previous studies in 2020, according to the Journal of the Medical Association of Thailand, found that fresh raw foods , including food from animal products, seafoods, vegetables , fruits and honey from two large wholesale markets in Thailand were contaminated with antibiotic-resistant bacteria and some contained antibiotic residues.[7]

Poultry is one of the most widespread food industries worldwide. Chicken is the most commonly farmed species,with over 90 billion tons of chicken meat produced per year.A large diversity of antimicrobials are used to raise poultry in most countries. A large number of such antimicrobials are considered to be essential in human medicine. The indiscriminate use of such essential antimicrobials in animal production is likely to accelerate the development of AR in pathogens,as well as in commensal organisms. This would result in treatment failures , economic losses and could act as a source of gene pool for transmission to humans. In addition, there are also human health concerns about the presence of antimicrobial residues in meat, eggs and other animal products.[8] Many antibiotics are used in poultry farms and that is why people who love to eat chicken and their eggs should be more aware of the problem.

This research is studying about the antibiotics used in chicken farms. Antibiotic resistance is now a very serious problem for the world population. If we do not change the way antibiotics are used , there will be more people dying from antibiotic resistance each year. Antibiotics enable the unnatural growth of billions of chickens every year. As they languish on factory farms, antibiotic resistance looms as a growing threat to human health worldwide. An effective way to take action against these threats is to withdraw support from the chicken industry by reducing or eliminating your consumption of these products. With the proliferation of plant-based alternatives to all types of chicken products , it's easier than ever to make a switch. Farmers raising poultries should consider more about giving their poultries antibiotics as chicken meat is widely eaten and also antibiotics can be found in the eggs. By following the veterinarian's rule strictly about how the antibiotics are used in the farm and the period they stop using antibiotics before their poultries are sold to consumers can then reduce the amount of antibiotics that transmit through their products.

What is drug resistance?

Drug resistance is the reduction in effectiveness of a meditation such as an antimicrobial or an antineoplastic in treating a disease or condition. Drugs that were once used to cure the condition are not effective anymore.

For example, in cancer treatment, there are many things that may cause resistance to anticancer drugs. For example, DNA changes or other genetic changes may change the way the drug gets into cancer cells or the way the drug is broken down within the cancer cells. Drug resistance can lead to cancer treatment not working or to the cancer coming back.[4]

Antimicrobials

Antimicrobials is a term used to describe drugs that treat many types of infections by killing or slowing the growth of pathogens causing the infection in humans , animals and plants.

There are four types of antimicrobials including antibiotics ,antivirals, antifungals and antiparasitics.

Germs are microbes—very small living organisms including bacteria, fungi, parasites, and viruses.

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Most germs are harmless and even helpful to people, but some can cause infections. Harmful germs are called pathogens.

1. Bacteria cause infections such as strep throat, foodborne illnesses, and other serious infections. Antibiotics treat bacterial infections.
2. Fungi cause infections like athlete's foot, yeast infections, and other serious infections. Antifungals treat fungal infections.

What is antimicrobial resistance

Antimicrobial Resistance (AMR) occurs when bacteria,viruses,fungi and parasites change over time and **no longer respond to medicines** making infections harder to treat and increasing the risk of disease spread, severe illness and death. As a result of drug resistance, antibiotics and other antimicrobial medicines become ineffective and infections become increasingly difficult or impossible to treat. [5]

What are antibiotics

Antibiotics are medicines that fight bacterial infections in people and animals. They work by killing the bacteria or by making it hard for the bacteria to grow and multiply. Antibiotics can be taken indifferent ways:

Orally ; for example pills , capsules, or liquids.

Topically ; for example cream, spray, or ointment

And sometimes through an injection or intravenously.

Antibiotics only treat certain bacterial infections, such as strep throat, urinary tract infections, and E.coli. People sometimes use "antibiotic" and "antimicrobial" interchangeably.

Antibiotics save lives but their use can contribute to the development of resistant germs. Antibiotic resistance is accelerated when the presence of antibiotics pressures bacteria and fungi to adapt. Antibiotics and antifungals kill some germs that cause infections, but they also kill helpful germs that protect our body from infection. The antibiotic-resistant germs survive and multiply. These surviving germs have resistance traits in their DNA that can spread to other germs.[9]

Spread of Germs & Resistance Mechanisms

To survive, germs develop defence strategies against antibiotics called Resistance Mechanisms. DNA tells the germ how to make specific proteins, which determine the germ's resistance mechanisms. Bacteria and fungi can carry genes for many types of resistance.

When already hard-to-treat germs have the right combination of resistance mechanisms, it can make all antibiotics ineffective, resulting in untreatable infections. Alarmingly, antibiotic-resistant germs can share their resistance mechanisms with other germs that have not been exposed to antibiotics.[9]

Antibiotic resistance

Antibiotic resistance happens when germs like bacteria and fungi develop the ability to defeat the drugs designed to kill them. That means the germs are not killed and continue to grow.Antibiotic resistance has the potential to affect people at any stages of life, as well as the healthcare, veterinary, and agriculture industries. This makes it one of the world's most urgent public health problems.

Bacteria and fungi do not have to be resistant to every antibiotic to be dangerous. Resistance to even one antibiotic can mean serious problems. For example:

1. Antibiotic-resistant infections that require the use of second- and third-line treatments can harm patients by causing serious side effects, such as organ failure, and prolong care and recovery, sometimes for months.
2. Many medical advances are dependent on the ability to fight infections using antibiotics, including joint replacements, organ transplants, cancer therapy, and the treatment of chronic diseases like diabetes, asthma, and rheumatoid arthritis.
3. In some cases, these infections have no treatment options.[1]

If antibiotics lose their effectiveness, then we lose the ability to treat infections and control these public health threats. More than 2.8 million antibiotic-resistant infections occur in the U.S. each year. More than 35,000 people die as a result, according to CDC's.[10] When a bacterium that is not typically resistant but can cause deadly diarrhoea and is associated with antibiotic use is added to these, the U.S. toll of all the threats in the report exceeds 3 million infections and 48,000 deaths.[11]

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In the present, antimicrobial resistance is a global concern. The emergence and spread of drug-resistant pathogens that have acquired new resistance mechanisms, leading to antimicrobial resistance, continues to threaten our ability to treat common infections. Especially alarming is the rapid global spread of multi-and pan-resistant bacteria, also known as "superbugs", that cause infections that are not treatable with existing antimicrobial medicines such as antibiotics. Antibiotics are becoming increasingly ineffective as drug-resistance spreads globally leading to more difficult to treat infections and death. If people do not change the way antibiotics are used now, these new antibiotics will suffer the same fate as the current ones and become ineffective. The cost of AMR to national economies and their health system is significant as it affects productivity of patients or their caretakers through prolonged hospital stays and the need for more expensive and intensive care. Without effective tools for the prevention and adequate treatment of drug-resistant infections and improved access to existing and new quality-assured antimicrobials, the number of people for whom treatment is failing or who die of infections will increase. Medical procedures, such as surgery, including caesarean sections or hip replacements, cancer chemotherapy, and organ transplantation, will become more risky.[5]

Antibiotic resistance is a naturally occurring process. However, increases in antibiotic resistance are driven by a combination of germs exposed to antibiotics, and the spread of those germs and their resistance mechanisms. Antibiotic resistance does not mean our body is resistant to antibiotics. It means the bacteria or fungi causing the infection are resistant to the antibiotic or antifungal treatment. [9]

The spread of antibiotic resistant

Generally,when an antibiotic is used in any setting, it eliminates the susceptible bacterial strains leaving behind those with traits that can resist the drug. These resistant bacteria then multiply and become the dominating population and as such, are able to transfer the genes responsible for their resistance to other bacteria. Resistant bacteria can be transferred from poultry products to humans via consuming or handling meat contaminated with pathogens. Once these pathogens are in the human system,they could colonise the intestines and the resistant genes could be shared or transferred to the endogenous intestinal flora, jeopardising future treatments of infections caused by such organisms.[6]

Antimicrobials in the environment

Antimicrobial resistant organisms are found in people,animals,food,plants and the environment, for example in water, soil and air. They can spread from person to person or between people and animals, including from food of animal origin. The main drivers of antimicrobial resistance include the misuse and overuse of antimicrobials; lack of access to clean water, sanitation and hygiene for both humans and animals; poor infection and disease prevention and control in healthcare facilities and farms; poor access to quality, affordable medicines, vaccines and diagnostics; lack of awareness and knowledge; and lack of enforcement of legislation. There are two main factors that cause antimicrobial resistance, bacterial factors which they mutate through time and human factors. The only way to reduce the risk of getting drug resistance is to focus on human behaviours that can lead to the drug resistance problem.

The microbial communities mostly associated with antibiotics resistant genes in hospitals are members of various human microbiomes as well as situated in hospital water and air flow systems. Hospitals employ a broad range of antibiotics over extended time spans thus enabling de novo resistance evolution. Pathogens carrying newly evolved antibiotics resistant genes can subsequently spread between patients epidemically or the gene can be transmitted into other genetic backgrounds via horizontal gene transfer. In addition to in-house evolution of resistance, pathogens carrying resistance genes may enter the hospital environment via infected patients, where they can spread epidemically or combine into a new genetic background.[12]

Antibiotics may spread into the environment through many ways for example ; unused antibiotics are thrown into landfills or flushed down drains or toilets. Antibiotics in manure and other waste-based fertilisers run off crop and grazing fields into waterways. Antibiotic-containing waste from our pets ends up in landfills and in neighbourhood sewer runoff. Antibiotics applied to fruit trees as treatment for bacterial infections run off fields and runoff into waterways. Some industrial processes ,like ethanol

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production, generate antibiotic-containing waste products that might contribute to environmental contamination. After the bacteria with antibiotic genes contaminate into the environment, these bacteria can also pass on the ability to resist antibiotic effects by sharing the genetic instructions (resistance genes) with other bacteria in water and soil.[13]

A research in 2012 which surveyed the amount of antibiotics contaminated in the environment. Among 123,761 entries with 631 different pharmaceuticals analysed in 20 different environmental matrices across 71 countries by comparing to the mean concentration. The results show that 7.9 percent of antibiotic analyses performed exceeded the PNEC value. Hospital wastewater and industrial wastewater had the highest burden of antibiotic residues with 43.7 percent and 49.6 percent of analyses exceeding PNEC, respectively. Industrial wastewater had disproportionately high mean concentration of Ciprofloxacin(3548.6 ug/L), Oxytetracycline(23119.0 ug/L), Sulfamethoxazole(18416.8ug/L) and Trimethoprim(3078.7 ug/L) compared to the other matrices. Drinking water had no antibiotics with a mean concentration exceeding PNEC. Ciprofloxacin(34.9 percent)and Clarithromycin(32.1 percent) had the highest proportion of analyses that exceed the respective PNEC values while amoxicillin(0.6 percent), Clindamycin(0.2 percent), Doxycycline(0.6 percent) and Sulfamethoxazole(0.2 percent) had the lowest proportion of analyses that exceed PNEC.[14]

Human factors that can lead to drug resistant problems

There are many human factors that can lead to drug resistant problems. The excessiveness of antibiotics used in products, for example, there are some cough candies that contain antibiotics which are actually not necessary. The excessiveness of antibiotics used in farms to prevent animals from getting sick. If farmers do not follow the hygienic rules strictly, antibiotics may contaminate the food that consumers consume. Antibiotics can be found in meat, animal faeces, soil and vegetables grown in that area. It can also be found in the environments around us. If people consume unnecessary antibiotics, it can lead to antibiotic resistance. Thus, people should be more aware of the antibiotics usage to prevent the problems. Some people who do not realise the consequence of getting excessive antibiotics and do not have the right knowledge, may take medicines which contain antibiotics even if their illnesses are not caused by bacteria. People may buy medicines from the drugstore without seeing the doctor, they may take excessive antibiotics to cure their illness and may take higher potency medicines if their illnesses are cured slower than their expectations which can lead to drug resistance from the use of unnecessary antibiotics . Some people may not take the right dose of medicine, for example, antibiotic medicines should be used for at least one week to make sure that all the bacterias are killed. Moreover, each medicine should be taken at the right time to prevent bacterias from producing more offspring. If patients do not follow the doctor's instructions strictly, they may get the antibiotic resistance genes, making the illnesses harder to be cured. Another obvious factor is using antibiotics in farms. These antibiotics can contaminate the environment and can be transferred to humans via the food chain.

In 2017, a research in Thailand found that the one-month prevalence of antibiotic use was 7.9 percent for three common conditions; flu(27 percent), fever(19.2 percent) and sore throat(16.8 percent). The majority of antibiotics(70.3 percent) were provided by public or private healthcare facilities and 26.7 percent by pharmacies. Thai adults have low levels of knowledge about antibiotics; only 2.6 percent gave correct answers to all six statements related to antibiotics,while 13.5 percent gave wrong answers to all six statements. A few factors associated with knowledge and having received information on antibiotics were assessed. People who have higher education levels, and belong to richer wealth quintiles,and receive antibiotics and AMR information have significantly higher levels of knowledge about antibiotics. Only 17.8 percent of respondents had heard information about the proper use of antibiotics and AMR; mostly from doctors (36.1 percent),health workers(24.8 percent) and pharmacists(17.7 percent). [15]

In the United States,77 percent of all UTIs and 47 percent of all community-acquired pneumonias (CAP) are treated inappropriately in the hospital setting, according to an expert panel convened by the Pew Charitable Trust in 2018 to evaluate antibiotic use in hospitals. The panel's findings, which were published in March 18, 2021, report revealed that

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Fluoroquinolones were used inappropriately 47 percent of the time and Vancomycin was used inappropriately 27 percent of the time.[16]

What the world populations are facing now

Around the world, about 700,000 people die from drug-resistant infection each year.If this situation still goes on and nothing has changed, it is predicted that in 2050, there will be ten million people who die from the drug resistant infection. [2]

Resistant bacteria can be passed from food-producing animals to humans in a number of ways.If an animal is carrying resistant bacteria, the bacteria can be passed on through meat that is not handled or cooked properly. Resistant bacteria can pass through the food chain by consuming food crops that have been sprayed with fertilisers containing animal manure with resistant bacteria.

One study in the year 2013, found that people living close to crop fields sprayed with pig manure fertiliser are at a higher risk of infection from the resistant bacteria MRSA. People should avoid using antibiotics in their daily lives to reduce the risk of getting resistant bacteria.

Once spread to humans, resistant bacteria can stay in the human gut and spread between individuals. The consequences of consuming resistant bacteria include

1. infections that would not have happened otherwise
2. increased severity of infections, often including vomiting and diarrhoea
3. difficulty in treating infections and higher chances that treatments will fail

In the United States, around 2.8 million people each year get infected with bacteria resistant to one or more of the antibiotics normally used to treat the infections .Of those people, at least 35,000 die each year. Many more die from other conditions that have worsened as a result of these infections.[17]

Antibiotics commonly used in Thailand

In Thailand, approximately 88,000 people contract drug resistance and about 38,000 people die from the infection, which affects the economic loss as much as 42 billion baht. According to the National Antimicrobial Resistance Surveillance, Thailand (NARST), it is found that the antimicrobial rates increase rapidly throughout the years. Carbapenem Resistance in E.coli and K.pneumoniae rate was stable in 2000 to 2010 which was about 0.7-0.8 percent,but in 2010 to 2017 the rate leaped rapidly from 0.7 percent to 8.4 percent and tends to be rapidly higher. The antimicrobial resistance rates of Acinetobactor was rapidly changing in 2000 to 2011.The rate leaped from 14.4 percent to 63.4 percent and then from 2012 to 2017 the high rate became more constant which was about 66.3 to 67.4 percent. [18]

Thailand Surveillance of antimicrobial consumption: Thailand-SAC found that the mostly used antibiotics in farms are Amoxicillin in Penicillins group for 26.9 percent, Halquinol which prevents the infection in the digestive system for 20.8 percent and Chlortetracycline in Tetracyclines group for 19.3 percent. In humans, the consuming rate of antibiotics is about 74.22 DDD per 1000 people. The mostly used antibiotics in humans are Amoxicillin for 70.39 percent , Ceftriaxone which is an antiviral drug for 17.56 percent and Tetracycline which is an antifungal drug for 5.69 percent. while in plants, Amoxicillin and Ampicillin are used to prevent the greening disease in Citrus.

Antibiotics and farming

Apart from humans , antibiotics are also used in animals and plants. In farms,where lots of animals such as pigs, poultries and cattles are kept, antibiotics are used to prevent the animals from getting sick ,to cure the disease and to promote their growth. Sometimes, antibiotics are used inappropriately. Animals get antibiotics even though they are healthy and do not need it.

These antibiotics can pass through the meat of that animal if farmers do not follow the instructions strictly before killing the animal and sell the meat to consumers. Worldwide it is estimated that 66% of all antibiotics are used in farm animals, not people. Much of this use is routine, and enables farm animals, most often pigs and poultry but sometimes also cattle, to be kept in poor conditions where disease spreads easily. Leading authorities such as the European Medicines Agency and the WHO say that the overuse of antibiotics in farming contributes to higher levels of antibiotic resistance in some human infections. Antibiotics have been used in

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livestock rearing for more than six decades. In Europe, antibiotics were originally given to animals to boost their growth. Use of antibiotics for growth promotion was banned throughout the EU in 2006. According to the OIE, worldwide 118 countries no longer allow growth promotion, but it's still allowed in at least 35 countries.

In the UK and across Europe, vast quantities of antibiotics are still used in farming. Farmers may even use antibiotics classed as 'critically important' for humans by the World Health Organisation. [19]

Antibiotics detected in meat

Antimicrobials' use in animal production dates as far back as the 1910 when due to shortage of meat products, workers carried out protests and riots across America. Scientists at that time started looking for means of producing more meat at relatively cheaper costs; resulting in the use of antibiotics and other antimicrobial agents. With the global threat of antibiotic resistance and increasing treatment failures, the non-therapeutic use of antibiotics in animal production has been banned in some countries. Sweden is known to be the first country to ban the use of antimicrobials for non-therapeutic purposes between 1986 and 1988. This move was followed by Denmark, The Netherlands, United Kingdom and other European Union countries. These countries also moved a step further and banned the use of all essential antibiotics as prophylactic agents in 2011. Several other countries have withdrawn the use of some classes of antibiotics or set up structures that regulate the use of selected antibiotics in animal production.

In 2020, according to the Journal of the Medical Association of Thailand, it was found that fresh raw foods , including food from animal products, seafoods, vegetables , fruits and honey from two large wholesale markets in Thailand were contaminated with antibiotic-resistant bacteria and some contained antibiotic residues. Food samples were cultured for antibiotic-resistant bacteria and tested for the presence and amount of antibiotic residue. Among 521 samples for bacterial culture, 86.9% grew at least one kind of bacteria. Among 501 samples for antibiotic residue testing, 37.1% contained at least one antibiotic residue. Enrofloxacin was the most prevalent antibiotic residue, followed by Doxycycline and Tilmicosin. Although most samples contained less antibiotics than the maximum residue limit (MRL), 7.0% contained an amount of at least one antibiotic above MRL. Therefore, Thai people are at risk of being colonised with antibiotic-resistant bacteria bacteria and developing antibiotic-resistant bacterial infection due to consuming foods contaminated with antibiotic-resistant bacteria or containing antibiotic residues.[7]

In Thailand, figures from the Ministry of Public Health reveal that the country spends 10 billion baht a year on antibiotics. Approximately 100,000 Thais are reported to fall prey to drug-resistant infections per year; of these 38,000 die. A study conducted in 2010 in over 1,000 hospitals countrywide found five infections resistant to many antibiotics, including urinary-tract infection, gastrointestinal-tract infection and respiratory-tract infection. A random test to screen for antibiotics in pork has recently been carried out by the Foundation for Consumer Protection ,with 15 samples of pork tenderloin collected from six Bangkok fresh markets, eight retail malls and one online source. According to Saree Ongsomwang , secretary-general of the Foundation for Consumer Protection , two samples were found to contain around 20 mg and 42 mg per kilo of the antibiotics chlortetracycline.

This, however,does not exceed the Ministry of Public Health's threshold, which allows no more than 200 mg per kilo of pork.[20]

Despite these developments, it is currently estimated that over 60 percent of all antibiotics produced are used in livestock production, including poultry.The use of antibiotics in poultry and livestock production is favourable to farmers and the economy as well because it has generally improved poultry performance effectively and economically but at the same time, the likely dissemination of antibiotic resistant strains of pathogenic and non-pathogenic organisms into the environment and their further transmission to human via the food chain could also lead to serious consequences on public health.

The most commonly used antibiotics are Staphylococcus species, Pseudomonas species, Escherichia species, Salmonella species, Streptococcus species, Campylobacter species, Yersinia species, Clostridium species, Bacillus species, Mycobacterium species, Klebsiella species, Enterococcus species and Proteus species. Infections

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from other bacterial species could also result in the use of antibiotics. Theses include Mycoplasmosis (which is caused by Mycoplasma gallisepticum, Mycoplasma meleagridis and Mycoplasma synoviae), Pasteurella multocida and Haemophilus gallinarum infections. These infections usually require the use broad spectrum antibiotics including tylosin, aureomycin, terramycin, gallimycin, penicillin, erythromycin, sulfadimethoxine, sulfathiazole and other sulfa drugs administered either in the feed, drinking water or by injections.[6]

Antibiotics detected in poultries

Poultry is one of the most widespread food industries worldwide. Chicken is the most commonly farmed species,with over 90 billion tons of chicken meat produced per year.A large diversity of antimicrobials are used to raise poultry in most countries. A large number of such antimicrobials are considered to be essential in human medicine. The indiscriminate use of such essential antimicrobials in animal production is likely to accelerate the development of AR in pathogens, as well as in commensal organisms. This would result in treatment failures , economic losses and could act as a source of gene pool for transmission to humans. In addition, there are also human health concerns about the presence of antimicrobial residues in meat, eggs and other animal products.[8]

Veterinary drugs are used in laying hens for therapeutic reasons. Antimicrobial residues can accumulate in egg components when administered to laying hens or when laying hens are mistakenly given medicated feed, or when the diet of egg-laying strains of chickens is accidentally contaminated at the feed mill due to prior use of antimicrobials with other feeds. Misuse of antimicrobials through improper licensing and unwatched withdrawal periods are commonly observed in developing countries. When these chemicals reach the hen's blood, these antimicrobials are deposited into egg yolk and albumen depending on their water or lipid solubility and protein binding ability. Egg processing through heating or storage reduces the levels of these antimicrobials but not to levels considered safe for human consumption. Antimicrobials fed to poultry are an important public health issue because of possible pathogenic microbial resistance. Routine surveillance for antimicrobials in eggs should be implemented.[21] Moreover,a study in 2019 found that 91.2 percent of chicken meat is contaminated with antibiotics. [22]

In 2019, chicken samples were randomly collected from one slaughterhouse located in Keserwan, in the Mount Lebanon Governorate. The results showed that none of the 30 antibiotics were detected in 22.5 percent. 77.5 percent of samples were contaminated with at least one residue. Out of the contaminated samples, 23.75 percent were contaminated with one antibiotic residue and 53.75 percent were contaminated with more than one antibiotic residue. This Level of contamination is higher than the incidence found in a study conducted in Portugal on 92 samples of chicken muscles for four Fluoroquinones, of which the contamination level was found to be only 42 percent.[23]

Why are antibiotics used on poultries ?

In the wild, chickens live in small flocks often with only a handful of members, traversing a range of habitats as they foraging for insects, seeds, and food. The disease can lurk around every corner and beneath every leaf. Despite these innumerable hidden threats, wild chickens can enjoy a lifespan of a decade or more, all without any intervention from human beings. Life in the wild does nor require the constant application of drugs : a fact that renders the woeful living conditions on factory farms all the starker. Virtually all of the chicken meat consumed in the United States comes from factory farms , where birds are kept in extremely crowded, filthy , indoor conditions , prevented from ever spending time outdoors or even seeing the sun through a window. Factory farms are the antithesis of natural living conditions for chickens. raising chickens in factory farms would be extremely expensive without antibiotics since these conditions are otherwise unlivable without a high level of disease. These drugs can be administered within daily water and food rations , and they are generally used throughout the chicken's lifetime, starting when chicks are only a few days old.[24]

What do antibiotics do to the chickens ?

On factory farms, antibiotics are used for two reasons : to promote growth and to prevent or treat infection. They are administered regularly in the chickens' feed, and they are so effective at encouraging rapid

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growth that today's chickens are twice as large as chickens were 60 years ago. This is a problem because broiler chickens' bodies can't support this much weight. Their unnatural growth leads to skeletal and joint issues and can cause so much stress on the chickens' legs that they become lame. The Better Chicken Commitment encourages companies to commit to purchasing chickens from suppliers that don't make use of rapid-growth breeds, among other welfare requirements. More than 200 companies have signed the commitment,including Burger King, Chipotle, Denny's,and Subway.

The most commonly used antibiotics in poultries are

1) **Aminoglycosides** ; treat intestinal infections 2) **Bambermycin** ; prevent the synthesis of cell walls of bacteria 3) **Beta-lactams** (3.1) Penicillins (3.2) Cephalosporins 4) **lonophores** ; prevent intestinal infections 5) **Lincosamides** ; prevent combat joint and bone infections 6) **Macrolides** ; treat a fatal condition called necrotic enteritis which is caused by overeating. 7) **Quinolones** ; broad-spectrum drugs that affect a wide range of bacteria 8) **Streptogramins** ; prevent cell wall formation and protein synthesis,used to treat and prevent necrotic enteritis 9) **Sulfonamides** ; prevent and combat Salmonella, E. coli, and other pathogens.

Antibiotic resistance is a major contribution to the long list of harms that factory farms inflict on people, animals, and the environment.The U.S. Food and Drug Administration (FDA) is responsible for regulating the use of antibiotics in farmed animals including poultry. Along with the USDA's Food Safety and Inspection Service, The agency monitors meat and eggs for trace amounts of unapproved drugs. Currently, the FDA is developing a framework for food producers to voluntarily stop using medically-important antibiotics for growth promotion. However, without strict mandatory regulations, these voluntary frameworks may not be effective in preventing widespread antibiotic resistance, since the financial incentives for farms to grow bigger chickens will likely outweigh any concern for human health. The Centres for Disease Control and Prevention support the judicious use of antibiotics in livestock. They have a section on their website dedicated to poultry producers and ways that the industry can combat antibiotic resistance. The recommendations include keeping animals healthy , working closely with veterinarians, and using antibiotics exactly as they are prescribed.[24]

In 2019, Antimicrobial residues had been detected in more than 60 percent of chicken meat in Thailand. Antibiotic residues found were as follow;

1. Fluoroquinolone Group : Enrofloxacin
2. Tetracycline Group : Doxycycline
3. Beta-Lactam Groups : Amoxicillin

Doxycycline may result in many ways such as darker colored teeth in children , causes stomach ache and can cause irritating skin. Enrolfloxacin can cause diarrhoea, rickets. Amoxicillin can cause irritating skin or asthma. According to the Ministry Of Public Health of Thailand, the maximum residue limit, MRL of Tetracycline Group in poultry meat should be less than 200 micrograms per kilogram and in poultry liver should be less than 600 micrograms per kilogram. By examining 62 samples of chicken meat , three types of antimicrobial residues had been detected in 26 samples. Over dose of Enrofloxacin had been detected in 5 samples. Doxycycline had been detected in 21 samples. While none of the antimicrobial residues were found in another 36 samples.[25]

Apart from the chicken meat , antibiotics can also be transmitted to their eggs, feathers and droppings. Meaning that giving chicken antibiotics can then be transmitted into many pathways.

That is why giving poultry necessary antibiotics when bacterial infections arise always comes with a veterinary warning to withhold eating or selling eggs for a period of time.

Egg withholding from antibiotics is recommended between 14 to 45 days before selling to consumers.

"Overuse of antibiotics in animal farms endangers all of us. We must remove antibiotics from the human food chain, except to treat sick animals, or face the increasingly real prospect of a post-antibiotic world."[26]

Solving the problem

Farmers often use antibiotics to their animals by mixing antibiotics in their food and water to prevent the animals from getting sick. These antibiotics can then be detected in their meat and other products from the animals such as eggs and milk. Not only

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consumers that are at risk of getting antibiotic resistant genes, but farmers are actually at higher risk. This is why farmers should be more careful about using antibiotics , while consumers should consider more about the meat they consume by buying meat only from the reliable farms and use antibiotics in the properways ,such as

1.Decrease the need for antibiotics by avoiding infections. People should wash their hands properly, cover their cough and get recommended vaccines.

2.Do not ask for antibiotics if your healthcare provider, dentist or veterinarian thinks they are unnecessary.

3.When you are prescribed antibiotics,take them exactly as directed.

4.Do not share or use leftover antibiotics. Antibiotics treat specific infections. Taking the wrong medicine might make things worse.

5.Do not save antibiotics for your next illness. Properly dispose of any leftover medication once the prescribed course of treatment is completed.[13]

Conclusion

Antibiotic resistance is now a very serious problem for the world population.If we do not change the way antibiotics are used , there will be more people dying from antibiotic resistance each year. Antibiotics enable the unnatural growth of billions of chickens every year. As they languish on factory farms, antibiotic resistance looms as a growing threat to human health worldwide. An effective way to take action against these threats is to withdraw support from the chicken industry by reducing or eliminating your consumption of these products. With the proliferation of plant-based alternatives to all types of chicken products , it's easier than ever to make a switch. Farmers raising poultries should consider more about giving their poultries antibiotics as chicken meat is widely eaten and also antibiotics can be found in the eggs. By following the veterinarian's rule strictly about how the antibiotics are used in the farm and the period they stop using antibiotics before their poultries are sold to consumers can then reduce the amount of antibiotics that transmit through their products.

Animals do not need routine antibiotics to stay healthy. Organic and higher welfare systems use antibiotics sparingly, and only when animals need it. Livestock should - and can - be kept healthy through good husbandry and welfare, rather than through 'bought-in' immunity.

Overwhelming evidence shows that animals are more susceptible to disease when stressed. Stress releases hormones such as cortisol in animals, which can reduce immunity by compromising the immune system. In intensive systems, animals are often bred for maximum yield, rather than for natural disease resistance and robustness.

There has been some progress in Europe in recent years. Between 2011-2018 sales of antibiotics for livestock fell by a third. In 2022 the EU is bringing in new regulations to end the routine use of antibiotics.In the UK, antibiotic use in livestock has fallen 50% over the last five years.

In Asia, the Far East and Oceania, farm antibiotic sales per livestock unit are nearly four times higher than in Europe. In the EU routine use of antibiotics will no longer be allowed from 2022. It is hoped that the UK will adopt the same ban, but this is yet to be confirmed. In the UK 30% of all antibiotic use is in farm animals and mass medication accounts for about 75% of antibiotic use.[19]

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