Antibiotics in Poultry Production

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Contributor: Letlhogonolo Andrew Selaledi , Zahra Mohammed Hassan , Tlou Grace Manyelo , Monnye Mabelebele

The utilization of antibiotics in feed has been reevaluated since bacterial pathogens have established and shared a variety of antibiotic resistance mechanisms that can easily be spread within microbial communities. Multiple countries have introduced bans or severe restrictions on the non-therapeutic use of antibiotics. Since the use of antibiotics may have a positive influence on poultry performance, excessive use as growth promoters harms human health. This has therefore warranted the urgent need for alternatives.

Antimicrobial-resistance antibiotic poultry Africa

1. Introduction

The use of antibiotics in the poultry sector is mainly for treatment, prophylaxis and growth promotion. In many parts of the world, food-producing animals are given antibiotics daily to make them grow faster and prevent diseases[1]. This trend is likely to continue given the growing demand for the protein of animal origin. When antibiotics are used for the purposes of growth promotion a small amount is often administered as compared to therapeutic use. Therefore, this may cause bacteria to develop resistance to antibiotics[2]. The emergence and spread of antibiotic resistance compromise the nutritional and economic potential of poultry and other food-producing animals. This is a global concern that affects both animal and human ecosystems. According to the report commissioned by the United Kingdom (UK), it is estimated that almost 10 million people could die of bacteria that are resistant to the antibiotic by 2050[3]. In the United States, over 2 million people get infected by antibiotic-resistance bacteria and around 23,000 of them die due to the resistance to treatment. The World Health Organization (WHO) has published a report regarding the incidence of antibiotic-resistance which shows an increase in the Asian continent[2]. In the US and Europe alone, antimicrobial-resistant cause overs 50,000 deaths annually[4]. Antimicrobial resistance threatens food security, animal welfare, longer treatment cycle and public health worldwide. There are many factors that contribute to the irrational use of antibiotic: Attitudes, perception of policymaker’s knowledge, manufacturer, prescribers, consumers and dispensers[4]. The European Union (EU) banned antibiotic use in animal production in 2006[3]. A retrospective study analyzing the relationship between prior antibiotic use with antimicrobial-resistant was conducted in Indonesia and the results showed that patients who have a history of antibiotic use over the previous three months had shown an escalation of the probability of higher resistance matched to the patient’s history of antibiotic use over the preceding months[5].

In 2018, Africa Centres for Disease Control and Prevention (Africa CDC) developed a framework for antimicrobial resistance in Africa. Africa CDC is an agency of African Union (AU) that helps member states to detect, prevent, control and respond to diseases in Africa[6]. WHO declared the week of 18–24 November to be an annual antibiotic awareness campaign week with the aim of increased responsiveness of global antibiotic resistance hazard[7]. The cause of resistance to antibiotics is a topic that is receiving much attention, factors such as inappropriate use of antibiotics, bacterial gene mutations and horizontal gene transfer between bacterial species are amongst the key contributing factors. Gram-negative bacteria such as Acinetobacter spp., Escherichia coli, Klebsiella spp. and Salmonella spp. are some of the microorganisms that are extremely resistant to existing antibiotics[8]. Escherichia coli, Salmonella spp., and Campylobacter spp. are some of the main bacteria that cause diseases in poultry. According to the WHO antibiotics such as fluoroquinolones used in agricultural animals have resulted in the development of ciprofloxacin-resistant Salmonella, Campylobacter and E.coli. which contributed to human infections that were difficult to treat[2]. Apart from developing antibiotic resistance, the public can also develop an allergic reaction or liver damage on the resistance of consuming antibiotic residues in animal products [9]. Campylobacter spp. are prevalent in South African poultry products and pose a threat to human health[10]. It can affect the gastrointestinal tract and causes diarrheal illnesses[10]. Antibiotics that are important for treating humans must be prohibited from being used in the feed as growth-promoting[2].

There are many international programs and platforms that have been developed to address the antimicrobial resistance issue. Programs such as antibiotic stewardship, therapeutic drug committee can be used as a standard measure for collecting and comparing drug utilization patterns within and between countries[11][12]. International organizations at the forefront of addressing antimicrobial resistance such as FAO, WHO, and OIE (World Organization for Animal Health) have invested enormously on advocacy on public health risk associated with the use of antibiotics. Studies examining antimicrobial use and antibiotic resistance in Africa is widely accessible. However, coordinated surveillance and monitoring of antimicrobial resistance and use in Africa is still limited.

2. The Environmental Impact of Antibiotics

The emergence of antibiotic-resistant bacteria in the environment is a global threat to the public. The rapid spread of multiple antibiotic resistance microbes in the environment is the main concern considering the low investment in developing new antibiotics. The wastewater treatment plants are regarded as a threat to public health simply because the three-stage treatment process is insufficient to remove all the pharmaceutical residues. The wastewater treatment plants serve as carriers and transmitters of the antibiotic-resistance border between humans and the environment. Wastewater from hospitals, households and poultry farms waste contains antibiotic-resistance bacterial of animal and human origin[13]. A study conducted in the Eastern Cape province of South Africa revealed that wastewater treatment plants could be one of the contributors of sources of antibiotic-resistant *Escherichia coli*[14]. The wastewater treatment plants in West Africa are also regarded as the major sources of antibiotic-resistant bacteria. Bougnon and colleagues also reported that in Burkina Faso water from sewages used for urban agriculture may likely be one of the major sources spreading pathogens and antibacterial resistance among animals and humans[13].

Most rivers are considered sources of antibiotic pollution. Residues from farms and human environment may contain antibiotic-resistant genes and antibiotic substance that can contaminate the environment[13]. The emergence of antibiotic-resistant genes in the water environment is becoming a global concern. Mhlathuze River in South Africa has enteric bacteria that are resistant to antibiotic except gentamicin, the β-Lactamase gene may be widely distributed in the environment[15]. Similar findings were also reported in the Eastern Cape province of South Africa that multiple antibiotic-resistant *Pseudomonas* species were prevalent in chlorinated municipal wastewater[16]. The presence of antibiotics residues in the environment is not only the African problem. Karst river in China is widely contaminated with the presence of antibiotics. The presence of antibiotics in rivers pose a high ecological risk to the most vulnerable aquatic organisms[17]. An integrated approach could be a solution to combat antimicrobial resistance. *Pseudomonas aeruginosa* that was isolated from the environmental and clinical origin in the Benin City of Nigeria was 100% resistant to cefuroxime and amoxicillin[18].

The presence of enteric bacterial and their resistance to the antibiotic in the environment at Kakamega town in Kenya is a challenge that can cause a health hazard to the public[19]. In Kenya the highest concentration of antibiotics was found in the suburban soil of Narok town (west of Nairobi), antibiotic such as Oxytetracycline, Sulfamethoxazole, enrofloxacin and sulfamethazine were identified as the main antibiotics contaminated in soils [20]. Therefore, it is imperative that sustainable microbial monitoring program developed by the Africa CDC and WHO be implement accordingly. The information regarding the presence of antibiotic-resistant pathogens in the environment is limited in Africa. The occurrence of antibiotic-resistant bacteria in the environment is a hazard to global public health. Therefore, detailed studies with monitoring and surveillance programs could serve as a good starting point in understanding antibiotic resistance in the African environment and developing mitigation strategies thereof.

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