

## Discussing the Relationship Between Antibiotic Use in the Poultry Industry and the Antibiotic Resistance Crisis

Sean Yu

### Abstract

Antibiotic resistance has become an urgent global public health issue. Although not often reported in mainstream media, antibiotics fundamental to healthcare are becoming increasingly ineffective as resistant bacteria diversify and spread. Many patients infected by resistant bacteria are unable to be treated, struggling to recover and dying in the worst cases. It is important to educate society about antibiotic resistance, an issue that has continued to affect many globally, including in the United States. Specifically, this article reports on how antibiotic use in the poultry industry has become a contributing factor to increasing antibiotic resistance. The goal of this article is to encourage society to work collaboratively to address this urgent issue. Throughout the article, statistical numbers and testimonials from those researching antibiotic resistance, those in the poultry industry, and those affected by antibiotic resistance are included. These viewpoints offer a holistic view of the antibiotic-resistant issue and encourage readers to form varied interpretations necessary to facilitate dialogue and develop working solutions.

### Introduction

Antibiotic resistance is becoming an increased public health issue. Dr. Shannon Ross of Alabama uses antibiotics to treat patients infected by bacteria. She says her “worst fear as a doctor [regarding] the antibiotic resistance crisis is not being able to treat a patient, and... having to tell that family” [1]. Antibiotics, the treatments Dr. Ross referenced, are drugs fighting bacterial infection. These drugs have been an important invention reducing death in people and animals such as livestock. Unfortunately, since the invention of antibiotics, there has been a steady increase in antibiotic resistance, when these drugs become ineffective as bacteria become resistant. Concerned agencies like the FDA tried to slow the resistance by restricting antibiotic use, specifically in poultry companies. In 2013, the FDA prohibited using antibiotics for non-medical reasons in livestock. Despite this ban, a 2016 CDC report found that antibiotic-resistant bacteria infected 2 million and killed 23,000 Americans annually.

Consequently, the FDA further restricted antibiotic use in livestock in 2017 by banning antibiotic use for growth promotion. However, In 2019, a new CDC report elevated the threat of several antibiotic-resistant bacteria, warning that they now infected 3 million and killed 35,000 Americans annually. These two numbers may appear small relative to the U.S. population, but they represent one infection every 11 seconds and one death every 15 minutes. Even worse, a 2022 worldwide study from the *Lancet* found that resistant bacteria killed over 1.27 million people in 2019 [2]. Despite the efforts to restrict antibiotic use, the antibiotic resistance crisis has continued. The contributing factors of this issue, although often not a focus of mainstream media, must be discussed. One such factor is how poultry companies often overuse antibiotics, which in turn increases preventable deaths in humans from resistant bacterial infections.

## Body

The use of antibiotics, especially medically-important antibiotics, is common in the poultry industry. Medically-important antibiotics are important for treating bacterial infections in humans and are essential to healthcare. Surprisingly, about 70% of these antibiotics sold in 2019 were for the poultry industry, where healthy livestock often receive antibiotics in their daily feed to prevent bacterial infections and boost growth [3]. This practice maintains the health of livestock, which are often raised in crowded and unsanitary feedlots where infectious bacteria are prevalent. Keeping livestock in feedlots is cheaper than raising them in pastures. Thus, many in the poultry industry use antibiotics to decrease expenses and raise profits. Approximately three-quarters of all antibiotics, or 150,000 tons, are used annually in this manner [5, 6]. In contrast, only small amounts of antibiotics are used to treat bacterial infections in livestock [4], even though antibiotics are designed to treat infected animals and people. This reliance on antibiotics worries researchers like microbiologist Lance Price, who believes poultry companies also circumvented FDA regulations [4]. Price describes how “[t]here was a huge increase in ‘therapeutic’ use of antibiotics”, using antibiotics to “prevent” infections, immediately after the FDA banned antibiotic use for growth promotion in livestock. Poultry companies had primarily labeled the purpose of their antibiotic use as growth promotion before increased FDA regulations. Essentially, poultry companies responded to new regulations by relabeling the purpose of their antibiotic use. Many poultry companies now claim to use antibiotics to prevent infections, while still using them for growth promotion and infection prevention.

These practices have increased the number of preventable deaths in human patients. Much of this death is caused by the decreasing effectiveness of antibiotics: from 2000 to 2018, the number of underperforming antibiotics tripled in chickens and pigs and doubled in cattle. Two of these underperforming drugs are ciprofloxacin and erythromycin, which are critical for treating bacterial infections in human patients [5]. Unfortunately, such antibiotics have been used excessively in animals, where they kill most non-resistant bacteria in bacterial populations and decrease overall competition [7]. This helps resistant bacteria (arising from de-novo mutations or horizontal gene transfer) divide and spread more frequently, infecting more people [7, 8]. When infected patients seek treatment, there are increased chances that prescribed antibiotics are ineffective and potentially unable to save the patient. To address this issue, new antibiotics are being quickly developed, but resistant bacteria are spreading faster [9]. In the journal *Molecules*, researchers reported that these bacteria easily spread to humans from livestock or undercooked meat previously treated with antibiotics [10, 11]. Additionally, eating meat containing antibiotics disrupts helpful bacteria in the human microbiome that help people digest food and process fats [11]. Disrupting the human microbiome contributes to an increased likelihood of common disorders such as diabetes and obesity. People affected by such diseases are even more susceptible to infection by antibiotic-resistant bacteria. Once infected, some patients may not have apparent symptoms and thus fail to seek treatments; these patients easily transmit resistant bacteria to others. Ultimately, this has contributed to the widespread prevalence of resistant bacteria and a public health crisis. A United Nations panel predicted by 2050 [13, 14], resistant bacteria could kill 10 million people worldwide yearly (Figure 1).

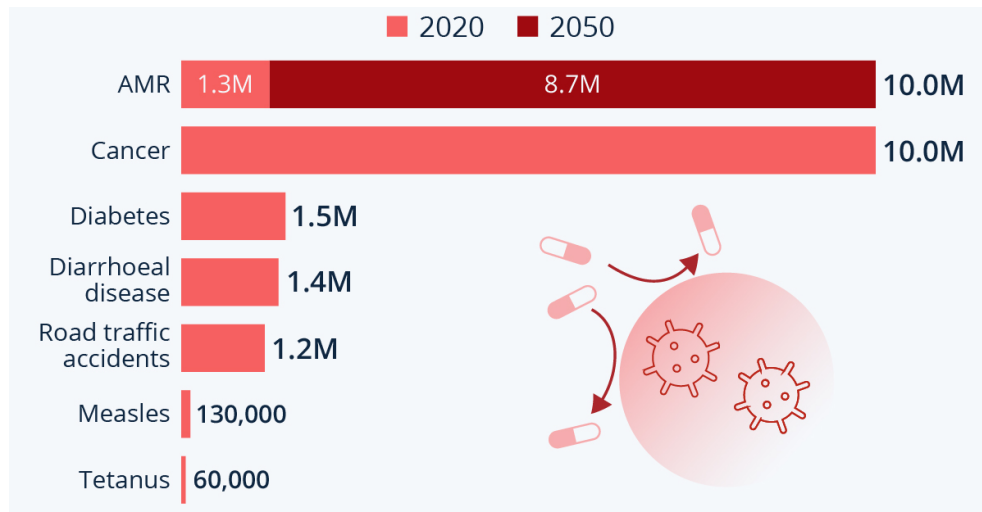


Figure 1: Annual Global Deaths from Resistance [12]

Many could die from bacterial infection during common hospital procedures like childbirth and surgery, making the procedures far riskier. These factors fuel the rapid spread of antibiotic-resistant bacteria, which could create a deadly pandemic. Though not yet a pandemic, the crisis has claimed many lives, including that of Carl Romm, a 27-year-old U.S. Army soldier who injured his trigger finger while serving and was honorably discharged [15]. After returning home, Carl's health worsened until he was hospitalized. Doctors found he had been infected by antibiotic-resistant bacteria and Carl's parents describe they "gave Carl every antibiotic and there was nothing left," but the infection spread and their son soon died. Carl's death, like many others, could have been prevented by antibiotics. Unfortunately, the spread of resistant bacteria has decreased the effectiveness of many antibiotics, causing widespread death and anguish.

Poultry companies are affecting public health by overusing antibiotics, which increases preventable deaths in patients infected by resistant bacteria. Nevertheless, many in the poultry industry often claim that antibiotics are a minor supplement essential to livestock food. Livestock food is high-calorie and helps animals such as cattle gain weight, ensuring they produce enough meat despite their often poor living conditions. Yet, livestock food also increases the chances of bacteria infections in cattle, which would stunt their growth; farmers say that using antibiotics is important to prevent this infection [11, 16]. Although this is accurate, most antibiotics used in livestock are still medically important—critical to treating people infected by bacteria. Using medically-resistant antibiotics daily, even if in small quantities, causes increased antibiotic resistance among bacteria. Instead of using antibiotics, those in the poultry industry should consider raising livestock on 100% free-range pastures, instead of in feedlots. This would provide better conditions and decrease the need for antibiotics. Investing in pastures is beneficial since society is becoming more aware of antibiotic resistance, which has increased the demand for pasture-raised meat [17]. Anyone can help address antibiotic resistance by purchasing pasture-raised meat and spreading awareness of the issue (Figure 2). These actions are collectively important in addressing antibiotic resistance and would decrease the number of people who are dying from bacteria resistant to antibiotics.



Figure 2: Example of Pasture-Raised Ground Beef [18]

## Discussion

Poultry companies' overuse of antibiotics and circumvention of regulations have contributed to the spread of resistant bacteria and indirectly the rising ineffectiveness of antibiotics. This has worsened antibiotic resistance, a public healthcare crisis impacting many globally, especially in countries with inadequate healthcare and social services [12]. Addressing this issue involves researchers working with government agencies to encourage those in the poultry industry to transition from feedlots to pastures while encouraging consumers to purchase pasture-raised meat. Additionally, researchers and government agencies should ensure existing regulations for antibiotic use are followed and review these regulations to determine if more are necessary. Government agencies should also support research on improving existing antibiotics (i.e. developing multidrug cocktails), developing new antibiotics, and alternative treatments to bacterial infections (i.e. bacteriophage therapy) [7, 19].

The widespread prevalence of antibiotic resistance makes it important to continue identifying and addressing contributing factors. Although this article focused on how poultry companies contribute to antibiotic resistance, there are many other factors, such as antibiotic overuse in healthcare [7]. Another factor is how many waste-water treatment plants and drug factories are not designed to efficiently remove antibiotics from wastewater before releasing such water [20]. This could result in antibiotics percolating into the environment surrounding wastewater throughways and selecting resistant bacteria. Ultimately, antibiotic resistance is a complicated issue with many contributing factors, highlighting the importance of ensuring collaborative efforts in addressing this issue.

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