



An emerging route to antibiotic resistance in South Asia: a correspondence

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The use of antibiotics started with the novel intention of treating diseases in the 19th century caused by bacterial infection. Nowadays, due to the overuse of antibiotics, bacteria can insist on the mechanisms to get stronger to fight back and prevail, referred to as ‘antibiotic resistance’ (AR). It is ranked among the significant causes of death worldwide, with the highest burdens in lower-middle-income countries^[1]. South Asia experiences a high burden of AR, with overall 76.8 deaths in 100,000 of the population^[1]. AR develops naturally as a result of bacterial survival, but it is exacerbated by unregulated and nonprescribed antibiotic use in clinical or agricultural settings as well as an aversion to vaccination programs, which popularize antibiotic use as a ‘quick tonic.’ Underdeveloped surveillance systems for antibiotic usage, insufficient antimicrobial stewardship practices, and excessive use in livestock production with little or no law enforcement are some potential factors contributing to AR in South Asia^[2].

For the last couple of decades, the South Asian region has gained recognition as a potential hub for several of the top livestock breeds in the world, including cattle, buffalo, goat, and poultry. Among all the livestock, broiler chickens need careful attention since it has become one of the major sources of meat worldwide. Poultry consumption has increased globally by more than 100% during the past three decades, from contributing 13% of total meat consumption in 1965 to 28% in 2015^[3]. Particularly in South Asian countries, poultry, a comparatively cheap source of animal protein, is immensely popular and widely consumed nowadays, from street-side fast food outlets to fine dining restaurants^[3]. Although this points to a potential ‘livestock revolution’ in South Asia, certain worries also surface parallelly. Due to this increasingly high demand, the farmers

are under constant pressure to produce poultry with the highest yield in the shortest amount of time. As a result, poultry farms are transitioning from traditional agricultural practices to a more stringent food production system, which entails substantial antibiotic use for either therapeutic or prophylactic use or to promote faster growth and enhance meat production^[4]. Although a clear mechanism for how antibiotics can promote animal growth is not well elucidated, some theories suggest that by neutralizing or damaging pathogenic intestinal bacteria, they may aid in enhanced nutrient protection and absorption, facilitating faster growth^[4]. The irony is that biosafety and biosecurity standards are rarely followed, and persistent use of low-dose antibiotics is thought to be crucial because it promotes antibiotic-resistant bacterial strains. Studies conducted in different small to medium commercial broiler poultry, layer poultry, cattle, and dairy farms, as well as household farms in Southeast Asian countries, showed that β -lactams, aminoglycosides, fluoroquinolones, tetracyclines, macrolides and lincosamides, sulfonamides are among the antibiotics that are widely used^[2]. About 94.16% of poultry farmers in Bangladesh use antibiotics^[5]. India consumes 3% of the world’s antibiotics; by 2030, that percentage is expected to rise by 82%^[6]. In the Maldives, livestock production is mostly concentrated toward poultry; hence antibiotic usage in poultry farms is also high^[7]. In Nepal, 62% of poultry farms have been reported to use antibiotics^[8]. Although the history of antibiotic usage in Sri Lanka is quite extensive, there is a lack of information regarding the manufacture and usage patterns as a result of inadequate research data^[6]. A prolonged war, lack of sufficient antibiotics, and repeated underdosing have all contributed to the economic and human costs of AR bacterial infections in Afghanistan^[9].

Horizontal gene transfer in bacteria facilitates the widespread dissemination of AR in the microbial community^[10]. Poultry products and byproducts are marketed before the antimicrobial drug withdrawal time, and farmers even sell their products throughout the treatment period with antibiotics. These resistant bacteria can enter human food chains in a variety of ways. When it reaches the human gut, it can pass its resistant genes to other commensals and pathogenic bacteria in the intestine and spread further. The nature of AR at the human–animal–environment interface is remarkably complex. Since there is a continuum of transmission routes for resistance, each reservoir of resistance acts as a constant source of AR for bacteria. Through these routes, antibiotics are even being introduced to soil and water bodies, which makes environmental dissemination of resistance an alarming issue^[10]. This escalating problem has multifaceted roots that are even unique to the pediatric ages as well, with some scary reports of newborns showing resistance toward most of the known antibiotics^[11].

What happens to antibiotics in meat products when they are cooked is a legitimate concern. Studies have been done to determine how cooking methods affect the amount of specific antibiotic

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residues left in meat samples. According to a study, roasting, boiling, and microwaving chicken continuously for 23.9, 53.2, and 106.6 min each might decrease tetracycline levels by 90%^[7]. Also, frying and grilling significantly reduced the number of oxytetracycline residues by 95.7 and 91.4%, respectively^[12]. However, no study could report a complete removal of antibiotic residues from meat samples^[12]. Therefore, knowingly or unknowingly, we have unwanted antibiotics by consuming poultry meat.

To address this alarming public health issue, the first and foremost step is to stop the unsupervised use of antibiotics to ensure nobody can get antibiotics without the prescription of an authorized veterinarian. Poultry farmers might consider using bacteriocinogenic probiotics and phytochemicals as alternatives to antibiotics^[13,14]. The poultry production system needs to be introduced with an isolated waste management set-up to avoid environmental dissemination. Proper cooking is crucial before consuming poultry meat to kill the superbugs. National-level food quality and security inspection authorities must put pressure on the chicken industries to reduce antibiotic use and take commitments from the largest chicken buyers and consumer restaurants to put 'limited or no antibiotic' logo on meat products. A framework that allows food producers to use judicious antibiotics while mandating the discontinuation of medically essential antibiotic usage only for enhancing meat production in a short amount of time should be devised. There is an urgent need to emphasize the importance of taking an AR perspective holistically, integrating humans, animals, and the external environment – a so-called one-health approach. Furthermore, mass awareness is highly required, and calling for programs like seminars, workshops, and training may come out as effective.

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Patient consent

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Author contribution

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All authors declare no conflicts of interest, financial or otherwise. The authors alone are responsible for the content and writing of this article.

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