

Does Antibiotic Usage in Animal and Plant Farm Really Become a Major Contributor in Human Antimicrobial Resistance Challenges?

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ABSTRACT

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Opinion

Antibiotic feeding supplement has been used worldwide in agricultural setting. The use of such antibiotics are also found in animal farm and aquaculture [1,2]. It has been well known that microbes can be found anywhere. Similar to what happen to humans, animals can also get infected by certain microbes that can yield infectious diseases. This might result the use of antibiotics to treat this sick animals. The use of antibiotics in animal feeding to prevent and control common diseases must be taken into consideration since this might influent the sensitivity of the antibiotics used [2]. Inside the animal's body, antibiotic will spread out to the whole part of the body . It will be metabolized and excreted into the environment through animal's faeces and urine [2]. Depending on the half time of the antibiotic, some parts of the antibiotic might remain in the animal's muscles and organs and eventually will be found in food animal products such as meat, milk, and eggs [2-5]. This particular antibiotic might be sustained in the food animal and animal products prior serving, although there are possibility that the antibiotic might be disrupted by environmental conditions during storage, or disrupted during preserving process [2,6].

Some of the antibiotic residues might reach to the consumers, influent the host commensal microbes [4]. There are possible opportunities for human commensal microbes to become antibiotic resistant organisms. The antibiotic resistant organisms must compete with the normal commensals to continue their life cycles.

The outcome of this competition is not always a succeed due to the biological fitness cost mechanism. There are three factors that can influence the outcome of this competition: The first one is if a person is receiving broad spectrum antibiotic as an empirical therapy, the selected antibiotic resistant organisms can have the opportunity to overgrowth and potentially be a secondary causative infective agent in this person [4]. The second one is if the antibiotics is used as an animal feeding supplement, this particular antibiotics will influent the animal's commensal microbes and causing them to be antibiotic resistant organisms. The biological fitness cost mechanism will also affecting the competition of the antibiotic resistant organisms and the animal's commensals allowing them to compete to be the winner in colonizing and continuing their life cycle. When the animals are eventually slaughtered, the selected antibiotic resistant organisms that already colonized will contaminate the animal food products. In this situation, there is a possibility of transmission of the Mobile Genetic Elements (MGE) of resistance genes or as known as plasmid from the selected antibiotic resistant organisms to the environment [7].

The third factor is when a human is consuming an uncooked or undercooked animal food products that are already contaminated with antibiotic resistant organisms. They will have a great chance of getting this particular antibiotic resistant organisms [8]. This microbes will eventually compete with the human 's commensal flora to continue their subsequent life cycle as describe above to

be the winner in colonizing and predominating their growth. But this competition might not happen when the person is consuming broad spectrum antibiotic as an empirical therapy. If the person is consuming broad spectrum antibiotic then the selection pressure applies and the selected antibiotic resistant organisms will have the opportunity to become overgrowth and potentially to be a secondary causative infective agent in this person. On the other hand, consuming well-cooked animal food products will destroy all the microbes including the antibiotic resistant microbes [6]. However, it is intriguing about the Mobile Genetic Elements harbouring resistance genes. Is it destroyed by the animal food product processing or not?

Some microbes have extracellular enzyme(s) which can destroy the microbial genome(s) resulting a nonfunctional molecular structure. This means that the intact Mobile Genetic Elements harboring the resistance genes will become useless. If this assumption is not happening then the intact functional Mobile Genetic Elements harbouring resistance genes might come into another microbes through transformation and or transduction [7]. We do believe that the above explanations are not constitute to just antibiotics, since there are many chemical substances that are used for antimicrobial agents such as pesticides and heavy metals [6]. It has been proven that resistance to heavy metals are associated with antibiotic resistancy via co-existence, co-resistance, and cross resistance manners [7,9]. Research findings on ESBL producing *Escherichia coli* from cattle and their worker's stool indicating a mutual transmission between farm animals and humans [10]. The finding of ESBL producing *Escherichia coli* from cockroach in hospital surrounding is also indicating that this bacteria already widespread in the hospital environment [11].

Our experience revealed that resistancy to certain heavy metal also resistant to certain antibiotic, and this development might be through the co-existence, co-resistance, or cross resistance pathways. We also believe that scientists who work in antibiotic finding always think that antibiotic found is used for therapy, not for prevention nor as a growth promoter. As a conclusion, regarding to antibiotic resistance challenges in human being, there are three possible mechanisms : 1) consuming un-destroyed residual antibiotics in food animals and animal products, 2) introduction of antibiotic resistant microbes through contamination of food animals or animal products, 3) release of Mobile Genetic Elements harbouring antibiotic resistance genes into the human gut. In the present time let us consider to explore bacteriophage as one of biological control for serving safe food toward One World One

Health, and our recommendation is that using antibiotic in food production must be proportional regarding the purpose, the doses, the durations as well as to strengthening safety in food serving processes.

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Conflict of Interest

We declare no conflict interest.

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