

The Importance of Antimicrobials to Animal and Public Health

Yong Ho Park, Professor, DVM, MS, PhD

Department of Microbiology, College of Veterinary Medicine, Seoul National University, Seoul, Korea

BK21 Program for Veterinary Science, Seoul National University, Seoul Korea

KRF Zoonotic Disease Priority Research Institute, College of Veterinary Medicine, Seoul National University, Seoul, Korea

Antimicrobial resistance is one of the crucial challenges that public health is facing today. Food animal production and veterinary and human medicine are the major components that are involved in the development and maintenance of antimicrobial resistance. Antimicrobials are used in food-producing and companion animals for therapeutic purposes. Also, their use in food animal production for growth promotion purposes provides demonstrated benefits, including improved animal health, higher production, and in some cases, reduction of foodborne pathogens. Resistant bacteria can be transferred between animals and human through the environment, food, and working or contact with animals with a variety of mechanisms. In addition, many of the antimicrobials already being used in food animal production and veterinary medicine are also used in human medicine, and antimicrobial resistant bacteria can easily transfer their resistance traits to unrelated bacteria inside the human body. Although how often they are colonized in the human gut and transfer resistance genes is not known, antimicrobial resistance in animals has been thought as "hazard" because the resistant organism itself may be zoonotic or may transfer its genetic material to a human pathogen. Thus, the crucial question is the degree of risk posed by the hazard.

Because of the increasing concerns on antimicrobial resistance problems, global consensus has been reached to develop the list of antimicrobials of human and veterinary importance and concept of critically important antimicrobials (CIA)/veterinary critically important antimicrobials (VCIA) for minimizing the negative public health impact caused by use of antimicrobials in humans and animals and simultaneously providing safe use of antimicrobials in both human and veterinary medicine. In developing the list for human and veterinary

medicine by the World Health Organization (WHO) and the World Organization for Animal Health (OIE), respectively, the following criteria are used for categorization of antimicrobials. In human medicine, two criteria, whether an antimicrobial is the sole or one of the few treatments available for serious human infection (criterion 1) and whether an antimicrobial treats pathogens that have the potential to transfer from animals to humans (criterion 2), are used. Antimicrobials which meet both criteria 1 and 2 are classified as CIA. Development of the list for veterinary medicine is more complicated than that for human medicine because many different species have to be treated in veterinary medicine. One criterion used for the list is whether an antimicrobial is the sole treatment or one of few treatments available for serious animal disease, which is the same with criterion 1 for developing the list for human medicine as described above. Antimicrobials classified as VCIA include aminoglycosides, cephalosporins, macrolides, penicillins, phenicols, quinolones, sulfonamides, and tetracyclines. The list of CIA or VCIA may play a key role in the establishment of national policies and in the development of treatment guidelines for veterinary use. More importantly, consumer protection can be secured as well.

In both human and veterinary medicine, CIA and VCIA should be differently determined based on the circumstances and specific needs of each country. However, several reports showed the possible evidence of global spread of antimicrobial resistant bacteria and/or resistant genes because of international travel and trade. Therefore, antimicrobials, which are considered globally as the most critical such as fluoroquinolones, must be included in the core CIA and VCIA list regardless of circumstances of each country. In Korea, antimicrobial resistance pro-

blems might arise easily because antimicrobial agents are readily available in food animal production. Therefore, establishment of proper antimicrobial regulation system is urgently needed for production of safe livestock products and consumer protection. Also, veterinary antimicrobial control should be met within international obligations because of active trade with foreign countries nowadays. Thus, the Korean government has schemed veterinary prescription system agreeably to this national consensus proposed. In addition, the antimicrobial list (VCIA list) developed based on the current situations in Korea as well as that generated from the OIE should be considered in the establishment of national policies such as veterinary prescription for the prudent use of antimicrobials in animals.

Antimicrobial resistant bacteria in food animals have been suspected as potential sources of resistance in human pathogens

although it has been the subject of considerable debate ever since. However, antimicrobial resistance in animals and humans cannot be explained by simple assumptions because of the complexities associated with the epidemiology of antimicrobial resistance. At this point, we should concentrate on minimizing the transmission of all zoonotic pathogens regardless of their antimicrobial susceptibilities. Also, the judicious use of antimicrobials and continuous monitoring of resistant bacteria in both humans and animals are foremost to prevent the emergence and spread of resistant bacteria. CIA/VCIA and risk management should be differently determined based on the circumstances and specific needs of each country and most importantly, we should carefully consider the final goals of all of these efforts are safe animal production and public health protection.