Antimicrobial Resistance and the Alternative of Using Probiotics as Growth Promoter

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Abstract: The countries in the Asia-Pacific region, namely, Australia, Bangladesh, China, India, Indonesia, Japan, Malaysia, Myanmar, Philippines, Republic of Korea, Thailand and Viet Nam, have come together on the occasion of the Tokyo Meeting of Health Ministers on Antimicrobial Resistance (AMR) held in Japan; 16 April 2016 (Communiqué of Tokyo Meeting of Health Ministers on Antimicrobial Resistance in Asia, 2016). People facing serious problem due to the rapid emergence of resistant bacteria(Antimicrobial Resistant/AMR) worldwide, endangering the efficacy of antibiotics, which are used to combat diseases caused by bacteria in veterinary medicine as well as in human medicine.Many decades after the successful of using antibiotics to control bacterial infections, recently begin to become a threat.The antibiotic resistance problem occurred is believed due to the overuse and misuse of these medications in controlling diseases human and animals and also a lack of new drug development by the pharmaceutical industries in the world.AMR is a public health threat that has broader social implications, transcends borders and endangers global and regional health security. The problem of AMR is compounded by (1) insufficient and a lack of awareness, cultural practices and system challenges from weak health systems with inequities in access to affordable and quality health-care services, (2) weak antimicrobial regulations both in humans and animals, (3) insufficient law enforcement, (4) poor infection prevention and control practices in health-care institutions, and (5) inappropriate use of antimicrobials across all sectors, which are larger development issues.

Keywords : *Antimicrobial Resistance, Probiotics, Growth Promoter*

Introduction

The countries in the Asia-Pacific region, namely, Australia, Bangladesh, China, India, Indonesia, Japan, Malaysia, Myanmar, Philippines, Republic of Korea, Thailand and Viet Nam, have come together on the occasion of the Tokyo Meeting of Health Ministers on Antimicrobial Resistance (AMR) held in Japan; 16 April 2016 (Communiqué of Tokyo Meeting of Health Ministers on Antimicrobial Resistance in Asia, 2016).

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The use of antibiotics in Veterinary Medicine

In the veterinary medicine, especially in the poultry industries the use of antibiotics as growth promoter as well as prophylaxis measure are common. Based on our field observation antibiotics are used commonly in the brooding period 3-5 days of age to prevent unspecific respiratory diseases (colibacillosis, mycoplasmosis) which frequently happen in this period and this treatment is well known as “flushing”. Flushing is also done in the stress conditions such as post vaccination, grading activity, heat stress and short before the peak production in layer.In order to express the genetic potential of the birds the good feeding management and health management are needed. Antibiotics play an important role in the treatment and in the prevention of bacterial diseases. The use of antibiotics as a prevention measure in human medicine might be not common. Based on field experience the application of antibiotics in a certain period seemed to have a significant efficacy to avoid the incidence of unspecific respiratory- and digestive diseases especially in the first week of brooding period.

The quality of day old chick (DOC) is critical factor which influence the performance of production. In some condition DOC may bring the pathogen without clinical symptoms and the symptoms appeared in the 8-12 days of age, if no antibiotics treatment is applied. In the field this is known as early depletion. In broilers which have very short period of life (30-40 days), early infection of pathogen caused the stunting growth of the birds. Disease treatments in broilers is not effective and disturb the growth of birds and caused significant economic loss.

Antibiotic as growth promoter

The use of antibiotics as feed additives has been popular of modern animal husbandry, but this widespread practice is not without criticism. In the early years, all antibiotics were allowed for use, although some did not enhance growth and many were too expensive. Concerns were raised that the use of antibiotics as therapeutics and for growth promotion could lead to a problem of increasing resistance in bacteria of human and animal origin, particularly regarding resistance in gram- negative bacteria (*Salmonella* spp. and *Escherichia coli*). It was proposed that antibiotic use for growth promotion should be restricted to antibiotics that (1) make a significant economic difference in the raising of livestock, (2) have little or no application as therapeutic agents in humans or animals, and (3) do not impair the efficacy of a prescribed therapeutic drug through the development of resistant strains.These are some antibiotics such as zinkbasitarasin, virginiamisin, maduramisin, monensin,higomisindansalinomisin is permitted as growth promoter in Indonesia.

The important issues is about the multidrug resistance bacteria has been reported among *Salmonella sp.*, *E. coli*, *Camphylobacterspdan* enterococci. How far is the effect of antibiotic residue in human food to stimulate the occurrence of drug resistance bacteria. There is no study is done in Indonesia which is comprehensive designed to answer this questions.

The selection and amplification of resistant bacteria might occur in gut during the antibiotic treatment without competitor from succeptible bacteria. The resistance gen theoretically can be transferred by the plasmid (conjugation and bacteriophage) or by transposon mutagenesis mechanism to other bacteria. This resistant bacteria spread dominantly among the host and contaminated the environment.

Observation of AMR

The AMR (using *Escherichia coli* as an indicator) against some antibiotics seemed to be related with the frequent use of antibiotics in the farm. The most frequent of AMR was found in poultry industries, followed by pig industries and dairy cattle. No AMR resistance was found in the buffalo. The intensive use of antibiotics in poultry-and pig industries might stimulate the occurrence of AMR in poultry and pigs, while the use of antibiotic in buffalo was rare (Table 1).

Table 1. Distribution of ***Escherichia coli*** **resistant to one or more antibiotics used** (Oxytetracycline Hydrochloride, Chloramphenicol, Dihydrostreptomycin, Sulfadimethoxine, Kanamycin, aminobenzyl-penicillin) **isolated from various animals (BPMSOH, 2016).**

Animals	Subtotal	(%)
Dairy cattle	218	38 (17.4%)
Beef cattle	77	7 (9.1%)
Buffalo	14	0 (0%)
Pig	235	97 (41.3%)
Layer	66	44 (66.7%)
Breeder Layer	34	32 (94.1%)
Broiler	35	34 (97.1%)
Breeder Broiler	77	75 (97.4%)

Table 2. Another example of *E. coli* resistant against antibiotics among animal species (BPMSOH, 2016).

Animals	Total isolates	*Escherichia coli* resistant to					
		TC	CP	SM	SA	KM	APC
Cattle	309	6.1	0	8.4	12.0	0	0.6
Pig	235	29.8	5.1	25.1	17.4	2.6	6.0
Chicken/poultry	212	74.5	10.4	69.8	65.5	11.3	23.1

TC : Oxytetracycline Hydrochloride
CP : Chloramphenicol
SM : Dihydrostreptomycin
SA : Sulfadimethoxine
KM : Kanamycin
APC : aminobenzyl-penicillin

Similar results was described in Table 2, the high percentage of resistance of *E. coli* against various antibiotics was shown by bacteria isolated from poultry industry, the less frequent from pig and cattle.

The use of Probiotics and Postbiotics

Probiotics are live bacteria or fungi, which can be ingested through food or feed, may also as supplements in order to help return and maintain levels of good bacteria. Although probiotics will not fight an already existing infection, especially in severe cases such as AMR, they can help to prevent infections by keeping the gut healthy and balanced, as well as being useful for patients during a course of antibiotics. Although probiotics naturally occur in dairy and other fermented products, the quantities of the bacteria present are nowhere near those in probiotic supplements.

Postbiotics refers to the metabolic by products like enzymes, peptides, teichoic acid, peptidoglycan derived muropeptides, exopolysaccharides, cell surface and secreted proteins, bacteriocins and organic aids generated by a probiotic organism during its lifespan (Tomar*et al*., 2016). Post biotics are believed to have biological functions such as (1) acidifier, support the existence of good bacteria and inhibit the growth of bad bacteria, (2) induce the mucosal cell proliferation, (3) support the integrity of digestive tract, (4) antimicrobial effect and (5) immunostimulatory effect and (6) signalling molecules. How effective is the use of pre-, pro- and post-biotics in controlling diseases should further elucidated.

Conclusions and Suggestions

1. The appropriate and prudent use of antibiotics in the treatment of diseases caused by bacterial infection is needed. There is no doubt that antibiotics have protected human and animals from diseases due to infectious agents. The rolling use of antibiotics in certain period must be done in order to depress the occurence of AMR.

2. Increase the quality of DOC, inGrand Parent (GP), Parent Stock (PS) and Final Stock (FS), especially keep free from *E. coli*, *Salmonella* and*Mycoplasma*. These can be done by implementing the good biosecurity measure and vaccination. These will help to avoid clinical symptoms and bacterial shedding.
3. Try to find medication and prevention as an alternative, instead of antibiotics such as probiotics or postbiotics. The use of butiric acid, propionic acid and lactic acid as acidifier, which has antimicrobial effect and support the integrity and the health of digestive tract.
4. The use of hepatoprotector to support the function of the liver, such as L-carnitine, sorbitol and curcuma.
5. Decrease the effect of free radical using vitamin E and Se.
6. The application of immunomodulators, to stimulate the activity of lymphoid cells.

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