Usage of Antibiotic on Chicken Poultry in District of Malang, East Java, Indonesia

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ABSTRACT

Usage of antibiotics on chicken poultry has been used for long time to control bacterial diseases. It is easy to obtain antibiotic on the market because there is an aim to increase productivity of livestock-based food quickly. However, it has encouraged the use of drug excessively without regard to the security aspect of livestock products produced. This study was conducted to determine the use of antibiotics on chicken farms in District of Malang. Research subjects were farmers who apply antibiotics on their chicken poultry. Primary data collection was done with a structured interview, and followed by in-depth interview for some key respondents. Secondary data was obtained from the Central Bureau of Statistics and the Department of Agriculture/Animal Husbandry, meanwhile data of antibiotic products was derived from drug companies or Veterinary Drug Association. The research result showed that the majority of chicken farmers in Malang use antibiotics, only a few of them gave multi-vitamin/ mineral and herbal medicine. Most farmers use the same antibiotics for the last 3 years and they determine drug dosage based on average weight of chicken, consequently a number of bacteria could be resistant to antibiotics, already. If one year District of Malang requires antibiotic dose of 3.315 billion, the cost required reaches approximately Rp 2.87 trillion. It needs to guide the farmers to use antibiotics wisely: change antibiotics, determine the dose and timing of giving antibiotics.

Key Words: Antibiotic Usage, Chicken Poultry, Food Safety

INTRODUCTION

Poultry play an important role in the food supply, especially as a source of animal protein in Indonesia. In 2010, the production of poultry meat amounted to 1,214.34 thousand tons, contributing as much as 53.76% of the national meat production. While egg production of laying hens reached 945.64 thousand tons, it is 69.87 percent of the total national egg production that reached 11,366.20 thousand tons (DITJENNAK, 2012). East Java is the province with the largest population of laying hens in Indonesia, which in 2012 reached 37,974,058 tails (DEPTAN, 2012).

Health is one of the factors that influence the increase of chicken productivity. One of the diseases that often threaten the health of poultry farm is bacterial infectious diseases. In the control of the disease, farmers generally use antibiotics.

Antibiotic is chemical compounds produced by a variety of microorganisms, such as bacteria and fungi that have the function to stop the growth or kill microorganisms. Natural antibiotic is obtained naturally by micro-organism, meanwhile synthetic antibiotic is produced in the laboratory. The semi-synthetic antibiotic is produced by microorganisms and modified in the laboratory by adding a chemical compound.

Antibiotics are divided into 4 groups based on how it works, namely: (1) inhibiting cell wall synthesis, such as Penicillin, Bacitrasin, Novobiosin, Sefalosporin and Vancomisin; (2) destroying cell membrane, such as Polimixin, Colistin, Novobiosin, Gentamisin, Nistatin and Amfoterisin B; (3) inhibiting protein synthesis, such as Tetrasiklin, Khloramfenikol, Neomisin, Streptomisin, Kanamisin, eritromisin, Oleandomisin, Tilosin and Linkomisin; (4) inhibiting synthesis of nucleic acids, such as Aktinomisin, Sulfonamida and kuinolon derivatives (Nester *et al.*, 2012).

In addition to the treatment of diseases, antibiotics are also used as growth promoters, to stimulate the growth of livestock (Widiastuti and Murdiati, 2011; Zalizar and Rahayu,2015). Safety factors must be considered; including the safety of livestock products from residues of antibiotics used. Almost all commercial feed (85.70%) contains antibiotics, i.e. coccidiostat 50%, and 33% anti-fungal medication. It is confirmed that the opportunities for other drug residues in meat and eggs (Bahri et al, 2005).

Prediction of resistance can be known from how farmer's behavior in delivering drugs. Is there any variety of drugs used or they always give the same kind of medicine for many years. Therefore it is necessary to investigate the behavior of farmers in using antibiotic drug.

Excessive usage of antibiotics will cause residues in livestock products such as meat, milk and eggs. The residue will cause resistance, allergy or poisoning on consumers. The presence of residues in livestock products could be avoided if all parties pay attention and obey to the using rules and downtime of antibiotics. The presence of antibiotic residues in livestock products will be a constraint in the supply of livestock products as an export commodity. Consequently, livestock products from Indonesia are unacceptable in global trade and the trust on Indonesian livestock products will decrease.

Antibiotic residues on livestock products have been reported by several researchers. From 93 samples of fresh chicken meat in West Java, it was found residues of tetracycline class antibiotics by 70%, and class of chlortetracycline (CTC) by 30% (Murdiati et al., 1988).

Results of survey on chicken farm in Malang by Zalizar and Rahayu (2005) shows cases of colibasilosis caused by Escherichia coli (E. coli), and koriza caused by *Hemophilus gallinarum*. Control of these two diseases commonly used antibiotics. Antibiotics are also used extensively on farms, suppose they are added in the feed with a lower dose with mean to prevent disease and increase weight of chicken.

Excessive use of antibiotics can lead to resistance. One hundred percent of E. coli isolates collected at the Laboratory of Microbiology, Faculty of Veterinary Medicine, University of Gadjah Mada are resistant to antibiotics of Lincomycin, danofloxacin; 80% were resistant to amoxycillin ampicillin; 60% were resistant to streptomycin; 40% were resistant to doxycycline; 20% were resistant to erythromycin (Krisnaningsih et al. 2005). Therefore it is necessary to investigate how big these types of applications in the field of antibiotics as well as evaluating the overall behavior of drug application.

This study was conducted to determine the use of antibiotics on chicken farms in District of Malang. The expected result is data about: 1) Farmer's Attitude toward bacterial diseases and pattern of antibiotic usage 2) the usage level of antibiotics (number of doses of the drug for the entire chicken population in District of Malang); 3) the average price of the drugs used; 4) types of drugs sold on the market 5) types of drugs most commonly used by farmers; and 6) frequency of drug usage in one production period.

MATERIALS AND METHODS

Research location was in District of Malang, East Java, Indonesia. This district is included in five biggest populations of chicken poultry in East Java. The sampling technique used is multistage sampling. First step chose the village sample, namely the center area of chicken production. Second step chose the poultry sample, namely them who applied antibiotics to the chicken.

Primary data included: social and economic data and the application of antibiotics on the poultry. It was obtained by a structured interview with farmers respondents and followed by in-depth interview for some key respondents. Secondary data was obtained from the Central Bureau of Statistics and the Department of Agriculture/Animal Husbandry, meanwhile data of antibiotic products was derived from drug companies or Veterinary Drug Association.

A quantitative descriptive analysis was used to analyze the data of antibiotics usage on poultry farms which includes the average price of antibiotics, the cost of the use of antibiotics per

chicken, the total cost of antibiotics needs in District of Malang, types of drugs most widely sold in the market, the type of herbal medicine and variations of drug usage.

RESULT AND DISCUSSION

Characteristics of Poultry That Use Antibiotics

All chicken poultries in District of Malang use chemical antibiotics to fight bacterial infections. Therefore, the observation of antibiotic usage was done on both poultries category, laying hens (65 poultries) and broiler (95 poultries).

Table 1. The number of laying hens sample in District of Malang*)

No	Sub District	Number
1.	Bululawang	3
2.	Dampit	3
3.	Karangploso	6
4.	Lawang	1
5.	Pakis	4
6.	Poncokusumo	14
7.	Tajinan	3
8.	Tumpang	20
9.	Turen	1
10.	Wajak	3
11.	Wonosari	7
	Total	65

*) Minimum population 5000 chicken and they use antibiotics

Research in Malang was conducted at the poultry farm that spread over eleven (11) sub-districts. The largest number of samples was located in the district of Tumpang, i.e. 20 farmers.

Farmer's Attitude Toward Bacterial Diseases and Pattern of Antibiotic Usage

According to the farmers, cases of disease caused by bacterial infection on laying hens and broiler farms often happen (> 7 cases per year) or quite often (4-6 cases per year). For example, snot disease or koriza caused by bacteria of Haemaphilus gallinarum was found by most farmers (38%) for about seven cases each year (Table 2). However, certain diseases are rare enough (<4 cases per year).

Many factors influence the occurrence of disease cases. Among them are environmental and sanitation factors. Malang District has high temperature and humidity. It supports the growth of bacteria, fungi and parasitic worms. Moreover, poor sanitation also supports bacterial infections.

To treat a bacterial disease, the majority of chicken farmers in Malang (93%) use antibiotics. Only a few farmers (4%) did not use antibiotics, they gave multi-vitamin/mineral and herbal medicine.

As many as 54% of broiler and laying hens farmers in Malang stated that they always use the same type of antibiotics continuously for the last three years. The main reasons are because the drug has already rationed from the partner (a business partnership with a Cattlemen's company), they has already knew the drug usage, they are familiar and feel appropriate. However, the farmers do not understand that giving the same drug continuously for a long time cause chicken's resistance to the drug. So, it needs to give guidance to them about the wise and effective management in giving antibiotics.

Table 2. Farmers' opinion to the case of snot/koriza diseases caused by bacteria of *Haemaphilus gallinarum*

No	Explanation	Frequency	Percentage
1	Often (>7 cases per year)	60	38%
2	Moderate (4-6 cases per year)	47	29%
3	Rare (<4 kasus dalam 1 tahun)	53	33%
4	Did not answer	0	0%
Total		160	100%

Table 3. Farmers' opinion on how to overcome bacterial diseases

No	Explanation	Frequency	Percentage
1	Using antibiotic	148	93%
2	Not using antibiotic	7	4%
3	Using another way	3	2%
4	Did not answer	2	1%
Total		160	100%

Although the farmers have been using antibiotics, most of them argued that their poultry had already been treated but not always cured, the disease still persist (table 4). It shows the decline of effectiveness of the drugs already given to the poultry.

Table 4. Farmers' opinion about the effectiveness of using antibiotics

No	Explanation	Frequency	Percentage
1	although has been treated, disease does not always recover (diseases still remain)	123	77%
2	The disease recovered	31	19%
3	Did not answer	6	4%
Total		160	100%

A number of bacteria could be resistant to antibiotics, already. For example, 100% isolates of bacteria Escherichia coli, collection of Microbiology Laboratory - Faculty of Veterinary Medicine - University of Gadjah Mada, resistant to antibiotics.

The research results showed that the antibiotics most commonly used by poultry farms (laying hens and broilers) in Malang is a combination of trimethoprim and sulfadiazine (Table 5). The combination is highly synergistic antibiotics to fight the infections of Gram-positive and Gram negative aerobic bacterial (Drug.com, accessed August 17, 2015). If it is given orally to broiler chickens, this drug combination works 80% (Baert, De Baere, Croubels and De Backer, 2003).

The second type of antibiotics most often used by laying hens and broilers poultries in Malang is amoxicillin (Table 5). A study has done by Krisnaningsih et al. (2005), shows that 80% of Escherichia coli isolates are resistant to antibiotics of ampicillin and amoxicillin. The bacteria of Escherichia coli in chicken farms often cause colibacillosis disease. If the bacteria are resistant to the antibiotics, the prevention to the disease needs to look for other types of antibiotics.

Table 5. Type of antibiotics used at chicken poultry in District of Malang

No	Composision of antibiotic	Percentage (%)
1	Sulfadiazine and trimethoprim	25,11
2	Amoxicillin	14,15
3	Enrofloxacin	12,33
4	Amoxicillin and colistin	10,04
5	Erythromycin and doxycyclin	7,31
6	Sulfonamide	6,39
7	Tetracycline HCL and erythromycin	1,83
8	Quinolon	1,83
9	Oxytetracycline HCL	1,83
10	Oxytetracycline dan neomycine sulfat	1,83
11	Ampicilin dan colistin	0,91
12	Ciprofloxacin	0,91
13	Golongan makrolida	0,91
14	Rifamycin	0,46
15	Penicillin	0,46
16	Aminoglikosida	0,46
17	Did not answer	13,24
	Total	100

Table 6. Behavior in using antibiotics

No	Description	Frequency	Percentage
1	Always use the same antibiotic for the last 3 years	87	54%
2	Do not use the same antibiotic in last 3 years	68	43%
3	Did not answer	5	3%
Total		160	100%

Most farmers in Malang determine drug dosage based on average weight of chicken (Table 7). However, there is 35% of farmers who determined standard doses of drugs based on the weight of the biggest chicken.

Table 7. How to determine the dose of drug

No	Description	Frequency	Percentage
1	Based on the average weight of chickens	127	79%
2	Based on the biggest chicken weight	26	16%
3	Did not answer	7	4%
Total		160	100%

Giving drugs with the average dose to the chickens which have weight that exceeds the average body weight will cause under dosing. It can lead to resistance to the drug given (Burgess et al, 2012).

Table 8. Last drug-treatment before the chicken sold

No	Description	Frequency	Percentage
1	1 day before	5	3%
2	3 days before	36	23%
3	5 days before	34	21%
4	7 days before	24	15%
5	Others (4 or 6 days before)	61	38%
Total		160	100%

Most farmers in Malang already know not to give antibiotics the day before the sale (Table 8), It was a great relief because if the day before the sale is treated antibiotics it is concerned that there is still a residue found in chicken meat. Nevertheless, it should be given counseling to five (5) the poultry farmers in Malang which still gives the drug a day before the sale.

Antibiotic residues in livestock products have been reported several researchers. In fresh chicken meat samples found in West Java class antibiotic residues tetrasiklin70% of 93 samples and a group chlortetracycline (CTC) 30% of 93 samples (Murdiati et al., 1988).

The presence of antibiotic residues will cause a decline in the level of public health as it can lead to resistance, allergic reactions or poisoning. In addition, if people frequently consume poultry products which still contain residues of antibiotics will disrupt the balance of microorganisms in the digestive tract that result in disorders of digestion and absorption of food.

Actually the use of antibiotics in chicken farming can gradually be reduced. This is because as much as 2 percent (3 of 160) farmers in Malang states have tried to overcome bacterial disease without the use of antibiotics and perform other way. Generally, breeders isolate the sick animals, giving vitamin and give herbs or herbal medicine. In addition there are breeders who overcome bacterial infection by giving a pure vitamin C into the drinking water is 1 gram of vitamin C dissolved in 1 liter of drinking water. Pure vitamin C preparations are aimed to lower the pH of drinking water under normal pH is around pH 5.5 to 6. This is done breeders to kill bacteria contained in the water because the bacteria are generally not acid resistant and live a normal temperature of about pH 6 , 8 to 7.5 (Nester, Anderson and Roberts, 2012).

A total of seventy-three (73) percent of laying hens and broiler breeders in Malang never use herbal medicine to overcome bacterial disease. However, there are 33 160 people (33 percent) of farmers in Malang who already use herbal remedies to overcome bacterial disease (Table 9).

Table 9. Usage of herbs to prevent bacterial diseases on chicken poultries in Malang District

No	Description	Frequency	Percentage
1	Ever give herbal	33	21%
2	Never give herbal	117	73%
3	Did not answer	10	6%
Total		160	100%

The farmers, who use herbs remedies, include garlic, ginger, betel leaf, turmeric, noni, brown sugar, binahong, black *temu*, and others. Many researchers have reported the benefits of

various types of herbs for health. Researchers themselves have proven antibiotic potency of garlic, *meniran* (Phylanthus niruri) and betel leaves (Zalizar, et al, 2013 and Zalizar 2013). Therefore, it is necessary to encourage farmers to give herbs antibiotics to their poultries to overcome bacterial infections.

Potency Usage of Antibiotics in Poultry in Malang

Potential usage of antibiotics in Malang is very high considering the population of broiler dan layer (Table 10).

Table 10. Population of chicken in District of Malang (tail)*

No	Population	2014	2013	2012
1	Laying hens	41.156.842	43.066.361	40.268.631
2	Broilers	179.830.682	52.288.601	51.981.778
Total		220.987.524	95.354.962	92.250.409

*Source : Animal Husbandry Department of East Java

If you look at the data in 2014, the population of broiler and layer reached approximately 221 million birds (Table 10). Most farmers in Malang district where the sick chickens are given antibiotics for 5 consecutive days (Table 11). Therefore, if the average chickens (laying hens and broilers) within one year only sick three (3) times and treated for five (5) consecutive days then in a year the potential use of antibiotics there are at least 3,315 billion doses (Table 12) ,

Table 11. Duration of giving drug during illness of chicken (day)

No	Answer	Description	Frequency	Percentage
1	A	3 days consecutive	17	26%
2	B	5 days consecutive	30	46%
3	C	7 days consecutive	8	12%
4	D	only until healing	5	8%
5		Did not answer	5	8%
		Total	65	100%

Prices vary depending on the antibiotic content/composition of the drug in it and the packaging. On all medicine packaging found no data on how the prices of medicines per chicken, so researchers are trying to process existing data of the number of doses available, the need per chicken and the price of each package so found the price for each chicken. Chicken was assumed body weight of at least 1 kg so as to facilitate researchers to determine the price per chicken.

Price of antibiotics for every chicken is expected to average Rp 865.26. If one year District of Malang requires antibiotic dose of 3.315 billion, the cost required more or less reached Rp 2.87 trillion.

Table 12. Cost of antibiotics (Rp per chicken)*

No	Drug name or composition	preparation	Cost per chicken (Rp)**
1	sulfadiazine and trimethopim	caplet	100
2	amoxicillin	tablet	499.5
3	sulfadiazine and trimethopim	bolus	4,216.67
4	amoxicillin and colistin	water-soluble powder	869
5	erythromycin and doxycyclin	water-soluble powder	180
6	Enrofloxacin	water-soluble powder	78.75
7	Tetracycline HCL and erythromycin	capsule	500
8	enrofloxacin	solution	44
9	enrofloxacin	sachet	900
10	Quinolon	Tablet	700
11	oxytetracycline HCL	injection solution	235
12	ampicilin and colistin	water-soluble powder	356
13	Ciprofloxacin	injection solution	1,500
14	oxytetracycline and neomycine sulfat	water-soluble powder	2300
15	Sulfonamide	injection solution	500
	Average (Rp)		865.26

* Data obtained from several sources

** Data analyzed and accessed from internet on 17 August 2015, for 1 kg minimum weight

CONCLUSIONS

- The majority of chicken farmers in Malang use antibiotics to fight against bacterial infection, only a few of them gave multi-vitamin/ mineral and herbal medicine.
- Most farmers use the same antibiotic for at least 3 years continuously.
- Most of farmers determine drug dosage based on average weight of chicken, it can cause under dosing and lead drug resistance.
- Type of antibiotic were often used by the farmers are combination of sulfadiazine and trimethropim, amoxicillin and enrofloxacin.
- If one year District of Malang requires antibiotic 3.315 billion doses, the cost required reaches approximately Rp 2.87 trillion.

SUGGESTIONS

It needs to guide the farmers to use antibiotics wisely: change antibiotics, determine the dose and timing of giving antibiotics.

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