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Research Article

Patterns in Anthelmintic Administration for Laying Hens in Blitar and Kediri District - Indonesia and the Opportunities of Drug Resistance

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Abstract: The purpose of this study was to determine the management of anthelmintic administration and the possibility of drug resistance in laying hens in Blitar and Kediri districts in Indonesia. This study consisted of two stages: first surveying 48 farmers in Blitar and 81 farmers in Kediri to find out how anthelmintic administration management included the frequency of anthelmintic administration for laying hens, types of anthelmintic, the habit of farmers using sustainably the same (> 3 yr) type of anthelmintic, determination of dosage, and use of herbal medicines in controlling worm disease. In the second stage, examine worm eggs at laying hens farms treated with worm medicine at intervals of 2 wk to 4 wk. The results showed that the majority of laying hens provide anthelmintic every 2 mo to 3 mo. In Blitar, the number of farmers who used the same worm medicine in more than 3 yr was 83.33 %. While in Kediri the number reached 97.53 %. The number of farmers who determined anthelmintic doses based on chicken body weight was 95.84 % (Blitar) and 90.12 % (Kediri). The administration of the same type of anthelmintic for more than three consecutive years and the calculation of anthelmintic doses based on the average body weight is thought to have an influence on the occurrence of drug resistance. It is seen that even though chickens were treated with anthelmintic for only 2 wk to 4 wk, worm eggs were found in fecal examination.

Keywords: Anthelmintic, Behaviour farmer, Drug administration, Herbal medicine, Immuno modullator, Worm disease.

1. INTRODUCTION

Food security is an important part of the right to food as well as one of the main pillars of human rights. It is therefore important that food security must be realized from the level of households, villages, districts and even the national level. Farmers have a strategic position in food security, as food producer, yet becoming the largest consumer group. Health is one of the factors that influence the improvement of chicken productivity. One of the diseases that often threaten the health of poultry farm infectious diseases due to worm infection. The health benefits of anthelmintic are very numerous. Anthelmintic administration is not only able to reduce the number of worm larvae but also increase the body weight of laying hens [1, 2]. Therefore, it is not surprising that many farmers uses anthelmintic.

During the past 30 yr the usage of factory-made anthelmintic was a common thing to do at the ranch not only in Indonesia but also worldwide. However administration of the same type of anthelmintic over a long period of time could trigger a drug resistance, so that the effect would become less effective. The use of less effective anthelmintic will be detrimental to farmers. The drug will not be able to kill the all the worms, since remaining worms that are still alive and will cause stunted growth and health of the chickens eventhough farmers have administer anthelmintic. Therefore, a series of research has been conducted about type of worms in poultry farm and pattern of anthelmintic administration on the farm and to assess their tendency to have drug resistance. Locations of research were limited in Blitar and Kediri, East

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Java province, which were considered as the center of chicken farms in Indonesia.

2. MATERIALS AND METHODS

This two-stage study was performed in Blitar and Kediri, East Java, Indonesia. The initial step was gathering information from 48 farmers in Blitar and 81 farmer laying hens in Kediri. This process was conducted by direct interview using a questionnaire. Then, result analysis of the questionnaire was compared with the worm eggs examination, taken from the feces of laying hens.

The method used in the first stage is a survey on the poultry farm that were using anthelmintic for at least three consecutive year. The questions proposed in the questionnaire regarding the type of worm that was often found, the type of anthelmintic used and management in anthelmintic administration (the frequency of drug administration, type of anthelmintic, farmer behavior in using the same type of an anthelmintic, the method of determining the dose and the use of herbal anthelmintic). Method on the second stage was conducting survey on a poultry farm that has been known to administer the same type of anthelmintic continuously for more than 3 yr. On the poultry farm, the stool samples were collected to calculate the number of worm eggs found in the feces. Sampling was repeated three times every 3 wk. The prevalence of worm infections are the number of animals infected with the worm (with the discovery of worm eggs) compared to the total laying hen sampled. The degree of infection is the number of worm eggs were found per gram of feces examined. The number of eggs g^{-1} of feces was calculated using the modified McMaster method with a sensitivity of 100 worm eggs g^{-1} of feces. Data were analyzed with descriptive methods.

3. RESULTS AND DISCUSSION

3.1. Type of Worms Found in the Poultry Farm

Most farmers in the district of Blitar and Kediri argued, Cestode was the type of worm that was most often found in poultry farm with a percentage of 70.83 % and 66.67 %. Cestode or tapeworms are type of worm whose life cycle requires intermediate host. Intermediate host for cestode are ants, flies and beetles rice. Those intermediate hosts are easily founded at chicken farm that has poor sanitation. This research was conducted at the local farm and generally managed with less attention to cage sanitation and environmental sanitation.

Environmental conditions affected the frequency of worm infections. Temperature of Blitar and Kediri district were 23 °C to 31 °C and 24 °C to 32 °C whereas humidity ranged between 70 % to 90 % and 65 % to 100 % [3]. This condition can support the growth of helminth's eggs and larvae in nature.

According to farmers, another worm which often attacked the laying hens was roundworm or including nematodes class. Nematode worm which is commonly found in the small intestine of laying hens is *Ascaridia galli* [4]. The worm's life cycle is very simple because it does not require intermediate host. Embryonated eggs come out from the chicken feces will hatch and grow up in the small intestine when ingested by other chicken. Given the direct life cycle, the opportunity to found of these worms in chicken farms is large.

3.2. Pattern in Anthelmintic Administration Management

Anthelmintic administration management patterns can affect the success of the control of worm infections in poultry farm. Anthelmintic administration management include the frequency of drug administration, type of anthelmintic, farmer behavior in using the same type of an anthelmintic, the method of determining the dose and the use of herbal anthelmintic

3.2.1. The Frequency of Anthelmintic Administration at Poultry Farm

In anthelmintic administration, farmers have different behaviors. Most farmers of laying hens in Blitar and Kediri give anthelmintic drug every 3 mo (43.41 %) and 2 mo (37.21 %). In addition, some farmers give anthelmintic drug every 6 mo (5.43 %); 4 mo (3.88 %); 1 mo (3.10 %). There are only 0.78 % of farmers who answered 5 mo, 7 mo and 8 mo. It can be concluded that the frequency of anthelmintic administration is every 2 mo to 3 mo.

Anthelmintic administration should be tailored to the degree of worm infections. The degree of

infection was the number of eggs/larvae per adult that worms were found in the body of livestock. Unfortunately, as much as 92 % of laying hens farmers in Blitar and 87 % in Kediri never performed laboratory tests to find out if their animal infected with worms before treatment. Some other farmers administer anthelmintic drug after worm was found in the chicken digestive tract during inspection held by health officials. The lack of laboratory facility was the main reason for farmers not to perform test to know the degree of infection. In fact, the price of tools and materials used for the examination of the degree of infection of worms were considered not expensive.

If the numbers of worm eggs are high, anthelmintic should be given to eradicate the worm and prevent interference in productivity or death. However, if the number is still very low, anthelmintic administration is not require because to maintance immunity of the poultry against parasite antigen. Continuous anthelmintic administration without any indication could lead to worm resistance toward those anthelmintic.

Farmers in Blitar and Kediri give anthelmintic every 2 mo to 3 mo. Anthelmintic administration aims to break the life cycle of worm that lasts ranges between 1 mo to 3 mo. But, it is more preferable to examine the degree of infection before administering anthelmintic to ascertain whether anthelmintic is needed.

3.2.2. The Type of Anthelmintic Used at Laying Hen Poultry Farm

Number of farmers of laying hens in Kediri mostly used Benzilmidazol group and Levamisol reached 48.15 %. Types of anthelmintic from Benzimidazole groups like Albendazole, and Fenbendazol. Benzimidazole is an effective anthelmintic to eradicate worms of the class Nematoda, Cestoda , and Trematoda. On the other hand, farmers in Blitar were most likely to use piperazine (64.42 %). Piperazine was considered effective for Nematode worms from the Ascarididae family (for example *A. galli*). However, when considering the majority of the farm in Blitar stricken with Cestode then treatment with piperazine will be less effective.

At the poultry farm in the district of Kediri most farmers used Benzimidazole group and levamisol. On the other livestock such as sheep, there were already many reports of some types of worms that develop resistance to this kind of anthelmintic. According to Garcia et al. [4], there has been a resistance to some anthelmintic in worms that attacked sheep in Colombia. It was seen from the efficacy of anthelmintic such as albendazole only between 0 % to 55 %; fenbendazole 51.40 % to 76.6 %; and levamisole: 0 % to 78.1 % [4]. This result was the first discovery of the existence of multi-resistant against anthelmintic in Colombia. In Tamil Nadu, India, there has been reported the emergence of anthelmintic resistance on sheep farm [5]. The researchers reported the existence of the resistance of worms to Benzimidazole group and levamisole. There was possibility that worm contained in laying hens already developing nature of anthelmintic resistant regarding the pattern of anthelmintic administration in the two districts that used the same type for more than 3 yr [5].

3.2.3. Farmers Behavior in using the Same Type of an Anthelmintic in a Long Term (> 3 yr) on an Ongoing Basis

Most farmers in Blitar and Kediri admitted that they have been using the similar anthelmintic for more than three years. In Blitar, the number of farmers who used the same anthelmintic in more than 3 years is as much as 83.33 %. While in Kediri the number reached 97.53 %. Administration of the same type of anthelmintic for a long period can lead to anthelmintic resistance [6–8]. Long term administration of the same type of anthelmintic was already accustomed and considered more effective than herbal drug.

3.2.4. Determination of Anthelmintic Dose

In Blitar and Kediri, the number of farmers who determined anthelmintic dose based on chicken's body weight was 95.84 % (Blitar) and 90.12 % (Kediri). There was no farmer who determines anthelmintic dose based on the biggest chicken's body weight in Kediri. Meanwhile 2.08 % of farmers in Blitar determined anthelmintic dose based on the biggest chicken's weight.

Determination of anthelmintic dose should be based on every chicken body weight individually. If anthelmintic dose was determined base upon average body weight, then chicken that has body

weight higher than the average chicken body weight will be underdosed. This condition caused only highly sensitive worms will be killed while others will survive and develop anthelmintic resistance and pass the resistance properties to the offspring [8].Most farmers considered that determination of anthelmintic based on individual body weight was not practical and requires automatic weighing instrument [8].

3.2.5. The use of Herbal Medicine in Controlling Worm Diseases

Most farmers having egg laying hens in Blitar and Kediri never use herbal medicine in controlling worm infection. The 75 % egg of laying hens in Blitar and 83.95 % in Kediri answered that they never used herbal medicine to overcome worm disease. Only 8.33 % of farmers in Blitar and 9.88 % in Kediri have used herbal remedies. Meanwhile 8.33 % farmers in Blitar and 6.17 % farmers in Kediri did not answer.

Generally farmers used garlic (*Allium sativum* L.), ginger (*Zingiber officinale* Roscoe.) and turmeric (*Curcuma longa* L.) to overcome the parasitic worms. Some herbal medicines have been widely studied for the ability to kill the worms, like *Citrus aurantifolia* (Christm.) Swingle peel extract [9], pomegranate (*Punica granatum* L.) peel extract [10] and paw paw (*Carica papaya* L.) seeds [11] Herbal also have potensial as Immuno modullator [12]. The attitude of farmers who rarely seek information about the efficacy of herbal medicine in disease treatment led to wrong perception. Most farmers did not use herbal medicines since they did not understand the benefit. While the reason for the farmers who use herbal medicine was because there were no side effects and thus more secure. In addition, some farmers said that by using herbal medicines they can save more costs. Herbal medicine, which was available around the farm, also makes it easier to be found and available to be used at any time.

3.3. The Impact of Anthelmintic Resistance Development in Poultry Farm that uses the Same Type of Anthelmintic for More than 3 years

Worm infection was found in laying hen that treated (2 wk to 4 wk before worm eggs examination) with similar anthelmintic continuously for more than three or more years (Table 1). This indicated the likelihood of the development of worm resistance against anthelmintic given.

In Sweden fenbendazol is considered effective in poultry, but surprisingly the risk of reinfection after administration of fenbendazol is still high [13]. The decline in the number of worm eggs after anthelmintic administration was only temporary, ranged between 2 wk to 4 wk post administration. It was due to suboptimal anthelmintic administration or anthelmintic resistance of worm larvae that are still present in the tissue. The larvae survive and develop into adult worms then produce eggs that were released with feces.

Administration of the same anthelmintic for three or more consecutive year and calculating anthelmintic dose based on the average body weight is thought to have influence on the occurrence of drug resistance. It can be seen from the result of laying hens worm eggs observations that was collected from the fecal examination (Tabe 1). The observation was undertaken in laying hens that was recently treated with anthelmintic albendazole (2 wk to 4 wk before the observation) by searching for the present of worm eggs in feces. In Blitar, from 100 laying hens that were examined, worm eggs was positively found in seven laying hens (worm disease prevalence reached 7 %). While in Kediri, from 120 laying hens that were examined, worm eggs was positively foung in 17 laying hens (14.17 %). Type of eggs worm that found were *Ascaridia galli* and *Heterakhis gallinarum*.

Table 1. Prevalence of layer infected with worms (%) after being treated with anthelmintic

No	Region	Number of Laying Hens Examined	Worm Eggs*		Prevalence (%)
			Positive	Negative	
1	Blitar	100	7*	93	7
2	Kediri	120	17*	103	14.17

*worm eggs examination was held 2 wk to 4 wk post anthelmintic administration.

Those facts showed that it was probable that worm resistance against anthelmintic was developing because worm eggs are still present from the fecal examination. Given the nature of drug resistance which can be transmitted by the worm to its offspring, the opportunity of increasing number of worm resistance to anthelmintic was high so that the treatment became less beneficial.

4. CONCLUSION

The results showed that most egg laying hens were given anthelmintic for 2 mo to 3 mo, anthelmintic types that are often used are Benzimidazole Group, Levamisole (in Kediri) and Piperazine (in Blitar). In Blitar, the number of farmers who used the same anthelmintic in more than 3 yr is 83.33 %. While in Kediri the number reached to 97.53 %. The number of farmers who determined anthelmintic dose based on chicken's body weight was 95.84 % (Blitar) and 90.12 % (Kediri). Most farmers having egg laying hens in Blitar and Kediri never use herbal medicine in controlling worm infection. Administration used the same anthelmintic for three or more consecutive years and calculated anthelmintic dose based effect on the average body weight is thought to influence the occurrence of drug resistance. According to farmers, the most common type of worm in farm are tapeworm (Cestode) and roundworms (Nematode). But from the results of feces examination only Nematodes *Ascaridia galli* and *Heterakhis gallinarum* were observed.

5. REFERENCES

1. Zalizar, L, F. Satrija, R. Tiuria & D.A. Astuti. Dampak infeksi *Ascaridia galli* terhadap gambaran histopatologis dan luas permukaan vili usus serta penurunan bobot hidup starter [The impact of *Ascaridia galli* infection on histopathological features and the surface area of intestinal villi as well as decreasing starter live weigh]. *Jurnal Ilmu Ternak dan Veteriner* 11(3): 215–222 (2006). [in Bahasa Indonesia].
2. Zalizar, L, F. Satrija, R. Tiuria & D.A. Astuti. Respon ayam yang mempunyai pengalaman infeksi *Ascaridia galli* terhadap infeksi ulang dan implikasinya terhadap produktivitas dan kualitas telur [The response of chickens who have experience of *Ascaridia galli* infection to reinfection and its implications for egg productivity and quality]. *Jurnal Produksi Ternak* 9(2): 92–98 (2007). [in Bahasa Indonesia].
3. BMKG. Badan Meteorologi, Klimatologi dan Geofisika. Prakiraan Cuaca Jawa Timur. [Meteorology Climatology and Geophysics Council. East Java Weather Forecast]. [Online] from https://www.bmkg.go.id/cuaca/prakiraan-cuaca-indonesia.bmkg?Prov=12&NamaProv=Jawa%20Timur (2018). [in Bahasa Indonesia]. [Accessed on 16 April, 2018].
4. Garcia, C.M., L.K. Sprenger, E.B. Ortiz & M.B. Molento. First report of multiple anthelmintic resistance in nematodes of sheep in Colombia. *The Anais da Academia Brasileira de Ciências* 88(1): 397–402 (2016).
5. Easwaran, C., T.J. Harikrishnan & M. Raman. Multiple anthelmintic resistance in gastrointestinal nematodes in sheep in Southtern India *Veterinarski Arhiv* 79(6): 611–620 (2009).
6. da Cruz, D.G., L.O. da Rocha, S.S. Arruda, J.G.B. Palieraqui, R.C. Corderio, S. Junior, et al. Anthelmintic efficacy and management practices in sheep farms from the state of Rio de Janerio, Brazil. *Veterinary Parasitology* 170: 340–343 (2010).
7. Shalaby, H.A. Anthelmintic resistance; how to overcome it? *Iranian Journal of Parasitology* 8(1): 18–32 (2013).
8. Burgess, C.G., Y. Bartleya, E. Redmanb, J.P. Skucea, M. Nath, F. Whitelawb, et al. A survey of the *Trichostrongylid* nematode species present on UK sheep farms and associated anthelmintic control practices. *Veterinary Parasitology* 189: 299–307 (2012).
9. Enejoh, O.S., M.M. Suleiman, J.O. Ajanusi & S.F. Ambali. In vitro anthelmintic efficacy of extracts of citrus Aurantifolia (Christm) Swingle fruit peels against *Heligmosomoides Bakeri* Ova and larvae. *International Journal of Current Pharmaceutical Research,* 7(2): 92–96 (2015).
10. Dkhil, M.A. Anti-coccidial, anthelmintic and antioxidant activities of pomegranate (*Punica granatum*) peel extract. *Parasitology Research* 112(7): 2639–46 (2013)
11. Ameen, S.A, O.S. Adedeji, L.O. Odejapo, T. Salihu & O.L Fakorede. Anthelmintic efficacy of paw paw (*Carica papaya*) seeds in commercial layers. *African Journal of. Biotechnology* 11(1):126–130 (2012).
12. Zalizar, L. Flavonoids of *Phylanthus niruri* as immunomodulators a prospect to animal disease control. *ARPN Journal of Science and Technology* (3)5: 529–532 (2013).