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Case Reports

Effectiveness Therapy to Eliminate Parasite in Cattle at Teaching Factory Polytechnic State of Lampung

Efektifitas Terapi Eliminasi Parasit pada Sapi di *Teaching Factory* Politeknik Negeri Lampung

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ABSTRACT

Background: Gastrointestinal parasitic infections remain a significant global health concern in livestock, involving parasites from the Trematoda, Cestoda, and Nematoda classes. These infections can severely impact animal health and productivity. **Purpose:** This comparative study to evaluate the effectiveness of oral albendazole versus subcutaneous ivermectin in reducing gastrointestinal parasite infestations in cattle maintained at the Teaching Factory of the State Polytechnic of Lampung. **Case:** Eight cattle exhibited clinical signs including emaciation, dull coat, foul-smelling and dark-colored feces, with body temperatures ranging from 38.2°C to 38.6°C. Appetite and activity levels remained within normal limits. The animals had a recorded history of deworming (July 2023) and foot and mouth disease (FMD) vaccination. **Case Management:** Anthelmintic therapy was administered using either oral albendazole or subcutaneous ivermectin. **Conclusion:** Gastrointestinal and ectoparasitic infestations can lead to significant economic losses in livestock production. Subcutaneous administration of ivermectin proved to be more effective than oral albendazole in reducing gastrointestinal parasite infestation in cattle.

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ABSTRAK

Latar Belakang: Infeksi parasit saluran pencernaan merupakan masalah kesehatan global yang signifikan pada ternak, melibatkan parasit dari kelas Trematoda, Cestoda, dan Nematoda. Infeksi ini dapat berdampak serius terhadap kesehatan dan produktivitas hewan. **Tujuan:** Penelitian komparatif ini bertujuan untuk mengevaluasi efektivitas pemberian albendazol per oral dibandingkan dengan ivermektin secara subkutan dalam menurunkan infestasi parasit saluran pencernaan pada sapi yang dipelihara di Teaching Factory Politeknik Negeri Lampung. **Kasus:** Delapan ekor sapi menunjukkan gejala klinis berupa badan kurus, bulu kusam, feses berbau lebih menyengat dan berwarna lebih gelap, dengan suhu tubuh berkisar antara 38,2°C hingga 38,6°C. Nafsu makan dan aktivitas masih dalam batas normal. Riwayat pengobatan cacing terakhir tercatat pada Juli 2023, serta telah menerima vaksinasi penyakit mulut dan kuku (PMK). **Penatalaksanaan Kasus:** Terapi anthelmintik dilakukan dengan pemberian albendazol per oral dan ivermektin secara subkutan. **Kesimpulan:** Infestasi parasit gastrointestinal dan ektoparasit dapat menyebabkan kerugian ekonomi yang signifikan pada usaha peternakan. Pemberian ivermektin secara subkutan terbukti lebih efektif dibandingkan albendazol per oral dalam menurunkan infestasi parasit saluran pencernaan pada sapi.

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Kata kunci: Albendazol; Ektoparasit; Endoparasit; Helmintiasis; Ivermectin

INTRODUCTION

Indonesia is an archipelagic country where the majority of Indonesian people earn their livelihood in the livestock sector. In this regard, paying attention to livestock and veterinary public health is necessary, which can impact the transmission of zoonotic diseases. One of them is parasitic diseases, especially helminthiasis. Gastrointestinal parasitic infection is one of the significant health problems in the world. These gastrointestinal parasites have various types from the Trematoda, Cestoda, and Nematoda classes. Of these three classes, the ones that most frequently infect livestock are worms from the Trematoda and Nematode classes. Worms that fall into the Trematoda Class, which commonly infect cattle, include Fasciola sp., Paramphistomum sp. Next in the Nematoda Class include *Trichuris sp., Oesophagostomum sp., Trichuris sp., Bunostomum sp., Strongyloides sp., Toxocara sp.,* and others. These three classes of worms can have quite a severe impact on livestock and the health of the veterinary community in general. The most economically significant general gastrointestinal parasites in ruminants are *Haemonchus sp., Trichostrongylus sp., Teladorsagia sp./ Ostertagia sp., Oesophagostomum sp., Trichuris sp., Nematodirus sp. and Strongyloides sp.* (Hutchinson, 2009; Solomon, *et al.,* 2024). Substantial economic losses have been seen in livestock production, causing problems for animals and humans (Kappes, *et al.,* 2023).

Another impact of helminth infection is one of the significant causes of wastage and decreased productivity, exerting their effect through mortality, morbidity, reduced growth rate, weight loss in young growing calves, and late maturity of slaughter stock. It also causes unthriftiness, gut damage, anemia, diarrhea, anorexia, gastroenteritis, abdominal distention, emaciation, reduced feed intake, decreased absorption of nutrients, reduced milk and meat production, and working capacity of the animal, mainly in developing countries (Ola-Fadunsin, *et al.,* 2020). To avoid this on a farm, deworming measures are needed. Deworming is an action carried out to provide anthelmintics to animals as a preventive or curative measure. Deworming can be administered orally or by subcutaneous injection. The use of chemotherapeutic drugs to control internal and external parasites is a widespread practice in livestock production, and several broad-spectrum anthelmintics are available on the market for the control of helminthosis. Currently, failure of anthelmintics and reduced efficacy due to resistance of nematodes in sheep and goats are becoming a threat in some countries (WOAH, 2021). Gastrointestinal parasites can generally be controlled using broad-spectrum anthelmintics. Widely available commercial anthelmintics commonly used by farmers include macrocyclic lactones (avermectin and milbemycins, benzimidazole, and imidazothiazoles (levamisole and hydropyrimidines [pyrantel/morantel]). Ivermectin is a macrocyclic lactone with broad activity against gastrointestinal nematodes and ectoparasites (Molento and Brandao, 2022). Ivermectin acts by binding the α-subunit of glutamate-gated chloride channel receptors (GluCl) in nerve synapses (Qian, *et al.,* 2023), which inhibits nematode feeding, fecundity, and motility (Barron-Bravo, *et al.,* 2020; Gkimprixi, *et al.,* 2023). Albendazole is a benzimidazole with a methyl carbamate group effective against lungworms (Abdullahi and Yeong, 2024), gastrointestinal nematodes, tapeworms, and liver flukes (Opsal, *et al.,* 2021). Benzimidazole acts by binding to β-tubulin, which inhibits dimerization with α-tubulin during microtubule formation in nematode cells (Jones, *et al.,* 2022). As a center for Vocational Higher Education, the Polytechnic State of Lampung has a Teaching Factory in which several types of livestock are used as learning media for students, especially in practical matters. Activities include cattle fattening, maintenance, and monitoring and evaluating livestock health. However, several obstacles are faced, including the reduction in body weight of cows caused by exposure to parasites, especially gastrointestinal parasites. This makes it difficult for students to carry out the maintenance process. The efforts made are by giving anthelmintics orally and also via intramuscular injection using several types of drugs, including Albendazole bolus and Ivermectin. Regarding the background above, a comparative study was carried out on the use of oral albendazole with Ivermectin given by subcutaneous injection to cattle to see the effectiveness through evaluating the reduction in parasite infestation in the digestive tract of livestock at the Polytechnic State of Lampung Teaching Factory.

CASE

Anamnesis and Physical Examination

Eight cattle (Table 1 with breed and body weight), kept at Polytechnic State of Lampung Teaching Factory (Polinela) showed clinical symptoms such as emaciation, dull fur, a more intense smell of feces, and darker fecal color. Body temperature ranged from 38.2ºC to 38.6ºC, appetite was as expected, and activity looked normal. There was a history of giving worm medicine around July 2023, and have history of Foot and Mouth Disease (FMD) vaccination. Physical examination was carried out at the Polinela Teaching Factory, including vital signs, including heart rate, respiratory frequency, rectal temperature, pulse rate, and capillary refill time (Table 2 with three repetitions). No abnormal signs were found in several examinations, such as examination of eyes and extremity movements.

Table 1. Breed and Body Weight cattle in Polytechnic State of Lampung Teaching Factory

No.	Breed	Body Weight
1.	Bali Cattle	80 kg
2.	Brangus Cattle	408 kg
3.	Friesian Holstein Cattle	120 kg
4.	Pesisir Betina Cattle	248 kg
5.	Male Pesisir Cattle	332 kg
6.	Female Peranakan Ongole Cattle	240 kg
7.	Male Peranakan Ongole Cattle	385 kg
8.	Simental Cattle	405 kg

Laboratory Examination

Laboratory examinations were carried out using the sedimentation method, the Modified Willis method (WM), and the McMaster method. The principle of the sedimentation

Table 2. Vital signs in cattle in Polytechnic State of Lampung Teaching Factory

No.	Breed	Result					Normal Value*				
		HR (×/m)	RF (×/m)	RT (°C)	PF (×/m)	CRT (second)	HR (×/m)	RF (×/m)	RT (°C)	PF (×/m)	CRT (second)
1.	Bali Cattle	40	27	38,0	40	<2	36 - 80	18 - 35	38 - 39	40 – 70	<2
2.	Brangus Cattle	43			43	<2	36 - 80	18 - 35	38 - 39	40 – 70	<2
3.	Friesian Holstein Cattle	40	33	38,6	40	<2	36 - 80	18 - 35	38 - 39	40 – 70	<2
4.	Pesisir Betina Cattle	50	20	38,1	50	<2	36 - 80	18 - 35	38 - 39	40 – 70	<2
5.	Male Pesisir Cattle	54	20	38,6	54	<2	36 - 80	18 - 35	38 - 39	40 – 70	<2
6.	Female Peranakan Ongole Cattle	47	18	38,1	47	<2	36 - 80	18 - 35	38 - 39	40 – 70	<2
7.	Male Peranakan Ongole Cattle	40	24	38,6	40	<2	36 - 80	18 - 35	38 - 39	40 – 70	<2
8.	Simental Cattle	46	35	38,2	46	<2	36 - 80	18 - 35	38 - 39	40 – 70	<2

Note: HR = Heart Rate, RF= Respiratory Frequency, RT= Rectal Temperature, PF= Pulsus Frequency, CRT= Capillary Refill Time

Table 3. Dosage of Anthelmintic Administration to Cattle

No.	Breed	Body Weight	Dosage and Medication Route of Administration
1.	Bali Cattle	80 kg	Ivermectin 1 mL/50 kg BW Subcutan
2.	Brangus Cattle	408 kg	Albendazole 10 mg/kg BW (Flukicide 1 bolus/200 kg) peroral
3.	Friesian Holstein Cattle	120 kg	Ivermectin 1 mL/50 kg BW Subcutan
4.	Pesisir Betina Cattle	248 kg	Ivermectin 1 mL/50 kg BW Subcutan
5.	Male Pesisir Cattle	332 kg	Albendazole 10 mg/kg BW (Flukicide 1 bolus/200 kg) peroral
6.	Female Peranakan Ongole Cattle	240 kg	Ivermectin 1 mL/50 kg BW Subcutan
7.	Male Peranakan Ongole Cattle	385 kg	Albendazole 10 mg/kg BW (Flukicide 1 bolus/200 kg) peroral
8.	Simental Cattle	405 kg	Albendazole 10 mg/kg BW (Flukicide 1 bolus/200 kg) peroral

method is to carry out repeated washing of fresh feces to obtain eggs in the debris. This process is done by mixing 200 mL of water with 5 grams of feces and leaving it for 10 minutes. The "washing" is usually completed by combining a large volume of water (200 mL) with a small number of feces, letting the suspension stand for at least 10 minutes, then discarding some of the supernatants and remixing the sediment with water and repeat 3 – 5 time (University of Saskatchewan, 2021). The eggs of helminth are visible in the final sediment. A modified WM was performed with centrifugation (Gałązka, *et al.*, 2022; Akande *et al.*, 2022). Three grams of feces were passed through a sieve in 10 mL of sucrose solution, and the suspension was poured into 10 mL centrifuge tubes and centrifuged for 2 min at 2,000 rpm. Subsequently, more sucrose solution was added to each tube to make a bulging meniscus, on top of which a cover glass was placed for 20 min. Finally, the coverslip was placed on a glass slide, and the presence of parasitic oocysts and eggs was investigated under a light microscope at 100 × and 400 × magnification (Gałązka, *et al.*, 2022; Pyziel-Serafin, *et al.*, 2022). The modified McMaster technique (MAFF, 1986) was performed using 3 grams of feces put into a container, adding 42 ml of saturated sodium chloride solution (NaCl, specific gravity = 1.2) diluted in a 1:15 ratio. The fecal suspension was thoroughly homogenized and strained three times through a wire mesh (aperture of 250 m) to remove large debris. The strained suspension was collected in a bowl and thoroughly mixed by pouring it 10 times from one bowl to another. Then, 0.5 ml aliquots were added to each of the two chambers of a McMaster slide. After 10 min, the GI parasites egg counts were performed under the McMaster slide's two grids (volume = 0.3 ml). Under a light microscope using a 100× magnification. FEC values, expressed as EPG or OPG of parasites, were obtained by multiplying the total number of eggs by 50 (McM50) (Alowanou, *et al.*, 2021).

Treatment

Giving anthelmintic doses to cattle is based on the label stated on the drug label and is by the dosage for worm medicine (Table 3). Administration of combination worming drugs refers to the elimination of widely parasites starting from the trematode, cestode and nematode groups such as Strongyloides sp., Ostertagia ostertagi (Hafiz, *et al.*, 2010; Suputtamongkol, *et al.*, 2011; Puspitasari, *et al.*, 2015).

RESULT

Examination of fecal samples from eight cattle of various breeds revealed gastrointestinal parasite infestations in five individuals (Table 4). Post-treatment fecal examinations of eight cattle from various breeds at the Teaching Factory of the State Polytechnic of Lampung revealed the presence of

Table 4. Results of laboratory examination of fecal sample

No.	Breed	Result	Information
1.	Bali Cattle	-	-
2.	Brangus Cattle	-	-
3.	Frisien Holstein Cattle	+	*Oesophagostomum sp.*
4.	Female Pesisir Cattle	+	*Fasciola sp.*
5.	Male Pesisir Cattle	+	*Trichuris sp., Fasciola sp.*
6.	Female Peranakan Ongole Cattle	+	*Paramphistomum sp.*
7.	Male Peranakan Ongole Cattle	+	*Fasciola sp., Paramphistomum sp.*
8.	Simental Cattle	-	-

Table 5. Parasite infections in cattle after anthelmintic treatment

No.	Breed	Result	Information
1.	Bali Cattle	-	-
2.	Brangus Cattle	-	-
3.	Frisien Holstein Cattle	-	-
4.	Female Pesisir Cattle	-	-
5.	Male Pesisir Cattle	+	*Paramphistomum sp.*
6.	Female Peranakan Ongole Cattle	-	-
7.	Male Peranakan Ongole Cattle	+	*Fasciola sp.*
8.	Simental Cattle	-	-

gastrointestinal parasites in two individuals. Male Pesisir cattle were found to be infected with *Paramphistomum sp.,* while male Peranakan Ongole cattle tested positive for *Fasciola sp.* All other cattle—including Bali, Brangus, Frisien Holstein, female Pesisir, female Peranakan Ongole, and Simental—showed no detectable parasitic infections following the administration of anthelmintic drugs.

DISCUSSION

Endoparasite and ectoparasite infections are prevalent in ruminant livestock worldwide. Parasite infections are the main factor for economic losses through decreased productivity and increased mortality. Infection of parasites will cause weight loss, lost appetite (Yuartono, *et al.,* 2020; Mendoza, *et al.,* 2023), decreased feed efficiency (Yuartono, *et al.,* 2020), delayed puberty, reduced fertility rates, low birth rates (Yuartono, *et al.,* 2020; Haywad, *et al.,* 2021), low immunity, susceptibility to the entry of other disease agents or other health disorders that can worsen the overall condition (Yuartono, *et al.,* 2020; Nielsen, *et al.,* 2023).

Control of parasitic infestations in ruminant livestock groups highly depends on the availability and type of anthelmintic drugs. Currently, antiparasitic drugs for both endoparasites and ectoparasites in ruminants with various products have been widely circulated and used in the field. Between 1960 and 1990, the pharmaceutical industry rapidly developed antiparasitic compounds with a high spectrum of activity and drug safety levels (Yuartono, *et al.,* 2020; Lifshitz, *et al.,* 2024). Ivermectin is an antiparasite that can be used for endoparasites and ectoparasites (Yanuartono, *et al.,* 2020; Dziduch, 2022; Sulik, *et al.,* 2023). Ivermectin can cause harmful side effects when administered above the maximum dose or given to non-target animals (Mounsey, *et al.,* 2022; Failoc-Rojas *et al.,* 2023). Cases of ivermectin toxicity have been reported in pigs, cows, dogs, cats, horses, and turtles (Celis-Giraldo, *et al.,* 2020; Salman, *et al.,* 2022). Ivermectin is a specific avermectin that is the result of the fermentation of *Streptomyces avermitilis* (El-Saber, *et al.,* 2020), which can be used to overcome gastrointestinal parasites and ectoparasites (Castillejos-López, *et al.,* 2022). Ivermectin inhibits parasite motility due to increased gamma amino butyric acid (GABA) in the central nervous system (Paul, 1986; Castillejos-López, *et al.,* 2022). In addition to ivermectin, the albendazole group is a broad-spectrum anthelmintic widely used in Indonesia. This type of anthelmintic is widely used because it is effective against many groups of gastrointestinal parasites and affordable in developing countries. This drug is also listed in the World Health Organization (WHO) Essential Medicine list as an effective and safe drug (WHO, 2016; Kristiyani, *et al.,* 2019).

Albendazole is a type of modern anthelmintic that is vermicidal, larvicidal, and ovicidal (Husin, *et al.,* 2022). Albendazole causes the worm's interstitial cells to be unable to absorb food, so the worms run out of glycogen and can no longer produce ATP (Chai, *et al.,* 2021). Albendazole also inhibits egg production (Melhorn, 2008; Ignacio, *et al.,* 2023). However, long-term use of anthelmintics can cause resistance effects (Nielsen, *et al.,* 2023). In this study, anthelmintic administration was given through two routes: the first through intramuscular injection and the second through the oral route. The results of the study showed that ivermectin was more effective than albendazole based on further examinations listed in Table 2 whereby only two cows still had parasites from the Trematoda group, namely *Oesophagostomum sp.* and *Fasciola sp.* While in cows injected with ivermectin, there were no parasites in their feces when re-examined.

A study showed that the effectiveness of albendazole against fasciolosis tends to decrease because the effectiveness of the drug is limited only to the adult stage and is less effective for worm eggs (Kristiyani, *et al.,* 2019; Babják *et al.,* 2021). Antitrematode compounds (flukicides) are divided into three groups, namely those that are effective for all juvenile and adult stages, juvenile stages aged 6-8 weeks and adults, and for adult stages only (Kristiyani, *et al.,* 2019; Fairweather, *et al.,* 2020). The mechanism of action of albendazole is to bind to beta-tubulin on the colchicine-sensitive side of the cell wall, thereby inhibiting polymerization and formation of worm tubules. This compound also inhibits spindle formation in the cell division process, causing inhibition of egg formation and development. Furthermore, albendazole will inhibit glucose uptake by larvae and adult worms, resulting in the depletion of glycogen storage (Kristiyani, *et al.,* 2019; Malak, 2023). However, the resistance mechanism by parasites causes drug target avoidance, or the parasite can build a specific defense mechanism (Kristiyani, *et al.,* 2019).

The advantage of using an Ivermectin sustained-release implant is that the drug can remain in the serum long enough to prevent parasite reinfestation. The results of research and treatment practices in the field show that ivermectin or ivermectin with various combinations of other drugs can effectively control endoparasite and ectoparasite infestations (Kaur, *et al.,* 2024). In addition, antiparasitic drugs can reduce disease incidence in livestock and ultimately reduce economic losses in the livestock industry (Yanuartono, *et al.,* 2020).

CONCLUSION

The impact of exposure to ectoparasites and endoparasites in livestock can cause economic losses, as well as weight loss. The use of ivermectin in cattle at the Teaching Factory Polytechnic State of Lampung is very effective, as evidenced by the examination of gastrointestinal parasite infestation, which decreased significantly compared to Albendazole.

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CONFLICT of INTEREST

The author declares no conflict of interest in the authorship of this case report.

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ETHICAL APPROVAL

In this Case Study, there is no ethical approval needed.

AUTHORS' CONTRIBUTIONS

VRP handled cases, laboratory examinations, recorded data, processed data, and wrote articles. DDP was responsible for supervising the handling of cases, laboratory examination, data processing, and article writing. FS handled case and laboratory examination.

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