Jurnal Veteriner pISSN: 1411-8327; eISSN: 2477-5665
Terakreditasi Nasional Peringkat 2, Dirjen Riset dan Pengembangan,
Kemendiktisaintek RI SK No 10/C/C3/DT.05.00/2025, 21 Mar.2025

Juni 2025 Vol. 26 No.2: 264-274
DOI: 10.19087/jveteriner.2025.26.2.264
online pada http://ojs.unud.ac.id/index.php/jvet

Poor Level of Knowledge About Fascioliasis Among Slaughter Officers and Beef Liver Traders in Traditional Markets and Its Infection in Beef Liver

(*TINGKAT PENGETAHUAN YANG RENDAH TENTANG FASCIOLIASIS PADA PETUGAS RPH DAN PEDAGANG HATI SAPI DI PASAR TRADISIONAL SERTA INFEKSINYA PADA HATI SAPI*)

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ABSTRACT

Based on data from the Central Bureau of Statistics in 2022, Jember Regency ranked fourth in East Java for the highest number of beef cattle commodities. One of the food products derived from cattle is beef liver, which must be kept safe to prevent foodborne diseases, such as fascioliasis. The distribution process of beef liver involves slaughterhouse (RPH) workers and market traders. This study was aimed to determine the differences in the level of knowledge about fascioliasis between slaughterhouse workers and beef liver traders in traditional markets, as well as its infection in beef liver. This research was a descriptive analytic study with a cross-sectional design, conducted at slaughterhouses and all traditional markets in Kaliwates, Ambulu, and Silo Districts from August to December 2024. The respondents consisted of 17 slaughterhouse workers and 24 beef liver traders. A total of six beef liver samples were taken from slaughterhouses and 24 from traditional markets. Knowledge levels regarding fascioliasis were assessed using questionnaires, while *Fasciola* spp. was identified in liver samples. Bivariate analysis showed no significant difference in knowledge levels between slaughterhouse workers and beef liver traders ($p>0.05$) namely poor level of knowledge, nor in *Fasciola* spp. infection rates between liver samples from slaughterhouses and those from traditional markets ($p>0.05$). These findings suggest that both groups have limited awareness of *Fasciola* spp., infection and its health impact. Therefore, enhanced education, outreach, and monitoring of fascioliasis are necessary to prevent foodborne diseases.

Keywords*:* foodborne disease*;* beef liver; *Fasciola* sp.*;* level of knowledge

ABSTRAK

Badan Pusat Statistik tahun 2022 menyatakan bahwa Kabupaten Jember menempati urutan keempat dengan jumlah komoditas sapi potong terbanyak di Jawa Timur. Salah satu produk pangan dari sapi ialah hati sapi yang penting dijaga keamanan pangannya sebagai pencegahan terhadap penyakit bawaan makanan atau *fooborne disease*, yaitu Fascioliasis. Proses distribusi produk hati sapi melibatkan petugas Rumah Potong Hewan (RPH) dan pedagang di pasar. Tujuan penelitian ini adalah untuk mengetahui perbedaan tingkat pengetahuan tentang fascioliasis antara petugas RPH dengan pedagang hati sapi di pasar dan infeksinya pada hati sapi. Penelitian ini merupakan penelitian deskriptif analitik dan desain penelitian *cross sectional*. Penelitian dilakukan di RPH dan seluruh pasar tradisional yang ada di Kecamatan Kaliwates, Ambulu dan Silo yang dilakukan pada bulan Agustus hingga Desember 2024. Responden penelitian adalah 17 petugas RPH dan 24 pedagang hati sapi di pasar tradisional. Jumlah sampel hati sapi yang digunakan sebanyak enam dari RPH dan diambil dari pasar tradisional sebanyak 24 sampel. Tingkat pengetahuan tentang fascioliasis ditentukan berdasarkan wawancara kuisioner dan cacing *Fasciola sp.* diidentifikasi dari sampel hati. Hasil analisis uji bivariat diketahui tidak ada perbedaan signifikan tingkat pengetahuan antara petugas RPH dengan pedagang hati sapi di pasar tradisional ($p>0,05$), yaitu tingkat pengetahuan rendah dan infestasi *Fasciola sp.* pada hati sapi di RPH dengan di pasar tradisional ($p>0,05$). Hasil tersebut menunjukkan infeksi *Fasciola* sp., di hati sapi dan dampaknya bagi kesehatan belum banyak diketahui oleh petugas RPH maupun pedagang hati sapi, sehingga perlu ditingkatkan edukasi, sosialisasi dan *monitoring* tentang fascioliasis untuk mencegah *food borne diseases*.

Kata-kata kunci: *foodborne disease*; hati sapi; *Fasciola* sp.*;* tingkat pengetahuan

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INTRODUCTION

The World Health Organization showed that 600 million cases of foodborne diseases result in 420,000 deaths yearly (WHO, 2015). Foodborne disease can be defined as a communicable and potentially deadly illness caused by the contamination of food and water with bacteria, viruses, parasites or chemicals (Qi *et al*., 2022). Foodborne trematodes (FBTs) are a foodborne disease caused by transmitting trematodes to humans through food. Based on the distribution data of FBTs conducted by WHO in 224 countries, *Fasciola* sp. infections were reported in 75 countries, with the highest percentage among the four other trematode genera (WHO, 2020). Foodborne trematodes are a foodborne disease caused by the transmission of diseases due to *Fasciola* sp*.,* infection in the liver or bile ducts of humans and livestock, known as fascioliasis (Yuskawati *et al*., 2023).

Humans and livestock can be infected directly by *Fasciola* sp., by consuming uncooked aquatic plants containing meta-cercariae of *Fasciola* sp., (Lalor *et al*., 2021). Fascioliasis is also classified as a zoonotic disease that can be transmitted from animals to humans (WHO, 2020). *Fasciola* sp., worms, known as ectopic fascioliasis, can infect organs other than the liver. Consumption of undercooked beef liver infected with *Fasciola* sp., in the adult phase will cause the worms to attach to the pharyngeal mucosa, resulting in *Halzoun syndrome*. This syndrome causes the suf-ferers to experience fever, cough, scratchy throat, tearing, tinnitus, submandibular oedema and even temporary hearing loss (Musharrafieh *et al*., 2018). The beef liver can contain adult *Fasciola* sp., worms concerning food safety, especially beef liver products. In implementing food safety for beef liver

products, slaughterhouse officers and beef liver traders in the market play a role in selecting beef liver that is suitable for consumption.

The slaughterhouse is a facility for slaughtering animals that provides food products in a clean and healthy condition. Quality control of animal food products at the slaughterhouse begins with the inspection of cattle health standards, cutting procedures and the hygiene and sanitation of the staff (García-Díez *et al*., 2023). Food safety animal products are closely related through the concept of safe from farm to table, which means the products are safe from the farm until they can be served to consumers (Biru *et al*., 2019). Therefore, beef liver traders are also responsible for being the final distributors in selecting healthy animal products before they reach the hands of consumers.

Several previous studies have shown the presence of *Fasciola* sp., infection in cow livers obtained from slaughterhouses and cow liver traders (Damayanti *et al*., 2019; Wariata *et al*., 2019). Therefore, the risk of of disease due to consuming liver containing *Fasciola* spp., could increase if the slaughterhouse officers or beef liver traders in the market were unaware of livestock fascioliasis. Knowledge is part of observation and application in the development of an individual's mindset, which will influence a person's attitude and behavior (Mohajan, 2016). The knowledge of fascioliasis among the slaughterhouse officers and beef liver traders could affect their attitudes and behavior to sell or not the liver containing *Fasciola* spp., to consumers. Therefore, this study was aimed to know the differences in knowledge levels about fascioliasis between slaughterhouse officers and beef liver traders in the market and the infection of *Fasciola* spp., in beef liver.

RESEARCH METHODS

This study was descriptive-analytical research with a cross-sectional study design. The research was conducted at the animal slaughterhouse and markets in the districts of Kaliwates, Silo and Ambulu, Jember Regency, East Java, from August to December 2024. The population in this study consists of all the staff at the slaughterhouse and all the beef liver traders in the traditional markets located in the districts of Kaliwates, Silo and Ambulu. The respondents in this study were determined using total sampling that consist of 17 slaughterhouse officers and 24 beef liver traders. Sampling of beef liver was carried out using total sampling too that consist of six samples from six cow in the slaughterhouses and 24 from traditional markets. This research has been approved by the Research Ethics Commission of the Faculty of Medicine, University of Jember with the number 5465/UN25.1.10.2/KE/2024.

Respondent interviews were conducted based on a questionnaire tested for validity and reliability. The questionnaire to measure the knowledge variable in the study contains eight questions for each slaughterhouse officer and beef liver trader in the traditional markets of Kaliwates, Silo and Ambulu District. The research began by providing respondents with an understanding of the study and requesting their consent by signing the informed consent form if they were willing to participate. The researcher conducted interviews by asking questions that corresponded to the research questionnaire.

The assessment result was obtained by comparing the total maximum score and multiplying it by 100%. Knowledge scores were calculated using the formula P= (n/N) x 100%. The interpretation of the knowledge level assessment (Darsini *et al*., 2019) was divided into two categories as follows: a) Knowledge was considered good if the score was above (>) 75%; b) Knowledge was considered poor if the total score was below (≤)75%.

Beef liver sample (500 g) was placed into a sterile pouch and transported in sterile container. A total of 30 samples were collected from slaughterhouse and

traditional markets. The samples were taken and sent to Parasitology Laboratory, Facul-ty of Medicine, University of Jember.

The liver samples were sliced and then examined for worm parasites. The presence of *Fasciola* sp., was identified macroscopically by observing the worm's morphology. *Fasciola* sp., worms are greyish-brown in colour, with a dorsoventrally flattened leaf-like body shape, narrow sho-ulders and a blunt posterior (Syamsuddin *et al*., 2024). The samples were identified as parasites and their numbers were counted. The samples were taken in the morning and examined on the same day to prevent damage to the samples. After identification, the worms were placed into a bottle containing 70% alcohol and labelled with the date, number of worms and sampling location.

Statistical analysis using SPSS soft-ware version 25 to determine the differences in the level of knowledge about Fascioliasis in beef liver between slaughterhouse officers and liver sellers in the market. The Mann-Whitney test was used to compare the level of know-ledge about fascioliasis between slaughter-house officers and beef liver traders in mar-kets, as well as to compare the infection of *Fasciola* sp., in beef livers in slaughterhouse with those in traditional markets.

RESULTS AND DISCUSSION

Sociodemographic Characteristics of Res-pondents

The research respondents included 17 slaughterhouse officers and 24 respondents who were beef liver traders in traditional markets. Sociodemographic characteristics are viewed from age, education level and years of service Or length of work The distribution of the characteristics of the respondents in this study is presented in Table 1.

Most slaughterhouse officers (Table 1) are between 36 and 45 years old (47.1%), while the majority of beef liver traders in the market are over 45 years old (54.2%). Both groups fall within the productive age range as defined by the Indonesian Minister of Man-power Regulation No. 10 of 2021, which classifies productive workers as those between the ages of 15 and 64. Age plays an important role in influencing a person's capacity to acquire knowledge and adapt to new situa-tions. Cognitive abilities such as memory, analogical reasoning and creative thinking typically become more developed after the age of 20 (Wardani *et al*., 2023). However, their level of knowledge is highly depen-dent on their last level of education, work experience and access to valid information. They should be the primary target of health education and training programs, including information on fascioliasis.

The majority of beef liver traders have completed only elementary school (37.5%), whereas most slaughterhouse offi-cers are high school graduates (41.2%) as seen in Table 1. Respondents with only an elementary-level education generally face greater challenges in developing a compre-hensive understanding and awareness of foodborne diseases. Higher levels of educa-tion are associated with broader, more ratio-nal perspectives and improved decision-making capabilities (Rachmawati, 2014). Therefore, a lower level of education among respondents may negatively influ-enced their ability to understand the risks associated with foodborne illnesses, parti-cularly those caused by *Fasciola* spp., infection in beef liver, which poses a threat to consumer health.

This study found that the majority of slaughterhouse officers and beef liver traders in traditional markets had more than five years of work experience (Table 1). Longer work experience is generally associ-ated with greater mastery of knowledge and skills, including the ability to assess and select beef livers suitable for sale in slaughterhouses and traditional markets. Workers with extensive experience are typi-cally more proficient in their duties, contri-buting to improved job performance (Gah and Syam, 2021). However, in this study, despite the long work experience of sla-ughterhouse officers and beef liver traders, their knowledge regarding *Fasciola* spp., infection was found to be low. Conse-

quently, a significant number of beef livers infected with fascioliasis were still being found. This may be attributed to a lack of access to relevant information and education concerning fascioliasis in cattle.

Table 1. Sociodemographic Characteristics of Respondents

Characteristic	Sociodemographic characteristics			
	Slaughterhouse officer		Beef liver trader	
	Frequency (N=17)	%	Frequency (N=24)	%
Age				
15-25 years	2	11.8	1	4.2
26-35 years	3	17.6	4	16.7
36-45 years	8	47.1	6	25.0
>45 years	4	23.5	13	54.2
Level of education				
Did not school	0	0.0	1	4.2
Elementary school	4	23.5	9	37.5
Junior High School	4	23.5	6	25.0
Senior High School	7	41.2	7	29.2
College	2	11.8	1	4.2
Length of work				
<5 years	8	47.1	4	16.7
5-8 years	1	5.8	6	25.0
9-12 years	6	35.3	11	45.8
>12 years	2	11.76	3	12.5

Description: N = Total frequency; % = percentage

Table 2. Differences in the level of knowledge about fascioliasis between slaughterhouse officer and beef liver traders in traditional markets

	Level of knowledge about fascioliasis						Asymp. Syg. (2-tailed)
	Good		Poor		Total		
	N	%	N	%	N	%	
Beef liver traders	8	33.3	16	66.7	24	100	0.887
Slaughterhouse officer	6	35.3	11	64.7	17	100	

Table 3. Distribution of knowledge about fascioliasis in slaughterhouse officer and beef liver trader in traditional market

No.	Indicators and answer of knowledge aspects	Slaughterhouse officer		Beef liver trader	
		Frequency	%	Frequency	%
1.	Do you know about liver flukes in cow?				
	a. Yes	15	88,2	13	54,2
	b. No	2	11,8	11	45,8
2.	What are the risk factors for liver flukes infection in cow ?				
	a. Environmental, feeds, and water	15	88,2	15	62,5

	hygiene				
b.	Don't know	2	11,8	9	37,5

Table 3. (Continued) Distribution of knowledge about fascioliasis in slaughterhouse officer and beef liver trader in traditional market

No	Indicators and answer of knowledge aspects	Slaughterhouse officer		Beef liver trader	
		Frequency	%	Frequency	%
3.	What are the symptoms of liver flukes in cow?				
	a. Asymptomatic	15	88,2	9	37,5
	b. Don't know	2	11,8	15	62,5
4.	Wher are *Fasciola sp.*usually found on cow?				
	a. Liver	14	82,3	8	33,3
	b. Don't know	3	17,7	16	66,7
5.	Can comspuntion of raw and undercooked beef liver cause foodborne disease?				
	a. Yes	10	58,8	12	50,0
	b. No	7	41,2	12	50,0
6.	What are the symptoms of consuming undercooked beef liver containing *Fasciola sp.*?				
	a. Coughing and sneezing	11	64,7	5	20,9
	b. Don't know	6	35,3	19	79,1
7.	What can be done to prevent foodborne disease due to liver flukes?				
	a. Do not consume beef liver that contains liver fluke and is undercooked	14	82,3	18	75,0
	b. Don't know	3	17,7	6	25,0
8.	What do you do when you find beef liver infected with *Fasciola sp.*?				
	a. Throw away	9	52,9	16	66,7
	b. Keep distributing	8	47,1	8	33,3

Table 4. Differences in *Fasciola spp.* infestation in liver samples

	Infection of Fasciola spp.				Total		Asymp. Syg. (2-tailed)
	Positive		Negative				
	N	%	N	%	N	%	
Beef liver traders	17	70,8	7	29,2	24	100	0,094
Slaughterhouse	2	33,3	4	66,67	6	100	

Differences in Levels of Knowledge about Fascioliasis

The results of the interviews on the level of knowledge about fascioliasis among slaughterhouse officers and beef liver traders in the traditional market are shown in Table 2. This study found that the level of knowledge about fascioliasis among slaugh-terhouse officers was mainly categorized as poor (64.7%). The results of this study are not in line with previous study which stated that most slaughterhouses officers have good knowledge in slaughtering, hygiene and sanitation, as well as antemortem-post mortem examinations to ensure meat quality (Herawati *et al*., 2020). This difference in knowledge level may be caused by the knowledge studied. In general, regarding livestock to be slaughtered, slaugh-terhouses officers have better knowledge, but not specifically about Fascioloasis in cattle. Knowledge about fascioliasis at the slaugh-terhouse can be categorized as good if the respondents know the risk factors and cha-racteristics of cattle infected with fascio-liasis, its impact on human health and its prevention (Khadafi *et al*., 2022). The level of knowledge of slaughterhouses officers can

be improved by providing training and education about Fascioliasis in cattle by related agencies, especially the Animal health and livestock Services (Andanawari *et al*., 2023). The purpose of conducting training for slaughterhouse officers is to develop the knowledge and skills of respondents in selecting healthy cattle, controlling risk factors, managing fascioliasis in cattle, and eliminating animal products that can potentially spread foodborne diseases to consumers. In addition, the Animal Health and Livestock Services also needs to conduct monitoring and evaluation to prevent foodborne diseases that endanger consumers (Pitaloka *et al*., 2023).

Data on the level of knowledge about fascioliasis among beef liver traders in traditional markets (66.7%) is mainly categorized as poor (Tabel 2). This result is inconsistent with research showing that 54% of animal product traders have good knowledge of food safety (Ujan *et al*., 2021). This difference in categories may be caused by previous studies assessing the level of knowledge of food safety to pork and chicken traders without emphasizing the concept of preventing foodborne disease due to consumption of beef liver infected with fascioliasis. The level of knowledge about fascioliasis among beef liver traders can be categorized as good if the respondents are aware of the characteristics of beef livers containing *Fasciola* sp., worms, the impact on human health, as well as their handling and distribution (Wijinindyah *et al*., 2024). The poor level of knowledge about fascioliasis among beef liver traders in traditional markets may be caused by the lack of information about fascioliasis in beef liver provided by the Indonesian Ministry of Agriculture apparatus. This condition caused the traders had insufficient understanding of the processes and standards needed to create safe products (Anggraini *et al*., 2019). Therefore, education and training conducted by the Animal Health and Livestock Service should be implemented to prevent the occurrence of foodborne zoonotic diseases caused by fascioliasis in cattle livers.

Based on the questionnaire answers (Table 3), more slaughterhouse officers knew about fascioliasis in cattle compared to beef liver traders. This was known based on the answers that they know about liver flukes, their symptoms, risk factors for transmission in cattle and their prevention. However, almost half of the officers stated that livers with fascioliasis can still be distributed to consumers. This condition showed that their knowledge about the impact of consuming liver flukes was still lacking. Therefore, officers from the Animal Health and Livestock Services should conduct inspections at slaughterhouses and ensure that the liver is healthy and safe for consumption. Unfortunately, this did not work as it should. On the other hand, the majority of beef liver traders answered to throw away beef liver infected with *Fasciola* spp. However, most traders do not know that *Fasciola* spp., is in beef liver. Therefore, beef liver containing *Fasciola* spp., is still widely sold to consumers. This condition showed that beef liver traders need to be educated by the Animal Health and Livestock Service about liver flukes and not sell them to consumers. In fact, in traditional markets, inspections and supervision of animal products are rarely carried out by the apparatus of Animal Health and Livestock Service, especially beef liver.

The results of statistical analysis showed no significant difference between the level of knowledge of slaughterhouse officers and beef liver traders in traditional markets, with a p-value of 0.887. This means the slaughterhouse officers and beef liver traders in the market having the same level of knowledge, which was categorized as poor. The lack of knowledge regarding food handling and distribution, a requirement for safe, healthy, intact, and halal food products, can lead to foodborne diseases (Sugiyoto *et al*., 2015). Poor knowledge about fascioliasis can cause slaughterhouse officers and beef liver traders to be unaware of the handling and distribution of beef liver

containing *Fasciola* spp*.,* worms. This is the results of beef liver products infected with *Fasciola* spp*.,* and escaped the attention of slaughterhouses officers and posing a risk to consumer health, sold in traditional markets. Therefore, slaughterhouse officers and beef liver traders are the main targets for education about fascioliasis in cattle, so that in future time they only sell beef liver that is free from fascioliasis and safe for consumers.

Differences in *Fasciola* sp., Infection in Beef Liver

The beef livers taken from the slaughterhouse and traditional market were brought to the Parasitology Laboratory, Faculty of Medicine, University of Jember, for identification. The *Fasciola* spp., was identified by slicing the beef liver thinly and observing the presence of *Fasciola* spp*.,* worms. The worms were identified and placed into a bottle containing 70% alcohol. The distribution of *Fasciola* spp*.,* infection in cattle liver is shown in Table 4.

This study found 33.3% of beef liver samples collected from the slaughterhouse was infected with *Fasciola* spp., and the percentage was lower than beef liver from the traditional market. This was because cattle entering the slaughterhouse go through standard procedures. In slaughterhouses there are technical eligibility standards which include: (1) the stage of receiving and housing cattle is carried out with an inspection of livestock documents, including the animal's health history, and the cattle need to rest for 12 hours, (2) a veterinarian must conduct the antemortem examination stage, (3) cattle that are declared sick may not be slaughtered and the slaughtering process with clean equipment, (4) the slaughtering process using a restraining box without any abuse, (5) the skinning stage, (6) removing the innards by separating the red and green innards, (7) the postmortem examination stage by examining animal food products. If an infectious or zoonotic animal disease is found, then the veterinarian or officer needs to carry out the established procedures (Muhami and Haifan, 2019). Therefore, the slaughterhouse has an important role in selecting cattle to be slaughtered, so that the meat and carcass parts are safe for consumers.

In this study, beef liver from traditional markets mostly contained liver flukes (70.8%). The high prevalence of fascioliasis in beef liver from traditional markets can be caused by the majority of beef liver traders maintaining and slaughtering the cattle independently, not at slaughterhouses. The beef liver traders usually have independent farms that use extensive or traditional maintenance patterns. This statement is in line with previous research which stated that 54% of beef liver traders in West Kalimantan use extensive maintenance patterns (Khadafi *et al*., 2022). Traditional livestock farming provides livestock feed from wild grass that can contain *Fasciola* spp., cysts called metacercariae. Therefore, transmission of fascioliasis in cattle is easier to occur. Cattle infected with *Fasciola* spp., are generally asymptomatic, making them difficult to detect, especially accompanied by the low knowledge of fascioliasis among livestock breeders and beef liver traders. This can be avoided if the slaughtering process is carried out at the slaughterhouse and supervised by the Animal Health and Livestock Service (Wariata *et al*., 2019).

In managing a farm, attention must also be paid to the sanitation of livestock pens. The cleanliness of the barn can prevent the spread of worm eggs through feces, which will contaminate cattle feed and hatch into miracidia in fresh water. Feces and leftover feed need to be buried to reduce the spread of worm eggs. *Fasciola* sp*.,* and continues the worm's life cycle (Purwaningsih *et al*., 2017). This is done to control fascioliasis in beef cattle on farms.

The results of the Mann-Whitney test to determine the difference in *Fasciola* sp*.,* infection in cattle liver at slaughterhouses and traditional markets showed no significant difference in *Fasciola* sp*.,* infection (p-value =0.094). However, beef livers that were positive for fascioliasis were more often found in traditional markets. The beef liver samples at the slaughterhouse that do not contain *Fasciola* sp*.,* worms may be due to

the implementation of slaughterhouse standard operating procedures with regular monitoring of animal food product safety, or the cattle farm has good husbandry practices (Lestari *et al*., 2019; Muhami and Haifan, 2019). Therefore, all the cattle will be slaughtered should be carried out in slaughterhouses, so that the safety of meat and carcasses is more guaranteed as an effort to maintain food safety and prevent food borne diseases.

Although the number of beef liver samples from the slaughterhouse was limited, the prevalence of fascioliasis in cattle can be a risk factor for the occurrence of foodborne diseases. Beef liver that is consumed undercooked and contains *Fasciola* sp*.,* worms will adhere to the pharyngeal mucosa and cause allergic reactions (Musharrafieh *et al*., 2018). Therefore, food safety concerns such as maintenance, slaughtering and distribution in slaughterhouses and traditional markets must be considered as one of the efforts in controlling foodborne diseases, particularly caused by *Fasciola* spp.

CONCLUSION

The level of knowledge about fascioliasis among slaughterhouse officers and beef liver sellers in traditional markets is still low and not differ between them. Likewise, the number of *Fasciola* spp., infections in liver samples between slaughterhouses and markets also did not differ. These results indicate the need for education and training about fascioliasis in beef liver for slaughterhouse officers and beef liver sellers, so that they can select unhealthy beef liver and not sell it as an effort to prevent food borne diseases.

SUGGESTION

In further research, the number of respondents and beef liver samples needs to be increased, so that the results are more representative. Determinant factors that influence the high prevalence of fascioliasis in beef liver also need to be studied further.

ACKNOWLEDGEMENT

Thanks are conveyed to the slaughterhouse and all parties who helped with this research.

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