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Uncovering subclinical diseases in sacrificial livestock in Kulon Progo, Indonesia: A comparative approach using ante-mortem and post-mortem inspections

Mengungkap penyakit subklinis pada ternak qurban di Kulon Progo, Indonesia: Pendekatan komparatif menggunakan pemeriksaan ante-mortem dan post-mortem

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ABSTRACT

Some cases of animal diseases are difficult to detect clinically, especially chronic and subclinical diseases. The condition of subclinical diseases poses the potential for hidden disease spread within a livestock population. This research aims to uncover subclinical diseases occurring in sacrificial livestock. The methodology employed involved a combination of ante-mortem and post-mortem examinations performed on the same individual animals. The study was conducted in Bunder Tengah, located within the Progo River watershed area. The subjects of the study consisted of four male cattle, eight male Etawa Crossbred goats (ECG), and one ram. The results indicated that during the ante-mortem examination, all animals were diagnosed as clinically healthy; however, the post-mortem examination revealed that two cattle (ID: BC-1 and BC-4) and one goat (ID: G-4) were infected with fasciolosis. The conclusion of this study is the combination of ante-mortem and post-mortem inspections can be used to uncover clinically hidden diseases, allowing information about disease occurrences in a region to be continuously monitored and identified, which can then serve as a guideline in planning disease prevention programs. Laboratory examinations as part of ante-mortem inspections should be conducted to obtain early information about disease occurrences in a particular area.

ABSTRAK

Beberapa kasus penyakit pada hewan sulit untuk dideteksi secara klinis terutama penyakit yang bersifat kronis dan subklinis. Kondisi penyakit yang bersifat subklinis menimbulkan potensi penyebaran penyakit secara tersembunyi di dalam suatu populasi ternak. Penelitian ini bertujuan untuk mengungkap penyakit subklinis yang terjadi pada ternak qurban. Metode yang digunakan dengan mengombinasikan pemeriksaan ante-mortem dan post-mortem pada ternak qurban yang sama. Lokasi penelitian di Bunder Tengah

yang merupakan wilayah daerah aliran Sungai Progo. Ternak qurban yang dijadikan objek penelitian terdiri dari 4 ekor sapi jantan, 8 ekor kambing jantan Peranakan Etawa, dan 1 ekor domba jantan. Hasil penelitian menunjukkan pada pemeriksaan ante-mortem semua ternak qurban didiagnosis sehat berdasarkan kondisi klinis, namun pada pemeriksaan post-mortem ditemukan bahwa 2 ekor ternak sapi (ID: BC-1 dan BC-4) serta 1 ekor ternak kambing (ID: G-4) teridentifikasi menderita fasciolosis. Kesimpulan dari penelitian ini bahwa kombinasi pemeriksaan ante-mortem dan post-mortem bisa digunakan untuk mengungkap penyakit yang secara klinis tersembunyi sehingga informasi tentang kejadian penyakit di suatu wilayah bisa terus dipantau dan diidentifkasi untuk selanjutnya menjadi pedoman dalam perencanaan program pencegahan penyakit. Pemeriksaan laboratorium sebagai bagian dari pemeriksaan ante-mortem seharusnya dilakukan untuk mendapatkan informasi lebih awal tentang kejadian penyakit di suatu wilayah.

Kata kunci:
Pemeriksaan ante-mortem
Fasciolosis, Parasit
Pemeriksaan post-mortem
Ternak qurban

INTRODUCTION

Indonesia has a variety of religions, cultures, ethnicities, and tribes. In this context of diversity, Islam has emerged as the predominant religion among the population in Indonesia (Adi et al., 2020). Idul Adha is an important annual celebration for Muslims in Indonesia. The highlight of the Idul Adha festivities is the slaughtering of sacrificial livestock. Typically, the owners of these livestocks donate them to the mosque, where they are slaughtered and the meat is distributed to community members in need (Awaludin et al., 2017).

The sacrificial livestock must meet several requirements and criteria, one of which is that the sacrificial livestock must be healthy (Awaludin et al., 2017). Sacrificial livestock are selected based on specific criteria to ensure quality. The animals should be healthy, fat, and free from defects like lameness or blindness. Additionally, they must meet age requirements, sheep and goats should be at least one year old, while cattle must be at least two years old (Kementerian Agama Republik Indonesia, 2010). The health status of sacrificial livestock is assessed through an initial inspection that includes checking their overall condition, examining the oral mucosa, the conjunctiva of the eyes, and analyzing feces (Sambodo et al., 2020).

Public awareness of the health of livestock-derived food and animal welfare has led to increased seriousness in managing products within the livestock sector (Liu et al., 2023). Livestock management encounters challenges in achieving sustainability, particularly the risk of parasitic infections that pose a common threat to livestock (Bricarello et al., 2023). Infections caused by endoparasites negatively impact the health, welfare, and productivity of livestock (Khan et al., 2023). Infections caused by endoparasites are among the most essential infections affecting the livestock sector globally (Hamid et al., 2023). Helminthes are classified into two main groups; nematodes (roundworms) and platyhelminthes (flatworms, including trematodes and cestodes) that parasitize various organ systems (Naeem et al., 2021). Nematodes are the most commonly found parasites that infect the gastrointestinal system in livestock (Cruz-Tamayo et al., 2021). Nematode infections can lead to severe malnutrition, anemia, weakness, decreased immune response, and even death in young livestock (Adduci et al., 2022). Nematode infections pose serious problems for animal welfare and the health of ruminant livestock. These infections create a substantial economic burden on the sustainability of the livestock industry globally. The financial losses resulting from endoparasite infections are determined by the pathogenicity and the number of parasites involved (Charlier et al., 2020). Subclinical endoparasite infections can lead to economic losses by reducing livestock productivity in farming systems worldwide (Strydom et al., 2023).

The key indicator for detecting sick livestock is observing behavioral changes, particularly a decrease in activity. Reduced eating habits and abnormal behaviors serve as indicators of livestock health and overall animal welfare (Högberg et al., 2021). Deviant behavior in cattle and sheep can be used to determine the etiology of diseases; however, parasitic infections are

generally subclinical, making it challenging to assess on the health status of the livestock (Forbes, 2021). Endoparasitic infections in ruminants are often subclinical. Significantly few clinical signs can be observed, or they may not be observable at all during a clinical inspection (Koltz et al., 2022). Endoparasites that are commonly found infecting ruminants consist of nematodes, trematodes, cestodes, and protozoa (Loginova et al., 2023).

Ante-mortem inspection has become a routine activity that must be conducted on sacrificial livestock. The purpose of the examination is to prevent the slaughter of animals that exhibit clear clinical signs of illness, are suffering from infectious diseases, or pose a risk of zoonoses (Soeparno, 2011). During the ante-mortem inspection of sacrificial livestock, most animals are typically found to be clinically healthy. However, laboratory tests can sometimes reveal subclinical helminth parasite infections. In a study involving 72 bulls from the Boyolali region, which were all declared clinically healthy, fecal examinations were conducted. The results indicated that 4.2% (3 bulls) tested positive for Fasciola sp. eggs, while 2.8% (2 bulls) showed the presence of *Paramphistomum sp*. eggs (Awaludin et al., 2022).

Post-mortem inspections ensure that the carcasses and offal of sacrificial livestock are safe and suitable for consumption (Soeparno, 2011). Post-mortem inspections provide an additional benefit by helping to identify the outcomes of the treatment process and allowing for the comparison of clinical diagnoses with pathological changes (Wäsle et al., 2017). Post-mortem inspection acts as a crucial barrier against the transmission of zoonotic diseases, playing an essential role in safeguarding animal welfare and public health (Peruzy et al., 2025). Post-mortem inspections fulfill a diagnostic and surveillance role, acting as a critical control measure to identify conditions that may jeopardize public health and animal welfare (Ciui et al., 2023).

There are several important research gaps related to the health of sacrificed livestock in Indonesia. Studies that combine ante-mortem and post-mortem inspections on the same animals are notably lacking. Because of this restriction, not enough is known about potential subclinical illnesses in these animals.

This research was conducted to investigate the potential presence of latent diseases that do not exhibit clinical symptoms during ante-mortem inspections. Examination of internal organs and meat is conducted to identify lesions or the etiological agents of subclinical diseases in sacrificial livestock. The objective of this research is to inventory the changes that occur in the vital organs and meat of sacrificial animals that have already been slaughtered. The results of this research are expected to provide new information about subclinical diseases in sacrificial livestock revealed through post-mortem inspections, thereby contributing data for the prevention of these diseases in the future.

The novelty of this research lies in the selection of a combination of ante-mortem and post-mortem inspection methods on the same sacrificial livestock in a single case of the series of sacrificial livestock slaughter, allowing for the determination of the health status before and after the sacrificial livestock slaughter is carried out.

MATERIALS AND METHODS

This research was conducted using the cross-sectional study design method. The cross-sectional study design method is often used in observational research and disease detection studies (Levin, 2006).

Selection of research location and sample

The research site was selected by the purposive sampling method, which refers to (Palinkas et al., 2015). The purposive sampling method was implemented by specifically selecting the research location at the slaughtering point for sacrificial livestock in the Bunder Tengah hamlet, Banaran village, Galur district, Kulon Progo regency, Special Region of Yogyakarta. This location was chosen because it meets several criteria: all sacrificial animals were sourced from and raised in the same region, Kulon Progo. Their health history during their care could be traced. There was a potential risk of fasciolosis in the animals due to the presence of a population of *Lymnea sp.* snails in the area where livestock feed was grown. In this study, the samples included four bulls, eight male Etawa crossbred goats (ECG), and one ram.

Ante-mortem inspection

The ante-mortem inspection was conducted one day before the slaughter of the sacrificial livestock. The inspection involves several tools, including rubber gloves, a digital thermometer, and personal protective equipment. The materials used include 70% technical alcohol for disinfection. The methods used in the ante-mortem inspection included observation and palpation. The inspection involved a thorough observation of the general condition of the sacrificial animals, covering their gait to assess the condition of the extremities, hooves, skin, conjunctiva of the eyes, oral mucosa, and Capillary Refill Time (CRT). Body temperature measurement was measured per rectum using a digital thermometer. The age of the sacrificial livestock was estimated by observing the replacement of incisors, based on (Sosroamidjojo et al., 1982).

Post-mortem inspection

Post-mortem inspection is performed after the slaughter of sacrificial livestock. The tools used for this inspection include rubber gloves and knives. For disinfection purposes, 70% technical alcohol is used. The methods of inspection involve observation, palpation, and incision, referring to (Foeh et al., 2022). The examination of organs includes the lungs, liver, kidneys, and cranial region. This approach involves monitoring any modifications in these organs, such as changes in color and shape. Palpation is used to evaluate the consistency of organs, and incisions may be performed to investigate potential parasites in organs that have displayed alterations in shape and color. The assessment of the head includes the masseter muscle, retropharyngeal lymph nodes, mandibular lymph nodes, and parotid lymph nodes.

RESULTS AND DISCUSSION

Conditions of the research location

The research location is in Bunder Tengah hamlet, Banaran village, Kulon Progo district, Special Region of Yogyakarta province, which is part of the Progo River watershed, located at coordinates 7°57'09"S 110°13'27"E, as shown in Figure 1. Most of the area consists of rice fields, with the primary water sources being the Progo River and Sermo Reservoir. The topography of the Bunder Tengah region consists of lowlands with flat land surfaces. The main occupation of the residents of Bunder Tengah is dominated by farmers who are also traditional livestock breeders.

The sacrificial livestock observed in this study were supplied by traditional breeders in the Bunder Tengah region. The sacrificial livestock that were slaughtered included four bulls, eight male Etawa crossbred goat (ECG), and one ram, as shown in Table 1. All of the sacrificial livestock were raised in the Bunder Tengah area, with maintenance durations ranging from 4 to 11 months. The livestock feed primarily consists of grass grown in the vicinity

Figure 1. Map of the research location, Bunder Tengah is located in the Progo River watershed (Google Earth).

Table 1. Sacrificial livestock in the Bunder Tengah region.

No.	Livestock ID	Type	Breed	Sex	Age (years)
1	BC-1	Beef cattle	Simental crossbreed	Male	2.0
2	BC-2	Beef cattle	Madura	Male	3.0
3	BC-3	Beef cattle	Limousin crossbreed	Male	2.0
4	BC-4	Beef cattle	Limousin crossbreed	Male	2.0
5	G-1	Goats	Etawa crossbred goat (ECG)	Male	1.0
6	G-2	Goats	Etawa crossbred goat (ECG)	Male	1.5
7	G-3	Goats	Etawa crossbred goat (ECG)	Male	1.0
8	G-4	Goats	Etawa crossbred goat (ECG)	Male	1.0
9	G-5	Goats	Etawa crossbred goat (ECG)	Male	1.0
10	G-6	Goats	Etawa crossbred goat (ECG)	Male	1.0
11	G-7	Goats	Etawa crossbred goat (ECG)	Male	1.0
12	G-8	Goats	Etawa crossbred goat (ECG)	Male	1.0
13	S-1	Sheep	Dombos	Male	1.0

of the rice fields. A potential disease that often affects the river watershed area is fascioliasis. Prastowo et al. (2022) reported that the cercarial stage of *Fasciola gigantica* was found in *Lymnaeid* snails in the Kulon Progo district.

Ante-mortem inspection

The first letter of each word in a subchapter must be capitalized and bold. The ante-mortem inspection was conducted on June 5, 2025. All sacrificial livestock were clinically healthy and fit for slaughter, as presented in Table 2.

The ante-mortem inspection of sacrificial livestock was conducted thoroughly, focusing on various aspects such as extremities, hoof condition, skin condition, conjunctiva, oral mucosa, Capillary Refill Time (CRT), and rectal temperature. Overall, the clinical evaluations indicate that all inspected livestock meet the health and eligibility requirements for sacrificial use (Figure 2). Awaludin et al. (2017) that one important requirement for sacrificial livestock is their health.

The examination of the extremities and hooves is conducted to evaluate the health of the limbs and identify any issues affecting the movement, posture, or overall well-being of the livestock. This assessment also focuses on detecting lameness and neurological disorders. During the examination, palpation of the limbs is performed to check for swelling and bone fractures. Assessment of the condition of the hooves and joints is important to evaluate the occurrence of diseases such as laminitis, foot-and-mouth disease, foot rot, and arthritis. The examination results of the extremities and hooves of the sacrificial livestock did not reveal any lesions or abnormalities. Jaques et al. (2023) describes various multifactorial disorders that occur in livestock with multiple etiologies, such as metabolic diseases and traumatic injuries, which can potentially cause imbalances related to limb extremities. Kaler et al. (2010) suggests that limping is a multifactorial disorder, including gait abnormalities, postural abnormalities, and discomfort resulting from lesions on the limbs or feet. Rashid et al. (2025), disorders in the hooves are the main cause of

Figure 2. Sacrificial livestock, showing a male Madura breed bull with ID BC-2 on the left and a Limousin crossbreed with ID BC-3 on the right.

Table 2. Results of ante-mortem inspection of sacrificial livestock.

No.	Livestock ID	Extremities	Hooves	Skin	Conjunctiva	Oral mucosa	CRT (seconds)	RT (°C)	Clinical diagnosis
1	BC-1	Nl	Nl	Nl	Pink	Pink	< 2	38.5	healthy and suitable for slaughter
2	BC-2	Nl	Nl	Nl	Pink	Pink	< 2	38.3	healthy and suitable for slaughter
3	BC-3	Nl	Nl	Nl	Pink	Pink	< 2	38.4	healthy and suitable for slaughter
4	BC-4	Nl	Nl	Nl	Pink	Pink	< 2	38.5	healthy and suitable for slaughter
5	G-1	Nl	Nl	Nl	Pink	Pink	< 2	38.5	healthy and suitable for slaughter
6	G-2	Nl	Nl	Nl	Pink	Pink	< 2	38.3	healthy and suitable for slaughter
7	G-3	Nl	Nl	Nl	Pink	Pink	< 2	38.2	healthy and suitable for slaughter
8	G-4	Nl	Nl	Nl	Pink	Pink	< 2	38.1	healthy and suitable for slaughter
9	G-5	Nl	Nl	Nl	Pink	Pink	< 2	38.5	healthy and suitable for slaughter
10	G-6	Nl	Nl	Nl	Pink	Pink	< 2	38.2	healthy and suitable for slaughter
11	G-7	Nl	Nl	Nl	Pink	Pink	< 2	38.4	healthy and suitable for slaughter
12	G-8	Nl	Nl	Nl	Pink	Pink	< 2	38.3	healthy and suitable for slaughter
13	S-1	Nl	Nl	Nl	Pink	Pink	< 2	38.2	healthy and suitable for slaughter

Note: Nl: No lesions, CRT: Capillary Refill Time, RT: Rectal temperature.

lameness, leading to issues related to livestock welfare and significant economic losses in small ruminants. Gelasakis et al. (2019; Chesterton et al., 2022) foot diseases and lameness are the main causes of welfare issues in goat and sheep livestock. Urban-Chmiel et al. (2024), Lameness is one of the common problems found in cattle, which is a major cause of losses in the health and economic sectors. Lameness generally occurs in the hind legs due to the greater load on that part of the body. Bran et al. (2018), lameness is defined as an abnormality in the way livestock move, which is one of the classic clinical symptoms of pain perception in livestock. Lameness consists of asymmetric movements, slowed walking pace, rhythm disturbances, abnormal body posture, and reduced weight on the hooves. Whay et al. (2017) defines lameness as an abnormality in the way livestock move, which is one of the classic clinical symptoms of pain perception in livestock. Lameness consists of asymmetric movements, slowed walking pace, rhythm disturbances, abnormal body posture, and reduced weight on the hooves.

Observation of the skin includes the identification of wounds, hair loss, swelling, and ectoparasites. Skin observation is part of the general clinical examination aimed at evaluating clinical health, detecting diseases, and assessing the welfare of livestock. In the observation, it can be used to evaluate ectoparasite infections (lice, ticks, and mites), fungal infections, bacterial or viral infections, and the presence of allergies. The results of the skin observation on the sacrificial livestock did not reveal any lesions, wounds, or ectoparasites. Yacob et al. (2008) explained that skin health disorders have varying impacts on livestock productivity, ranging from mild skin irritations to rapid death. Teshome et al. (2015) reports that skin diseases in livestock are an important health disorder requiring vigilance. Skin diseases commonly found in ruminants

include ectoparasitic disorders caused by ticks (8.95%), lice (7.02%), mange (2.39%), sheep ked (5.56%), Dermatophilosis (0.69%), Lumpy Skin Disease (2.24%), orf (3.47%), and goat and sheep pox (5.94%). Ectoparasites that frequently infect ruminants include mange mites (*Sarcoptes, Psoroptes, and Demodex*), lice (*Linognathus and Damalina*), and ticks (*Rhipicephalus, Amblyomma, Hyalomma*, and *Boophilus*). The prevalence of skin diseases in cattle is 27.68%, in goats is 38.12%, and in sheep is 42.47%. Ratyotha et al. (2022), Lumpy Skin Disease (LSD) is a skin disease caused by the LSD virus (LSDV) from the genus *Capripoxvirus*, family *Poxvirus*. This virus infects buffalo (*Bubalus* spp.) and cattle (*Bos* spp.), causing lesions on the skin. Rahmi et al. (2025) reported an LSD prevalence of 7.6% in Pakem District, Sleman Regency, Special Region of Yogyakarta Province.

The examination of the conjunctiva in the eyes and the oral mucosa serves as an indicator of the livestock's circulatory system status, hematological condition, and hydration levels. In healthy sacrificial livestock, the conjunctivae and oral mucosa appear pink, which indicates that they are in normal condition. MSD (2025), in normal conditions, the conjunctiva of the eyes and the oral mucosa are pink. Changes in the mucosa to pale can occur in conditions of anemia or shock, cyanotic in conditions of severe hypoxemia or decompensated shock, and yellowing in conditions of increased bilirubin due to liver organ disorders or hemolysis. Aiello et al. (2016) explaining that pale conjunctiva indicates anemia, dark red indicates hyperemia or systemic infection, and yellow (icteric) indicates possible liver disorder or hemolysis. Dry oral mucosa indicates dehydration, bluish (cyanotic) color indicates signs of hypoxemia, pale color indicates anemia or poor circulation, and the presence of sores or erosions indicates infectious diseases such as stomatitis, Bovine Viral Diarrhea (BVD), and Foot-and-Mouth Disease (FMD).

Capillary Refill Time (CRT) is the duration it takes for the normal color of the blood capillaries in the oral mucosa to return after being pressed for a few seconds. It is usually measured by pressing the oral mucosa or the animal's gums for 1–2 seconds, then counting the time it takes for the pink color to return. The CRT examination on sacrificial animals has an important function in health evaluation, namely to assess peripheral blood circulation, detect shock, and dehydration. The CRT examination results on sacrificial animals showed a CRT of < 2 seconds or within the normal range. MSD (2025), normal CRT is 1-2 seconds, in conditions of poor perfusion or peripheral vasoconstriction, CRT values > 2 seconds can be observed, while in conditions of fever or heat stress, CRT values < 1 second can be observed.

Rectal temperature examination in ruminants is one of the important clinical examination procedures for evaluating health status. Rectal temperature is one of the indicators to determine the pathological and physiological status of livestock, making it useful for initial diagnosis and health monitoring. The results of the rectal temperature examination on sacrificial animals show normal conditions, with the rectal temperature of sacrificial bulls ranging between 38.3-38.5 °C, sacrificial bucks between 38.1-38.5 °C, and sacrificial ram at 38.2 °C. MSD (2025), the normal rectal temperature for beef cows is between 36.7-39.1 °C, for goats between 38.5-39.7 °C, and for sheep between 38.3-39.9 °C. Constable et al. (2017), elevated body temperature or hyperthermia (fever) is an indicator of infections caused by bacteria, viruses, protozoa, heat stress, systemic inflammatory processes, and responses to certain vaccines or medications. The condition of decreased body temperature or hypothermia is an indicator of severe dehydration, shock due to blood loss, advanced-stage sepsis, and metabolic diseases.

Ante-mortem inspection is one of the efforts to evaluate sacrificial animals that will be slaughtered by assessing their clinical health status. Ante-mortem inspection is an important part of the food safety assurance system originating from livestock. The importance of ante-mortem inspection includes ensuring public health by detecting symptoms of zoonotic diseases, avoiding the consumption of meat from livestock that is unfit for consumption, assessing the welfare status of livestock by evaluating stress or injury conditions that could affect meat quality and are part of animal welfare principles, preventing contamination and disease spread, providing epidemiological data related to animal diseases in a region, and serving as a basis for

post-mortem inspection decisions by providing initial information about the clinical condition of the livestock.

Post-mortem inspection

The post-mortem inspection was conducted on June 6, 2025 (Figure 3). The inspection results for the head (Table 3), lungs (Table 4), and kidneys (Table 6) indicate that all these organs are in normal condition and safe for consumption. However, the liver inspection (Table 5) revealed instances of Fasciolosis, with identified lesions and the presence of *Fasciola* sp. in the liver organs of sacrificial livestock identified as BC-1, BC-4, and G-4. The liver organs of the remaining sacrificial livestock were found to be normal and safe for consumption. Consequently, the affected liver organs (BC-1, BC-4, and G-4) were condemned, while the meat and other organ parts from these animals were deemed safe and fit for consumption.

Figure 3. Post-mortem inspection on sacrificial livestock.

Post-mortem inspection of the head was conducted on the eye organs, masseter muscle, parotid lymph nodes, mandibular lymph nodes, and retropharyngeal lymph nodes. The inspection results of the head section indicated normal conditions, and no parasites were found (Figure 4, Table 3). The eyes can harbor parasites, specifically worms from the genus Thelazia, and the masseter muscle is a predilection site for the developmental stages of cysticercosis from *Taenia saginata*, which is zoonotic in nature. The examination of the

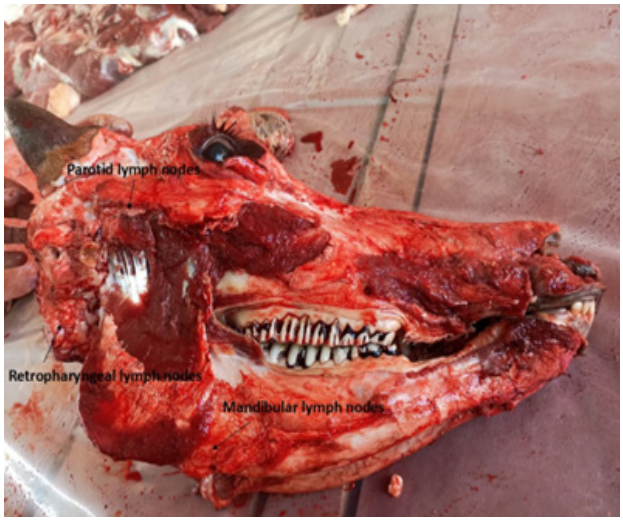

Figure 4. Head lymph nodes of the sacrificial bull with livestock ID BC-2.

parotid, mandibular, and retropharyngeal lymph nodes was performed to assess the health of these lymph nodes situated around the head and neck, particularly to identify any signs of inflammation, infection, or cancer.

Thelazia sp. is a type of parasitic worm that resides in the conjunctival sac of the eye. This parasite measures about 2 cm in length and is white in color. Infection with *Thelazia* sp. can affect one or both eyes of livestock. Infected animals may show symptoms such as depression, dullness, loss of appetite (anorexia), and conjunctivitis, which may progress to conjunctival edema. Despite these symptoms, vital signs such as body temperature, respiration, and pulse usually remain within normal ranges Padhi et al. (2017). The disease caused by the *Thelazia sp.* worm is called Thelaziasis (Taylor et al., 2015). Thelaziasis in cattle is caused by *Thelazia gulosa, Thelazia rhodesii, and Thelazia skrjabini* (Prakash et al., 2016). Thelaziasis is a vector-borne ocular parasitic infestation commonly found in animals and poses a critical threat to animal health (Kasarla et al., 2021). Face flies (species Musca; Diptera, Muscidae) as intermediate hosts of *Thelazia* sp. (Bradbury et al., 2018).

Cysticercosis in cattle is caused by the larval stage of *Taenia saginata* or the tapeworm, which belongs to the class Cestoda of the family Taenidae. Cattle act as intermediate hosts while humans are definitive hosts. Cysticercosis can be found in the masseter muscle, but it can also sometimes be found in other organs such as the

tongue muscles, liver, heart, and kidneys (Cueto González et al., 2015). Humans can become infected by consuming raw or undercooked beef that contains parasitic cysts, leading to cysticercosis. The adult worms inhabit the human small intestine and can cause various symptoms, such as nausea and abdominal pain (Mirzaei et al., 2017). The latest epidemiological data on cysticercosis and taeniasis available are relatively scarce, even though these parasites are known to be endemic in several islands in Indonesia (Sutisna et al., 2019).

Parotid lymph nodes, mandibular lymph nodes, and retropharyngeal lymph nodes are regional lymph nodes located in the head, including in ruminants (such as cows, goats, sheep), which play an important role in the immune system. Under normal conditions, parotid lymph nodes, mandibular lymph nodes, and retropharyngeal lymph nodes in ruminants are small to medium in size, have a smooth surface, a solid consistency with slight elasticity, are resilient, and are grayish-brown in color (Abdel-Magied et al., 2001). Post-mortem inspection of the lymph nodes is important in confirming clinical diagnoses, with a validation rate of 86% and provides additional details of pathological information that may be found in the changes occurring in body organs (Wäsle et al., 2017). Pathological changes in lymph nodes can occur as a response to health disturbances. Hyperplasia in lymph nodes can indicate a mild infection, whereas atrophy in lymph nodes is caused by chronic immunosuppression or severe stress. Necrotic lesions in the lymph nodes indicate a severe infection caused by a virus. Abscesses, swelling, hyperemia with pus are generally indicators of a pyogenic infection

Table 3. Results of post-mortem examinations of the head.

No.	Livestock ID	Parasite infestation		Infection			Diagnosis
		Ocular Inspection	Masseter muscle	Parotid lymph nodes	Mandibular lymph nodes	Retropharyngeal lymph nodes	
1	BC-1	Np	Np	N	N	N	normal, safe, and suitable for consumption
2	BC-2	Np	Np	N	N	N	normal, safe, and suitable for consumption
3	BC-3	Np	Np	N	N	N	normal, safe, and suitable for consumption
4	BC-4	Np	Np	N	N	N	normal, safe, and suitable for consumption
5	G-1	Np	Np	N	N	N	normal, safe, and suitable for consumption
6	G-2	Np	Np	N	N	N	normal, safe, and suitable for consumption
7	G-3	Np	Np	N	N	N	normal, safe, and suitable for consumption
8	G-4	Np	Np	N	N	N	normal, safe, and suitable for consumption
9	G-5	Np	Np	N	N	N	normal, safe, and suitable for consumption
10	G-6	Np	Np	N	N	N	normal, safe, and suitable for consumption
11	G-7	Np	Np	N	N	N	normal, safe, and suitable for consumption
12	G-8	Np	Np	N	N	N	normal, safe, and suitable for consumption
13	S-1	Np	Np	N	N	N	normal, safe, and suitable for consumption

Note: Np: No parasites, N: Normal

caused by bacteria. Caseous necrosis in lymph nodes is generally associated with tuberculosis (TB) in livestock (Elmore, 2006).

Post-mortem inspection of the lungs from all sacrificial livestock showed a pink color, multilobular structure, sponge-like consistency, and no abnormal changes in the bronchial lymph nodes and mediastinal lymph nodes (Figure 5). Therefore, it can be concluded that the lungs are in normal condition, free from infection, and suitable for consumption, indicating that the condition of the lungs is safe and fit for consumption (Table 4). The results also provide information that the sacrificial livestock are free from respiratory system-related diseases.

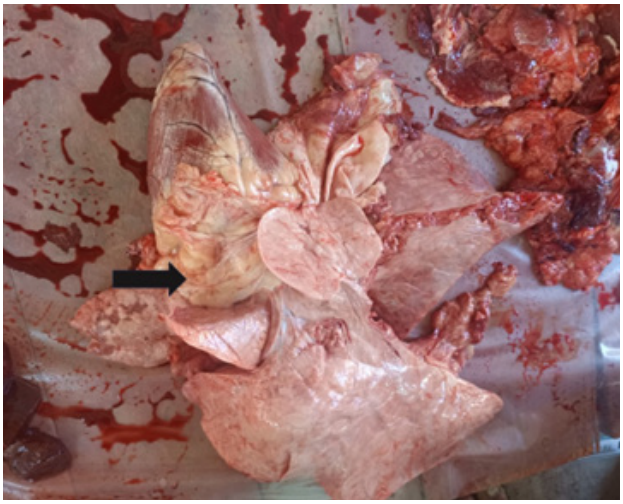

Figure 5. Lungs of the sacrificial bull with livestock ID BC-3 (as shown by the arrow).

Normal lungs have a pink color, are multilobular in shape, and have a sponge-like consistency. Infected lungs will be smaller (atrophied), have pathological lesions, have a hard consistency, and be hyperemic or contain pus. One of the examinations of the lung organ is to evaluate Pasteurella multicida infection, which is characterized by the presence of pus in the lungs (Gregory et al.,

Table 4. Results of post-mortem inspection of the lungs.

No.	Livestock ID	Inspection		Palpation	Incision		Diagnosis
		Color	Shape	Consistency	Bronchial lymph nodes	Mediastinal lymph nodes	
1	BC-1	Pink	multilobular	sponge	N	N	normal, safe, & suitable for consumption
2	BC-2	Pink	multilobular	sponge	N	N	normal, safe, & suitable for consumption
3	BC-3	Pink	multilobular	sponge	N	N	normal, safe, & suitable for consumption
4	BC-4	Pink	multilobular	sponge	N	N	normal, safe, & suitable for consumption
5	G-1	Pink	multilobular	sponge	N	N	normal, safe, & suitable for consumption
6	G-2	Pink	multilobular	sponge	N	N	normal, safe, & suitable for consumption
7	G-3	Pink	multilobular	sponge	N	N	normal, safe, & suitable for consumption
8	G-4	Pink	multilobular	sponge	N	N	normal, safe, & suitable for consumption
9	G-5	Pink	multilobular	sponge	N	N	normal, safe, & suitable for consumption
10	G-6	Pink	multilobular	sponge	N	N	normal, safe, & suitable for consumption
11	G-7	Pink	multilobular	sponge	N	N	normal, safe, & suitable for consumption
12	G-8	Pink	multilobular	sponge	N	N	normal, safe, & suitable for consumption
13	S-1	Pink	multilobular	sponge	N	N	normal, safe, & suitable for consumption

Note: N; Normal

2009). Bovine respiratory disease (BRD) is an infection affecting both the upper and lower respiratory tracts, marked by inflammation of the lungs. BRD is caused by bacterial and viral infections. Infectious bronchopneumonia is one of the BRD infections that occurs in the lower respiratory tract with lesions in the form of lung inflammation (Berman, 2024). The common pulmonary pathological conditions found in sheep are verminous pneumonia, hepatization, emphysema, atelectasis, hydatid cysts, edema, pleuritis, hemorrhage, abscesses, suppurative bronchopneumonia, and pulmonary congestion. Verminous pneumonia is the dominant pathology, accounting for 22.87% with lesions in the caudal lobe, followed by atelectasis at 22.16%, and hepatization at 19.67%. Hydatid cysts are found more frequently in adult sheep compared to young sheep (Baghezza et al., 2020). Health disorders affecting the lungs of livestock include pleuritis at 79.89%, interstitial pulmonary emphysema (16.26%), and pneumonia (16.19%). The occurrence of Echinococcus cysts and tuberculosis lesions in livestock has been reported at 2.18% and 0.10%, respectively (Peruzy et al., 2025).

Post-mortem inspection of the liver of sacrificial bulls with livestock ID BC-1 and BC-4, as well as a buck with livestock ID G-4, revealed lesions with a hard and sandy consistency, pale color, swelling, and inflammation in the portal lymph nodes. *Fasciola* sp. parasites were found in the bile ducts (Figure 6), leading to the conclusion that the sacrificial livestock with livestock IDs BC-1, BC-4, and G-4 suffered from fasciolosis, and their liver organs were condemned. Meanwhile, the liver of the other sacrificial livestock did not show any pathological lesions, was reddish-brown in color, lobed, had a solid and smooth consistency, and was concluded to be in normal condition and suitable for consumption (Table 5).

Fasciolosis is often found in livestock raised around river watersheds, including the Progo River watershed. This is supported by the abundance of intermediate hosts, *Lymnea* snails, allowing the life cycle of *Fasciola* sp. to continue. *Lymnea* snails serve as the infective stage host for *Fasciola* sp., which is the *cercaria* stage. *Lymnea* snails containing the *cercaria* stage of *Fasciola* sp. in the Progo River watershed reach 3.75% (Prastowo et al., 2022). The prevalence of fasciolosis in cattle within the Progo River watershed reached 39.7% (Nugraheni et al., 2018). Fasciolosis was identified in cattle in the Kulon Progo district (Rinca et al., 2019). Fasciolosis is also present in buffalo and goats (Hu et al., 2020; Rengganis et al., 2024). Fasciolosis is a serious parasitic disease that causes significant economic losses in the livestock sector, especially in ruminant commodities (Mazeri et al., 2017).

Fasciolosis is characterized by hardened liver tissue and enlargement (hepatomegaly), causing bile duct obstruction, and the edges of the organ's surface tend to be blunt (Apritya et al., 2021). Fasciolosis is caused by the trematode helminth, *Fasciola* sp., which is located in the liver and has a flattened body shape measuring 2 to 3 centimeters in length (Damayanti et al., 2019). Fasciolosis is a zoonotic disease that causes liver damage. In livestock, it can result in

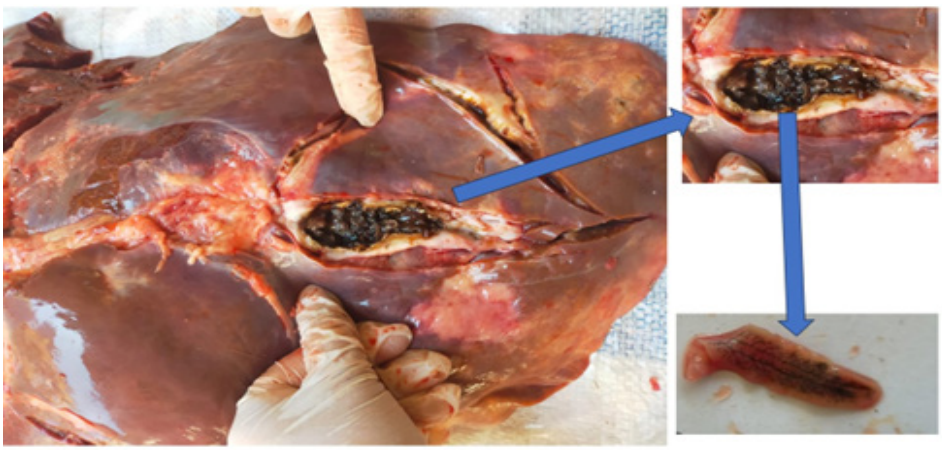

Figure 6. Fasciola sp. identifed in the liver of a sacrifcial bull with livestock ID BC-1.

Table 5. Results of post-mortem examination of the livers.

No.	Livestock ID	Inspection		Palpation	Incision		Diagnosis
		Color	Shape	Consistency	Portal lymph nodes	Ductus biliferus	
1	BC-1	Pl	irregular surface, necrotic & fibrotic lesions	swollen, hard & gritty	enlargement	Fasciola sp.	Fasciolosis, liver condemned
2	BC-2	Rb	lobed & asymmetrical	solid & smooth	N	Np	normal, safe, & suitable for consumption
3	BC-3	Rb	lobed & asymmetrical	solid & smooth	N	Np	normal, safe, & suitable for consumption
4	BC-4	Pl	irregular surface, necrotic & fibrotic lesions	swollen, hard & gritty	enlargement	Fasciola sp.	Fasciolosis, liver condemned
5	G-1	Rb	lobed & asymmetrical	solid & smooth	N	Np	normal, safe, & suitable for consumption
6	G-2	Rb	lobed & asymmetrical	solid & smooth	N	Np	normal, safe, & suitable for consumption
7	G-3	Rb	lobed & asymmetrical	solid & smooth	N	Np	normal, safe, & suitable for consumption
8	G-4	Pl	irregular surface, necrotic & fibrotic lesions	swollen, hard & gritty	enlargement	Fasciola sp.	Fasciolosis, liver condemned
9	G-5	Rb	lobed & asymmetrical	solid & smooth	N	Np	normal, safe, & suitable for consumption
10	G-6	Rb	lobed & asymmetrical	solid & smooth	N	Np	normal, safe, & suitable for consumption
11	G-7	Rb	lobed & asymmetrical	solid & smooth	N	Np	normal, safe, & suitable for consumption
12	G-8	Rb	lobed & asymmetrical	solid & smooth	N	Np	normal, safe, & suitable for consumption
13	S-1	Rb	lobed & asymmetrical	solid & smooth	N	Np	normal, safe, & suitable for consumption

Rb: Reddish-brown, Pl: Pale, N: Normal, Np: No parasites

growth disturbances, decreased production, and death. During a post-mortem inspection, any infected liver should be condemned (Nyirenda et al., 2019). Fasciolosis can infect both animals and humans. The *Fasciola* species that infects them are *Fasciola hepatica* and *Fasciola gigantica* (Cwiklinski et al., 2016). Fasciolosis is a zoonotic disease that poses a significant health risk in several countries (Mas-Coma et al., 2019).

Fasciolosis has become a zoonotic disease that causes health problems for rural communities in addition to causing economic losses in livestock worldwide (Nyindo & Lukambagire, 2015). Cattle generally exhibit fewer clinical symptoms than small ruminants, as fascioliasis in cattle often presents as a chronic disease (Mazeri et al., 2017). The diagnosis of fasciolosis can rely on several factors: clinical symptoms, fecal examination, post-mortem analysis, seasonal occurrence, and the history of grazing areas (Wagari, 2021).

Post-mortem inspection of the kidneys from sacrificial bulls showed reddish-brown color in the cortex, pale medulla, multilobular shape, solid and resilient consistency, and no abnormal changes in the renal lymph nodes. Meanwhile, the kidneys of sacrificial bucks and ram showed dark reddish-brown color in the cortex, lighter reddish medulla, bean-shaped, semi-solid and porridge-solid consistency, with no abnormal changes in the renal lymph nodes (Figure 7). The results indicate that the kidneys of the sacrificial livestock are in normal condition, safe, and suitable for consumption (Table 6).

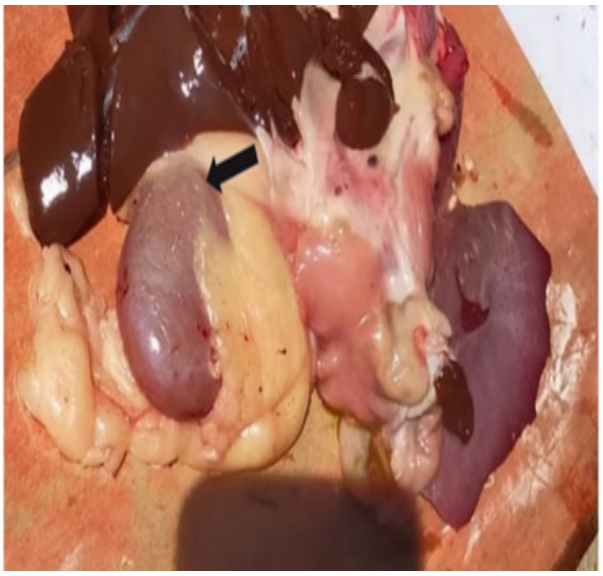

Figure 7. The kidney of the sacrificial goat with livestock ID G-1 appears normal (as shown by the arrow).

The kidney is one of the important organs in post-mortem inspections because it is one of the sites for the predilection and development of cysticercosis from *Taenia saginata* in cattle (Eom et al., 2020). Abnormal changes in the kidneys can manifest in several ways: pale cortex color (pale kidneys) with a smooth surface indicating chronic anemia, glomerulonephritis, amyloidosis, and tubular degeneration; congested kidneys marked by dark or reddish-purple color and swelling indicating septicaemia and blood stasis due to kidney failure; nephritis characterized by swelling, exudate, and granularity in the kidneys indicating infection by bacteria (*Corynebacterium renale, Escherichia coli, and Leptospira* sp.); and petechiae in the kidneys marked by bleeding spots indicating babesiosis, leptospirosis, or intoxication (Maxie, 2015).

Table 6. Results of post-mortem examination of the rens.

No.	Livestock ID	Inspection		Palpation	Incision	Diagnosis
		Color	Shape	Consistency	Renal lymph nodes	
1	BC-1	Rb (cortex), Pl (medulla)	multilobular	solid & resilient	N	normal, safe, & suitable for consumption
2	BC-2	Rb (cortex), Pl (medulla)	multilobular	solid & resilient	N	normal, safe, & suitable for consumption
3	BC-3	Rb (cortex), Pl (medulla)	multilobular	solid & resilient	N	normal, safe, & suitable for consumption
4	BC-4	Rb (cortex), Pl (medulla)	multilobular	solid & resilient	N	normal, safe, & suitable for consumption
5	G-1	Dr (cortex), Lr (medulla)	bean-shaped	semi-solid, porridge-like	N	normal, safe, & suitable for consumption
6	G-2	Dr (cortex), Lr (medulla)	bean-shaped	semi-solid, porridge-like	N	normal, safe, & suitable for consumption
7	G-3	Dr (cortex), Lr (medulla)	bean-shaped	semi-solid, porridge-like	N	normal, safe, & suitable for consumption
8	G-4	Dr (cortex), Lr (medulla)	bean-shaped	semi-solid, porridge-like	N	normal, safe, & suitable for consumption
9	G-5	Dr (cortex), Lr (medulla)	bean-shaped	semi-solid, porridge-like	N	normal, safe, & suitable for consumption
10	G-6	Dr (cortex), Lr (medulla)	bean-shaped	semi-solid, porridge-like	N	normal, safe, & suitable for consumption
11	G-7	Dr (cortex), Lr (medulla)	bean-shaped	semi-solid, porridge-like	N	normal, safe, & suitable for consumption
12	G-8	Dr (cortex), Lr (medulla)	bean-shaped	semi-solid, porridge-like	N	normal, safe, & suitable for consumption
13	S-1	Dr (cortex), Lr (medulla)	bean-shaped	semi-solid, porridge-like	N	normal, safe, & suitable for consumption

Note: Rb: Reddish-brown, Pl: Pale, Dr: Dark reddish-brown, Lr: Lighter reddish, N: Normal

A comparative approach by combining ante-mortem and post-mortem inspections is crucial for evaluating disease occurrences in a region, especially diseases that are subclinical symptom. By integrating these inspections, we can derive conclusions and gather data about disease indicators that may remain hidden and undetected during ante-mortem evaluations. The information can be utilized to create detailed maps of disease occurrences, allowing for the implementation of prevention programs aimed at eliminating these diseases. Another benefit of the combination of ante-mortem and post-mortem inspections is that they prevent the spread of diseases through livestock products and protect the community from zoonotic diseases caused by the consumption of livestock products.

Behavioral changes due to disease symptoms become indicators in disease monitoring and early diagnosis, including deviations in eating activities, which serve as sources of information in evaluating the health and welfare status of animals during ante-mortem inspections (Högberg et al., 2021). Inspection of livestock before slaughter, carcasses, and organs during post-mortem inspection is conducted to protect public health from zoonotic diseases and ensure animal health and welfare (Almqvist et al., 2021). The process of meat inspection in the European Union refers to the procedure introduced by Ostertag in 1899, which involves a series of activities before and after stunning (Alvseike et al., 2018). The series of inspections includes ante-mortem inspections while the animal is still alive, along with related documentation, and post-mortem inspections of the carcass and organs (Daniel et al., 2024). Post-mortem inspection serves supervisory and diagnostic functions while acting as the final critical control point for evaluating, detecting, reducing, and preventing conditions that may jeopardize animal welfare and public health (Ciui et al., 2023).

The limitation in this study is the lack of laboratory examinations to support the ante-mortem inspection. Laboratory examinations are essential for confirming and establishing initial diagnoses, as some chronic parasitic diseases do not exhibit significant behavioral or clinical changes in livestock. However, laboratory examinations, including routine blood tests and fecal analyses, can reveal health issues, such as the presence of parasites in the blood, abnormal white blood cell counts, and the detection of worm eggs or other protozoa in fecal samples.

CONCLUSIONS

The combination of ante-mortem and post-mortem inspections successfully revealed clinically hidden diseases. The combination of ante-mortem and post-mortem inspections is essential for evaluating the health status and welfare of livestock. Information from the combined results of pre- and post-mortem examinations can be used as data to map and plan prevention programs for subclinical diseases.

Recommendations for future research suggest that ante-mortem inspections should also include laboratory tests, at a minimum, blood and feces tests, to obtain more comprehensive information about diseases hidden in subclinical cases.

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