Original Article
Wallacea: Tropical Biomedicine Journal

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Identification of Parasitic Protozoan and Helminth Egg in Flies on Traditional Cake in Palangka Raya

Identifikasi Protozoa Parasit dan Telur Cacing pada Lalat di Kue Tradisional di Palangka Raya

Septiani[1*], Natalia Sri Martani[1], Arif Rahman Jabal [2]

[1]*Medical Study Program, Faculty of Medicine, Palangka Raya University, Jl. Yos Sudarso, Palangka Raya, Central Kalimantan, Indonesia*
[2]*Medical Laboratory Technology Study Program, Faculty of Medicine, Palangka Raya University, Jl. Yos Sudarso, Palangka Raya, Central Kalimantan, Indonesia*

Abstract

Introduction: Instestinal parasites caused food contamination. Flies are known to act as mechanical vectors that can transfer protozoan parasites and helminth eggs from contaminated sources to exposed food. Objective: This study aimed to identify intestinal protozoa and helminth eggs carried by flies collected from traditional cake vending sites in Palangka Raya City, Central Kalimantan, Indonesia. Methods: This study employs an observational research design, focusing on descriptive analysis. A sampling of flies was collected at nine locations. The flies that were successfully collected, were identified morphologically and examined microscopically to detect the presence of protozoan parasites and worm eggs attached to the surface of the flies' bodies. Results: The results showed that *Musca* sp. and *Chrysomya* sp. were the fly species collected during the study. There are two protozoan parasites found in two locations, *Blastocystis* sp. and *Endolimax* sp. *Musca* sp. was the dominant fly species (78 specimens), while *Chrysomya* sp. was less frequently encountered (11 specimens). In addition, helminth eggs including *Ascaris* sp., were identified conducted on the external morphology of flies, indicating fecal contamination in the study environment. Conclusions: In conclusion, flies collected from traditional cake vending sites in Palangka Raya City were found to carry intestinal protozoa and helminth eggs, highlighting their role as mechanical vectors of parasitic contamination. These findings emphasize highlighting the critical role of enhancing environmental sanitation and food hygiene in mitigating the risk of parasite transmission through food.

Keywords: Identification; Parasitic protozoa; Helminth eggs; Flies; Traditional cake

Abstrak

Pendahuluan: Parasit usus akibat kontaminasi makanan. Lalat dikenal sebagai vektor mekanis yang dapat memindahkan parasit protozoa dan telur cacing dari sumber yang terkontaminasi ke makanan yang terpapar. Metode: Penelitian ini menggunakan desain penelitian observasional, dengan fokus pada analisis deskriptif. Sampel lalat dikumpulkan di sembilan lokasi. Lalat yang berhasil dikumpulkan diidentifikasi secara morfologis dan diperiksa secara mikroskopis untuk mendeteksi keberadaan parasit protozoa dan telur cacing yang menempel pada permukaan tubuh lalat. Hasil: Hasil penelitian menunjukkan bahwa *Musca* sp. dan *Chrysomya* sp. adalah spesies lalat yang dikumpulkan selama penelitian. Terdapat dua parasit protozoa yang ditemukan di dua lokasi, yaitu *Blastocystis* sp. dan *Endolimax* sp. *Musca* sp. merupakan spesies lalat yang dominan (78 spesimen), sedangkan *Chrysomya* sp. lebih jarang ditemukan (11 spesimen). Selain itu, telur cacing parasit termasuk *Ascaris* sp., diidentifikasi berdasarkan morfologi lalat yang menunjukkan adanya kontaminasi feses. Kesimpulan: Lalat yang dikumpulkan dari tempat penjualan kue tradisional di Kota Palangka Raya ditemukan membawa protozoa usus dan telur cacing parasit yang yang peran sebagai vektor mekanis kontaminasi parasit. Temuan ini menekankan pentingnya peningkatan sanitasi lingkungan dan kebersihan makanan dalam mengurangi risiko penularan parasit melalui makanan.

Kata Kunci: Identifikasi; Protoza parasit; Telur cacing; Lalat; Kue tradisional

✉ To whom correspondence may be addressed. E-mail: Faniseptiani984@gmail.com

doi: xxxx

Article history: Received 8 December 2025; Revision 18 January 2026; Accepted 25 February 2026; Available online 28 February 2026

1. Introduction

Diarrheal disease remains a major public health problem in Indonesia, within to the consumption of food contaminated with intestinal parasites. Intestinal parasites, including protozoa and helminths such as *the risk of infection from pathogens such as Giardia lamblia, Entamoeba histolytica, Cryptosporidium* spp.,

Ascaris lumbricoides, and Trichuris trichiura, are known to contribute to diarrheal illness, particularly in environments with poor sanitation. As reported by the World Health Organization (WHO) in 2024, diarrheal diseases account for nearly 443,832 annual fatalities in children under five, alongside 50,851 deaths in the 5–9 age bracket. In the Indonesian context, the 2023 Indonesian Health Survey (SKI) indicates a national diarrhea prevalence of 4.3% across all demographics and 7.4% among children under five. In Central Kalimantan Province, 18,327 diarrhea cases were recorded in 2023, while in Palangka Raya City the number of cases increased from 1,010 in 2022 to 1,739 in 2023.

Globally, intestinal protozoan infections remain an important cause of diarrhea in developing countries. Abdoli et al. (2024) reported high prevalence rates of protozoan parasites in several Asian countries, with commonly identified species including *Giardia duodenalis, Entamoeba histolytica, Entamoeba coli,* and *Cryptosporidium* spp. In Indonesia, various studies have demonstrated a strong association between food contamination by intestinal parasites and diarrheal disease, highlighting the role of environmental sanitation and food-handling hygiene in parasite transmission. One of the key factors contributing to parasitic contamination of food is the presence of flies acting as mechanical vectors. Flies frequently land on feces, garbage, and decomposing organic matter, allowing infective stages of intestinal parasites to adhere to their body surfaces and subsequently be transferred to exposed food. Studies conducted in Indonesia have shown that the green bottle fly *C.megacephala* and the housefly *M.domestica* were positive for carrying helminth eggs, including *A.lumbricoides and T. trichiura*, on their body surfaces (Ryani et al., 2017; Tan & Machrumnizar, 2018). These findings indicate that flies commonly found in food-related environments play a significant role in the mechanical transmission of soil-transmitted helminths. Similar findings have been reported internationally. Similar findings have been reported internationally. In Iraq, *M.domestica* was found to carry intestinal protozoa, including *E.histolytica* and *G.lamblia*, as well as several helminth eggs, such as *A.lumbricoides*, *E.vermicularis*, *H.nana*, *T.trichiura*, and *S.stercoralis*[12].

The presence of protozoa and the presence of helminth eggs attached to the external body surfaces of flies indicates fecal contamination in the surrounding environment and highlights the function of flies as mechanical vectors for the transmission of intestinal parasites. However, studies that simultaneously investigate protozoan parasites and helminth eggs carried by flies associated with traditional cake snacks remain limited, particularly in Palangka Raya City, Central Kalimantan. Traditional cakes are often displayed uncovered, increasing the risk of fly-borne contamination. Therefore, this study aimed to identify intestinal protozoa and helminth eggs on flies collected from traditional cake vending sites in Palangka Raya City, Indonesia, to support food safety improvement and diarrheal disease prevention.

2. Materials And Methods

This research utilized a descriptive, observational, laboratory-based design. The fly specimens were gathered through a purposive sampling technique. The study samples consisted of flies landing on traditional cake snacks sold at several locations in Palangka Raya City. In total, nine sampling locations were included in the research.

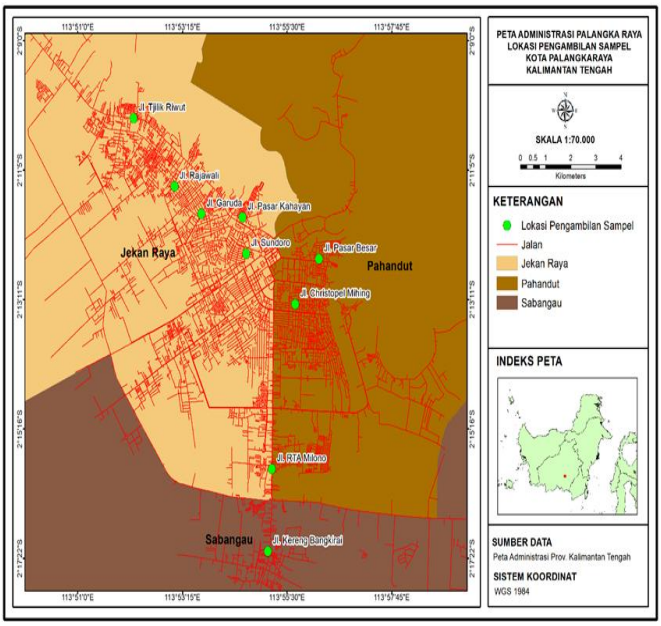

Figure 1. Locations of fly sampling in Palangka Raya City

Collected flies were processed using the sedimentation method. The flies were first immersed in sterile distilled water. The mixture was centrifuged at 2000 rpm for 5 minutes, after which the sediment was pipetted onto a glass slide. Microscopic examination was then conducted at 40× magnification to identify the presence of pathogens using microscope compound to observe the presence of parasitic protozoa and helminth egg, using standard identification references by Soulsby (1982), Garcia (2007), and John & Petri (2006). The study protocol was approved by the Health Research Ethics Committee of the Faculty of Medicine, Universitas Palangka Raya (Reference No: 129/UN24.9/LL/2025).

3. Results And Discussion

Identification of Flies collected from traditional cake vending sites in Palangka Raya City flies sampled from traditional cake stalls in Palangka Raya were categorized based on their morphological characteristics. The results showed that the flies obtained during sampling belonged to *Musca* sp. and *Chrysomya* sp. (Fig.1). Identification was performed by observing external features, including body size, body color, with the morphology of the head, thorax, abdomen, and wings. *Musca* sp. was identified by its small to medium body size, grayish body coloration, and the presence of longitudinal dark stripes on the thorax (Rahmayanti et al., 2022; Supiyani et al., 2025). In contrast, *Chrysomya* sp. was characterized by a

larger body size and a distinctive metallic green to bluish coloration with a shiny body surface (Oematan & Moenek, 2018). The presence of both fly species at traditional cake vending sites suggests environmental conditions that support fly activity, such as uncovered food displays, organic waste, and inadequate sanitation, supporting highlighting their role as potential mechanical vectors for the transmission of enteric pathogens pathogenic microorganisms.

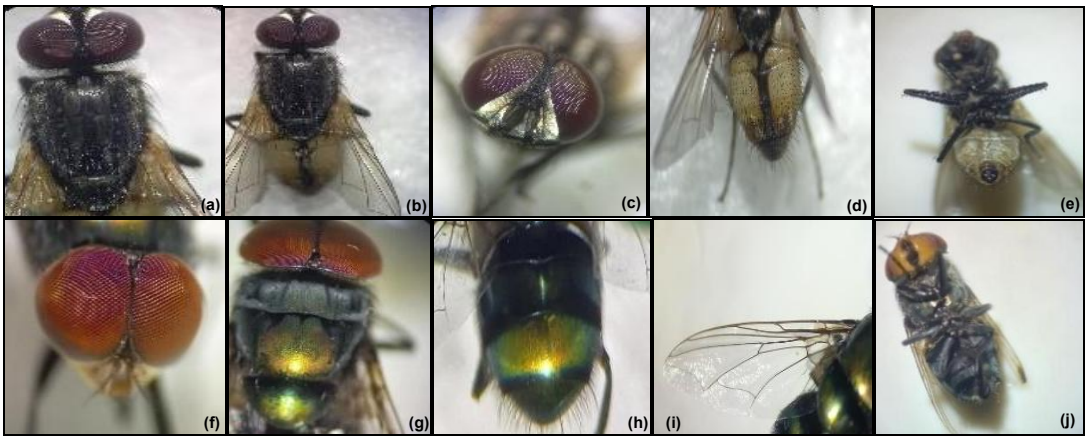

Figure 2. *Musca* sp. flies are shown in images (a,b,c, d, e) while *Chrysomya* sp. flies are shown in images (f, g, h, i, j). The flies were observed under a stereo microscope at appropriate magnification for morphological identification from collecting in tradisional cake market.

Protozoan parasites were detected at two locations. *Blastocystis* sp. was identified at Jl. Tjilik Riwut with two findings, while *Endolimax* sp. was detected at Jl. Pasar Kahayan with one finding. Helminth eggs identified in this study were eggs of *Ascaris* sp. These eggs were detected at Jl. Rajawali, Jl. Christopel Mihing, and Jl. Pasar Besar, each with one to two findings, indicating fecal contamination in multiple sampling sites. In total, three findings were recorded as protozoan parasites, and one finding was worm eggs from *Ascaris* sp. A total of 89 flies were examined, consisting of 78 specimens of *Musca* sp. and 11 specimens of *Chrysomya* sp. *Musca* sp. was the dominant fly species across all sampling locations, whereas *Chrysomya* sp. was present at only a limited number of sites.

Table 1. Characteristics of parasitic protozoa detected on flies in Palangka Raya

No	Site	Parasite	(n)	Species of flies	
				Musca sp.	*Chrysomya* sp.
1	S 02°10.250'E 113°52.200'	*Blastocystis* sp.	2	9	0
2	S 02°10.247'E 113°52.199'	*Ascaris* sp.	2	8	3
3	S 02°11.888'E 113°54.556'	-	0	9	0
4	S 02° 12.443'E113°54.617'	*Endolimax* sp.	1	8	4
5	S 02°12.289'E 113°53.285'	-	0	7	0
6	S 02°14.511' E 113°55.199'	*Ascaris* sp.	1	11	0
7	S 02°17.232' E 113°55.124'	-	0	8	0
8	S 02°13.232' E 113°66.638'	*Ascaris* sp.	2	9	4
9	S 02°12.561' E 113°56.177'	-	0	9	0
Total			8	78	11

Using microscope of flies revealed the presence of intestinal protozoa, namely *Blastocystis* sp. and *Endolimax* sp., on the body surface of flies. The detection of these protozoa indicates fecal in contamination of traditional cake vending sites and reflects inadequate environmental sanitation. *Blastocystis* sp. was predominantly observed in the vacuolar form, appearing as round to oval structures haracterized by a large central vacuole that occupies the majority of the intracellular space, causing the cytoplasm to form a thin peripheral layer peripheral rim, while the nucleus was not clearly visible under light microscopy. This morphology corresponds to the vacuolar form of *Blastocystis* sp. commonly reported in environmental and fecal samples and is frequently associated with contaminated food and water sources. *Endolimax* sp. was identified in the cyst stage, characterized by small oval-shaped structures with thin cyst walls and granular cytoplasmic contents. The nucleus exhibited a large karyosome without peripheral chromatin, which is a distinguishing feature of *Endolimax* sp. cysts (Garcia, 2007). The presence of cysts indicates that the protozoa were in a resistant stage, enabling survival outside the host and increasing the potential for transmission through contaminated surfaces and food.

In addition to protozoa, microscopic observation also revealed the presence of helminth eggs identified as *Ascaris* sp. on flies collected from the same vending sites. The *Ascaris* sp. eggs observed were oval to oval-elongated in shape, with thick shells, yellowish to brown bile staining, and granular internal contents. Morphological variation was observed, with some eggs exhibiting a rough outer surface while others appeared smoother. These characteristics are consistent with the typical morphology of *Ascaris* sp. eggs identified under light microscopy. The presence of *Ascaris* sp. eggs on the body surface of flies indicates fecal contamination in the surrounding environment (Garcia, 2007; John & Petri, 2006; Soulsby, 1982). Moreov *Ascaris* eggs are known for their ability to persist u a unfavorable environmental conditions and to adhere easily to fly body parts such as legs, mouthparts, wings, and body hairs, thereby reinforcing the role of flies as mechanical vectors in the transmission of helminth infections, particularly in food vending environments with uncovered products.

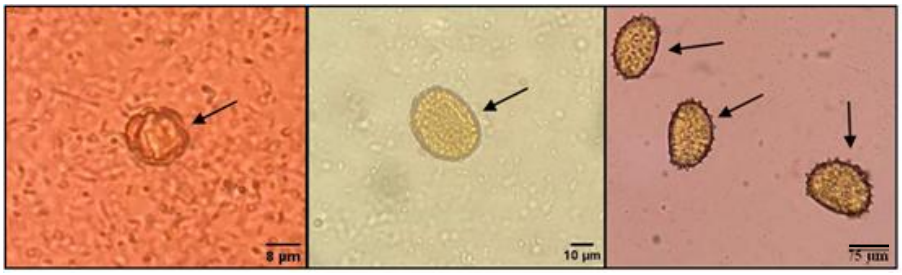

Figure 3. The microscopic examination results showed protozoa images of (a); *Blastocystis* sp, (b); *Endolimax* sp. (c) eggs of *Ascaris* sp. The observations were conducted using a compound microscope at magnifications of 10×10 and 400x to identify morphological characteristics.

The simultaneous detection of *Blastocystis* sp., *Endolimax* sp., and *Ascaris* eggs confirms that flies act as mechanical vectors of multiple intestinal parasites. Mechanical transmission occurs through the physical transfer of infective stages from contaminated sources, such as feces or organic waste, to exposed food without parasite development within the vector. Flies frequently land on feces, garbage, and decomposing organic matter before landing on food. During feeding, flies may regurgitate digestive contents or defecate on food surfaces, further increasing the risk of contamination (Arif et al., 2025).

The presence of these parasites on flies reflects the sanitary conditions of traditional cake vending environments. Factors such as uncovered food containers, inadequate waste management, and high fly density contribute to the persistence of fecal contamination (Fitri & Sukendra, 2020). These conditions facilitate the transfer of intestinal parasites from contaminated sources to ready-to-eat traditional cake snacks, increasing the potential risk of transmission to consumers.Overall, the findings of this study demonstrate that *Musca* sp. and *Chrysomya* sp. collected from traditional cake vending sites in Palangka Raya City carry intestinal protozoa and soil-transmitted helminth eggs. The significant role of flies in transporting intestinal parasites highlights the urgent need for better environmental hygiene and food safety standards. Implementing integrated fly control measures is essential to reduce the prevalence of parasitic contamination in traditional food settings.

4. Conclusion

This study demonstrated that flies collected from traditional cake vending sites in Palangka Raya City consisted of *Musca* sp. and *Chrysomya* sp., which are synanthropic fly species commonly associated with human activities and environments with suboptimal sanitation. The presence of these fly species reflects environmental conditions that support fly activity in traditional food vending areas. Microscopic examination revealed the presence of intestinal protozoa, namely *Blastocystis* sp. and *Endolimax* sp., as well as helminth eggs identified as *Ascaris* sp. on the body surface of flies. The detection of protozoan cysts and *Ascaris* sp. eggs indicates fecal contamination in the vending environment. The simultaneous presence of protozoa and *Ascaris* sp. eggs on flies confirms the role of flies as mechanical vectors capable of transferring intestinal pathogens and parasitic stages to human food sources parasite stages from contaminated sources to exposed traditional cake snacks. Overall, these findings highlight the potential risk of parasitic contamination associated with traditional cake consumption. Therefore, improving environmental sanitation, ensuring proper food covering, and implementing effective fly control measures are essential to reduce the risk of intestinal parasite transmission in traditional cake vending settings**.**

Conflict of interest statement

The authors declare that there is no conflict of interest.

Acknowledgement

The authors extend their sincere appreciation to all individuals who contributed to the realization of this study supported the completion of this study. Appreciation is extended to the traditional cake vendors and local authorities who granted permission for sample collection at the study locations.

Authors' contributions

S performed conceptualization, methodology, writing, review and editing. NSM performed

investigation, supervision, visualization. ARJ performed revision, editing, analyzed and writing.

References

Abdoli, A., Olfatifar, M., Vafae, A., Zeinab, E., Oskar, M., & Majid, N. (2024). Prevalence of Intestinal Protozoan Parasites Among Asian Schoolchildren : A Systematic Review and Meta Analysis. *Infection*, *52*(6), 2097–2133. https://doi.org/10.1007/s15010-024-02339-1

Al-aredhi, H. S. (2015). Role of House Flies (Musca domestica) as Vector Host for Parasitic Pathogens in Al-Diwaniya Province / Iraq. *International Journal of Science and Research (IJSR)*, *4*(4), 1961–1965.

Antoh, L., Winarso, A., & Almet, J. (2021). Ragam Jenis dan Kelimpahan Lalat pada Peternakan Sapi di Kupang. *Jurnal Veteriner Nusantara*, *4*(1), 1–13. https://doi.org/10.35508/ jvn.v4i1. 6047

Arif, A., Putri, D. U. P., & Hermawan, N. S. A. (2025). Tingkat Kepadatan Lalat dan Kepemilikan Jamban Sehat dengan Kejadian Diare Di Puskesmas Air Hitam Lampung Barat. *JIKMH : Jurnal Ilmiah Kesehatan Media Husada*, *14*(2), 127–135. https://doi.org/10.33475/jikmh.v14i2.422

Ariyani, S., Suhermanto, & Dahlan, A. (2025). Keberadaan Musca Domestica Sebagai Parasit Usus Di Tempat Penampungan Sampah Sementara. *Jurnal Studi Multidisipliner*, *9*(6), 116–124. https://oaj.jurnalhst.com/index.php/ jsm/article/view/11785

Badan Kebijakan Pembangunan Kesehatan. (2024). *Survei Kesehatan Indonesia (SKI) 2023 Dalam Angka: Data Akurat, Kebijakan Tepat. Kementerian Kesehatan Republik Indonesia*. https://www.badankebijakan.kemkes.go.id/ski-2023-dalam-angka/

Dinas Kesehatan Kota Palangka Raya. (2023). *Buku Statistik Kota Palangka Raya Tahun 2023*. Dinas Kesehatan Kota Palangka Raya.

Dinas Kesehatan Kota Palangka Raya. (2024). *Buku Statistik Kota Palangka Raya Tahun 2024*. Dinas Kesehatan Kota Palangka Raya.

Dinas Kesehatan Provinsi Kalimantan Tengah. (2024). *Profil Kesehatan Provinsi Kalimantan Tengah Tahun 2024*. https://dinkes.kalteng.go.id/

Eslahi, A. V., Olfatifar, M., Zaki, L., Karimipour Saryazdi, A., Barikbin, F., Maleki, A., Abdoli, A., Badri, M., & Karanis, P. (2023). Global prevalence of intestinal protozoan parasites among food handlers: A systematic review and meta-analysis. *Food Control*, *145*, 109466. https://doi.org/10.1016/j.foodcont.2022.109466

Fadilla, Z., Febriyossa, A., Habibie, A., & Indrawan, I. (2022). Identifikasi Parasit Pada Eksoskleton Lalat Hijau Chrysomya spp. *Jurnal Medical Laboratory*, *1*(2), 28–37. https://doi.org/ 10.57213/medlab.v1i2.105

Fitri, A., & Sukendra, D. M. (2020). Efektivitas Variasi Umpan Organik pada Eco Friendly Fly Trap Sebagai Upaya. *Higeia Journal Of Public Health*, *4* (Special 2), 448–459. https:// doi.org/10.15294/ higeia.v4iSpecial%202.39965

Garcia, L. S. (2007). *Diagnostic Medical Parasitology* (6th Ed.). ASM Press.

Jabal, R., Ifandi, S., Suriawanto, N., Wahyudi, P., Pisu, A. J., Tuhuteru, F. M., & Pawane, M. S. (2021). Detecting Helminth Eggs on The Body Surface of Flies In Markets In Makassar. *Journal of Physics: Conference Series*. https://doi.org/10.1088/1742-6596/1918/5/052019

John, D. T., & Petri, W. A. (2006). *Markell and Voge's Medical Parasitology* (G. Martin (ed.)). Saunders.

Lestari, H. D., & Mulyowati, T. (2019). Identifikasi Entamoeba hystolitica dan Balantidium coli pada Lalat di Pasar Legi Surakarta. *Jurnal Biomedika*, *12*(01), 79–83. https://doi.org/10.31001/ biomedika.v12i1.426

Putri, Y. P. (2015). Keanekaragaman Spesies Lalat (Diptera) dan Bakteri Pada Tubuh Lalat di Tempat Pembuangan Akhir Sampah (TPA) dan Pasar. *DAMPAK*, *12*(2), 79–89. https://doi.org/ 10.25077/dampak.12.2.79-89.2015

Rahmayanti, Erlinawati, & Safwan. (2022). Tingkat Kepadatan Lalat dan Identifikasi Jenis Lalat pada Tempat Penjualan Ikan di Pasar Peunayong Kota Banda Aceh. *Journal of SAGO Gizi Dan Kesehatan (Nutrition and Health)*, *3*(2), 144–149. https://doi.org/10.30867/gikes.v3i2.924

Ryani, M. H., Hestiningsih, R., & Hadi, M. (2017). Ektoparasit (Protozoa dan Helminthes) pada Lalat di Pasar Johar dan Pasar Peterongan Kota Semarang. *Jurnal Kesehatan Masyarakat (JKM)*, *5*(4), 570–576. https://doi.org/10.14710/jkm. v5i4.18715

Salamandane, A., Malfeito-Ferreira, M., & Brito, L. (2023). The Socioeconomic Factors of Street Food Vending in Developing Countries and Its Implications for Public Health : A. *MDPI Foods*, *12*(3774). https://www.mdpi.com/2304-8158/12/ 20/3774

Sarkari, B., Hosseini, G., Motazedian, M. H., Fararouei, M., & Moshfe, A. (2016). Prevalence and Risk Factors of Intestinal Protozoan Infections: A Population-Based Study In Rural Areas of Boyer-Ahmad District, Southwestern Iran. *BMC Infectious Diseases*, *16*(1), 703. https://doi.org/ 10.1186/s12879-016-2047-4

Soulsby, E. J. L. (1982). *Helminths, Arthropods and Protozoa of Domesticated Animals*. Bailliere Tindall.

Supiyani, F., Pratami, G. D., Mumtazah, D. F., & Rosa, E. (2025). Identifikasi Ektoparasit pada Sapi Simmental dan Sapi Limousin di Peternakan Desa Jaya Asri , Kecamatan Metro Kibang , Kabupaten Lampung Timur. *Gunung Djati Conference Series*, *59*, 53–67.

https://conferences.uinsgd.ac.id/index.php/gdcs/article/view/3197

Oematan, A. B., & Moenek, D. Y. (2018). Keragaman Dan Aktifitas Lalat Pengganggu Di Peternakan Sapi Semi Ekstensif. *Partner*, 23(2), 722-729. http://dx.doi.org/10.35726/jp.v23i2.315

Tan, S., & Machrumnizar, M. (2018). Peranan Musca Domestica Sebagai Vektor Mekanik Telur Infektif Ascaris Lumbricoides. *Jurnal Penelitian Dan Karya Ilmiah Lembaga Penelitian Universitas Trisakti*, *2*(1), 8–13. https://doi.org/10.25105/ pdk.v2i1.2454

Utoyo, A. P., & Ardillah, Y. (2021). Efektivitas Atraktan Tahu, Oncom dan Kacang Tanah pada Fly Trap dalam Pengendalian Lalat. *Jurnal Kesehatan Masyarakat Indonesia*, *16*(2), 115–120. https://doi.org/10.26714/jkmi.16.2. 2021. 115-120

World Health Organization (WHO). (2024). *Diarrhoeal Disease*. WHO. https://www.who.int/news-room/fact-sheets/detail/diarrhoeal-disease

Xavier, A., Dwinata, M., & Oka, I. (2022). Identifikasi Jenis Lalat Tidak Penghisap Darah pada Peternakan Babi di Bali. *Buletin Veteriner Udayana*, 531–537. https://doi.org/10.24843/bulvet.2022.v14.i05.p13