

A Rare and Fatal Encounter: First Report of *Gasterophilus intestinalis*-Induced Fatality in an Akiabara Horse in Brunei Darussalam - A Case Report

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Abstract

Gasterophilus intestinalis, or the "horse bot fly," primarily infects equines, with known cases causing discomfort but rarely resulting in death. This paper is the first record of *G. intestinalis*-induced fatality in an Akiabara horse in Brunei Darussalam. The death of a 7-year-old intact female Akiabara horse due to infestation of *G. intestinalis* was recorded in 2023. The presence of *G. intestinalis* in Brunei's horse population necessitates rigorous surveillance, highlights the importance of recognizing and addressing parasitic infection and the need for vigilant parasite research and surveillance in equine health management, thereby promoting improved equine healthcare practice in Brunei Darussalam. It is important to recognize and address parasitic infections, even in regions where they are uncommon. This case underlines the need for vigilant parasite control measures, early diagnosis, and effective treatment to prevent similar incidents. By strengthening surveillance, prevention, and biosecurity practices Brunei can safeguard its equine population from the risks of *G. intestinalis* infestation. Not only that, but enhancing biosecurity protocols for imported horses is vital to ensure the spread of *G. intestinalis* is prevented.

Index Terms: *Gasterophilus intestinalis*, Akiabara, horse, Brunei Darussalam

1. Introduction

Gasterophilus intestinalis, commonly known as the "horse bot fly", is a well-documented parasitic insect that predominantly infests equines. While cases of *G. intestinalis* infestations are known to cause discomfort and health issues in horses worldwide, fatality attributed to this parasite is exceptionally rare.¹ This case report marks the first documented instance of *G. intestinalis*-induced fatality in an Akiabara horse in Brunei Darussalam.²

G. intestinalis is part of the *Gasterophilidae* family, encompassing various species of bot flies known to parasitize mammals, primarily horses. The adult female *G. intestinalis* fly lays its eggs on the horse's hair coat, which are later ingested by the horse during grooming. Upon ingestion, these eggs hatch into larvae within the horse's stomach. The larvae attach themselves to the gastric mucosa for an extended period before detaching and being expelled from the host.³ In extremely rare instances, the infestation can lead to severe complications, including death.

This report aims to not only serve as a clinical record of a unique and regrettable incident but also to raise awareness among veterinarians, horse owners, and researchers in Brunei Darussalam regarding the potential implications of *G. intestinalis* infestations in local equine populations.

As an exceptional case in the region, this report highlights the importance of comprehensive parasitological research and surveillance in equine health management. Understanding and addressing such unusual cases can contribute to improved equine healthcare practices, potentially preventing similar incidents in the future.

2. Case History

A 7-year-old intact female Akiabara horse arrived in Brunei Darussalam on August 1st, 2023, from Argentina. On August 14th, 2023, the mare developed watery diarrhea, accompanied by hyperthermia and tachycardia, while maintaining a normal respiratory rate. Despite a 20-minute cold bath, her body temperature remained elevated. Subsequently, she received treatment, including hyoscine butyl bromide, flunixin meglumine, procaine benzylpenicillin, dexamethasone, and bismuth subsalicylate. During this time, she was housed in an air-conditioned room but remained anorexic, refusing to consume Timothy hay and fresh napier grass. Additional intravenous (IV) fluids, containing vitamin B complex, hyoscine butyl bromide, flunixin meglumine, and bismuth subsalicylate, were administered due to ongoing tachycardia, diarrhea, and low urine output (UOP). Her body temperature initially improved to 37.6°C but later increased to 38.6°C.

On the morning of August 16th, 2023, the mare continued to exhibit hyperthermia (38.6°C), tachycardia (60 bpm), and persistent watery diarrhea. Hematologic and serum biochemical profiles revealed leukocytosis, notably elevated eosinophil levels, along with increased Alkaline Phosphatase, Creatine, and sodium. She received further doses of bismuth subsalicylate, vitamin B complex, and IV fluids. Throughout this period,

the horse remained in her stall, showing no signs of distress until 12:00 am.

On August 17th, 2023, at 06:00 am, the horse was discovered deceased. Subsequently, the horse's remains were transported to the Pathology Laboratory (PHL) at the Veterinary Laboratory Service (VLS) of KKP Terunjing Brunei Darussalam for post-mortem examination and further investigation.

The examination revealed that the horse had a normal body condition score of 4-5/9⁴ and exhibited superficial wounds around the right hip region. In the gastric lumen, lesions were observed, including black scars suggestive of perforation, with red maggots firmly attached to the mucosal layer, raising suspicion of *Gasterophilus intestinalis* larvae infestation. These maggots, measuring approximately 1.2 to 1.9 cm in length, displayed characteristics adapted for life in the gastrointestinal tract, featuring a rounded body, narrow, hooked mouthparts, and spines.

Unique among these spines were rows of smaller spines interspersed with larger ones, a distinctive feature identifying these larvae as belonging to the *Gasterophilidae* family (see **Figure 1**).

Additional findings included dark purpuric areas in the intestinal mucosa, dark red spots around the serosa layer of the large intestine, inflamed kidneys with a dark red-brown appearance upon incision (indistinct medulla and pelvic margin), and the presence of foamy white material within the trachea and bronchi. Notably, 80% of the lungs displayed a dark-brown appearance, and petechiae were identified in the pericardium and heart.

Histologically, examination of the tissue surrounding the submucosal cavity revealed marked edema and infiltration of macrophages and neutrophils. In regions of the gastric mucosa away from the perforation site, mild, diffuse eosinophil infiltration was observed. Other tissues exhibited signs of generalized vascular congestion and sporadic secondary microvascular

bacterial emboli in the lung and kidney (see **Figure 2**).

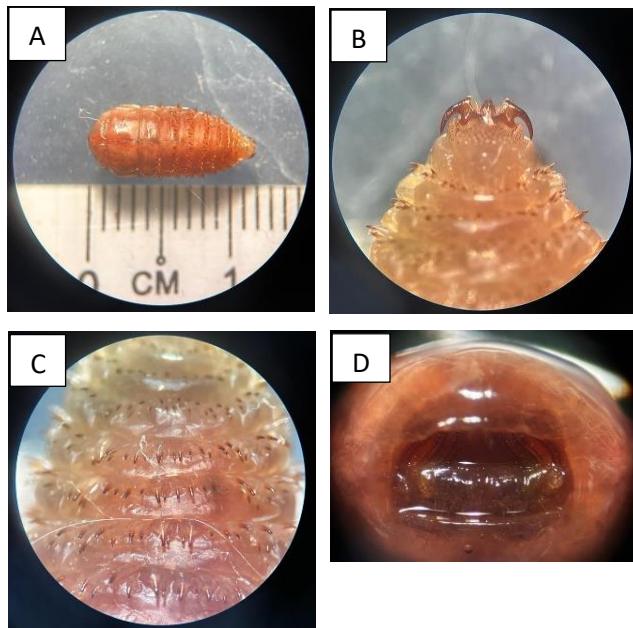


Figure 1. (A) The larvae size, (B) Hooked mouthparts (maxillae) enable the larvae to securely attach to the lining of the stomach and intestinal tract, (C) Dorsal view shows *Gasterophilidae* are all characterized with rows of smaller spines amongst rows of larger spines, (D) Posterior spiracle identifying these larvae as belonging to the *Gasterophilidae* family.

3. Discussion

This report documents a tragic incident involving an Akiabara horse in Brunei Darussalam, which succumbed to the effects of *G. intestinalis* infestation. The clinical presentation, diagnostic challenges, and ultimately, the unfortunate outcome of this case underscore the significance of recognizing and addressing parasitic infections, even in regions where such infestations are relatively uncommon.

It's noteworthy that there have been no reported cases of *Gasterophilus* infestations in horses in Brunei. This lack of reported cases could be due to several factors, including limited surveillance, the absence of a suitable host population, or simply a lack of awareness about the issue in the region.

The situation changes when a horse arrives in Brunei from Argentina, a region where *Gasterophilus* infestations may be more common or reported. If this horse has been in contact with *Gasterophilus*-infested environments or other horses carrying the parasite while in Argentina, there is a possibility that it could introduce *Gasterophilus* larvae into Brunei.⁵

The patho-mechanism leading to gastric perforation in horses due to *Gasterophilus spp.* infestation comprises several stages. It commences with the ingestion of *Gasterophilus* eggs by horses, typically transferred from their hair coat during grooming. These ingested eggs then hatch within the horse's mouth, and the ensuing larvae embark on a journey through the oral cavity, eventually reaching the stomach. Equipped with specialized mouthparts, the larvae attach themselves to the gastric mucosa and commence feeding on the stomach lining, inducing superficial ulcerations that compromise the stomach's integrity.⁵

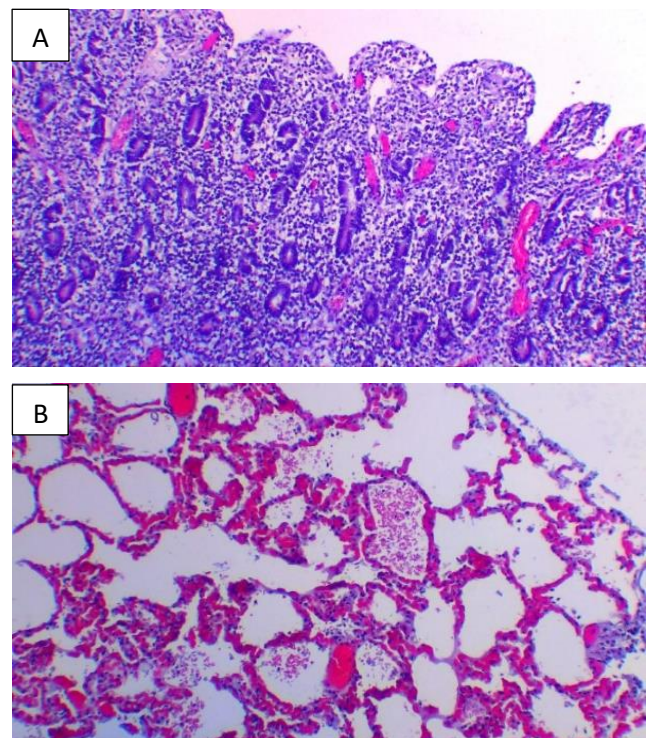


Figure 2. (A) Histopathological findings of macrophages and neutrophils in intestine and epithelial erosion, (B) Generalized vascular congestion and exudate in lumen of alveoli in the lung.

As time progresses, the larvae undergo growth and development within the stomach, concurrently forming protective pupal chambers within the gastric mucosa. This process further weakens the gastric wall, making it more susceptible to damage. In severe cases, this weakened stomach lining can culminate in gastric perforation, characterized by the development of a hole or rupture in the stomach wall. This perforation permits the escape of stomach contents, including digestive fluids and partially digested food, into the abdominal cavity.⁵

The consequences of gastric perforation caused by *G. intestinalis* include the onset of peritonitis, an intense and painful inflammation of the abdominal lining, alongside the potential for systemic inflammation resulting from the irritation and infection caused by the stomach contents. Clinical signs in affected horses typically manifest as severe colic, encompassing restlessness, abdominal pain, sweating, and behavioral changes. If left untreated, gastric perforation can lead to shock and ultimately prove fatal. Consequently, swift diagnosis and immediate surgical intervention are imperative in managing this severe veterinary emergency effectively.⁶

In this particular case, *G. intestinalis* infestation in the horse did not result in the formation of a gastric perforation with a hole in the stomach lining. Instead, the infestation initiated a systemic infection. This patho-mechanism likely involved the larvae attaching to the gastric mucosa, inducing local inflammation and creating ulcerations. The compromised gastric lining may have facilitated a secondary bacterial infection, leading to systemic spread of the infection to other parts of the horse's body. Clinical signs included fever, lethargy, loss of appetite, and manifestations of generalized illness.⁵

However, these parasites induced unexpected and severe complications, including the development of petechiae within the heart. This unusual cardiac involvement, though relatively rare, highlights the intricate and systemic consequences these parasites can impart on

equine health. Despite their primary infestation site being the gastrointestinal tract, the systemic repercussions of their presence can lead to unanticipated complications in diverse organs, including the heart.⁵

The precise patho-mechanism behind *Gasterophilus*-induced petechiae in the heart is not completely understood but likely encompassed a multifaceted interplay of factors. It is conceivable that the irritation and inflammation provoked by the parasites within the gastrointestinal tract may have incited a systemic inflammatory response. The mechanisms involved remain poorly understood, but they probably included an immune-mediated inflammatory response to the larvae attaching to the tissue. Thus, it is hypothesized that parasitic antigens initiated the formation of immune complexes, whose localization in vessel walls either by deposition from the circulation or by in situ formation initiated the vasculitis. This response, in turn, could have induced alterations in the blood coagulation system, potentially culminating in abnormal clotting and microvascular damage across various organs, including the lung.⁷

Given the introduction of a horse from an area where *Gasterophilus* has been reported, it is essential for Brunei's veterinary and health authorities to be vigilant. They should conduct thorough examinations of the horse and consider preventive measures to reduce the risk of *Gasterophilus* infestation spreading in the local equine population.

G. intestinalis poses a notable threat to equine health, while bot flies, in general, exhibit a broad distribution among various livestock, including cattle, horses, donkey, sheep, goats, and reindeer. The implications for the livestock industry are substantial, potentially leading to significant economic losses.⁸

Avermectin and moxidectin anthelmintics are highly effective for the control of *G. intestinalis*.¹² In Brunei's warmer climate, it is advisable to administer anti-parasitic medication

gradually. For prevention and control measures, bot fly infestations can be managed by applying insecticides to deter adult flies from laying eggs on horses, clipping hair to remove eggs, or preventing ingestion by the horse, and administering appropriate anthelmintic agents. Additional measures include the collection and elimination of feces contaminated with larvae.¹²

Gasterophilosis presents a zoonotic concern as botflies exclusively lay their eggs on or near horses. Nevertheless, individuals in proximity to horses may occasionally contract infections from larvae or near-hatching eggs. Migration of first-stage larvae is associated with cutaneous and ocular myiasis in humans, often manifesting as a visible, tortuous path under the skin accompanied by severe pruritus.¹²

This situation underscores the importance of biosecurity measures when transporting horses internationally and the need for ongoing surveillance and monitoring of equine health to detect and address potential health threats promptly. It is advisable for equine owners and veterinarians in Brunei to stay informed and take appropriate measures to protect the health of their horses.

4. Conclusions

The occurrence of *G. intestinalis*-induced fatality in this Akiabara horse sheds light on the potential severity of parasitic infections in equines, reinforcing the need for vigilant parasite control measures, early diagnosis, and effective treatment. The potential presence of *Gasterophilus spp.* in Brunei's horse population warrants careful attention. It is crucial to initiate thorough surveillance and take proactive measures to safeguard the local equine community. This situation highlights the necessity of reviewing and enhancing biosecurity protocols for importing horses into the region. By strengthening surveillance, prevention, and biosecurity practices, Brunei can better protect its equine population from the risks associated with *Gasterophilus* infestation.

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