



CASE REPORT

***Taenia saginata* Infection in a 25-Year-Old Immigrant in Malaysia: A Case Study**

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ABSTRACT

Taeniasis is a parasitic infection in humans by tapeworm species typically acquired through the ingestion of undercooked pork or beef leading to infections with *Taenia solium*, *Taenia asiatica* or *Taenia saginata*. We reported a case of taeniasis in a young man of Chinese nationality who presented with recurrent episodes of expelling proglottids. He was at risk due to his preference for consuming undercooked beef. He remained asymptomatic and his physical examination was unremarkable. A 330 cm tapeworm was recovered; each mature proglottid contained 12–30 primary lateral uterine branches. Stool examination revealed eggs consistent with *Taenia* species. DNA sequencing from the isolate confirmed the identification of *T. saginata*.

Keywords: Taeniasis; *Taenia saginata*; beef tapeworms; proglottids; Malaysia.

INTRODUCTION

Taeniasis, the intestinal parasitic infection of large zoonotic tapeworms, is caused by *Taenia solium*, *Taenia asiatica* or *Taenia saginata*. Taeniasis is endemic in Southeast Asia such as Indonesia and Thailand (World Health Organization, 2022). However, despite its proximity to these endemic countries, taeniasis is rarely reported in Malaysia. In fact, *T. saginata* infection was first reported in 1976 among local Malay population in Perlis and no cases reported thereafter until 2017 whereby 2 cases were reported among a Malaysian Chinese traveling to Madagascar and a native Sabahan respectively (Chua *et al.*, 2017).

As a matter of fact, *T. saginata* tapeworms are the largest among the three species (Table 1). As such, *T. saginata* is more likely to cause symptoms among infected patients. The reported symptoms

are often non-specific, for example, mild abdominal discomfort, anorexia, diarrhea, perianal pruritus, weight loss or insomnia. Often, the most striking signs are active passage of proglottids from anus or in faeces (Centers for Disease Control and Prevention, 2023, 2024). It can occasionally cause appendicitis or pancreatitis if the proglottids were lodged in appendiceal lumen or the biliary tract (Liu *et al.*, 2005; Sharifdini *et al.*, 2021). We report a case of *T. saginata* tapeworm infection in a young immigrant who presented with recurrent episodes of passing proglottids.

CASE REPORT

A 25-year-old man from Shandong province, China, presented with complaints of passing long whitish material during defecation two days earlier. He denied experiencing any associated symptoms,

Table 1. Differentiating features among *Taenia* species (CDC, 2024)

	<i>T. saginata</i>	<i>T. solium</i>	<i>T. asiatica</i>
Source (intermediate host)	Beef	Pork	Pork
Length (m)	4–12 m, possible to grow until 25 m	2–8 m	4–8 m
Proglottids per worm	1,000 to 2,000	1,000	700
Eggs per worm (per day)	~100,000	~50,000	~80,000
Primary lateral uterine branches in mature proglottids	12–30	7–13	15–20
Scolex	4 large suckers Lack rostellum and rostellar hooks	4 large suckers Presence of rostellum	Rudimentary hooklets in wart-like formation

including abdominal pain, nausea, vomiting, or weight loss. A similar episode had occurred three months prior, during which he sought medical attention. A colonoscopy performed at that time was unremarkable, and he was empirically treated with oral albendazole 400 mg once daily for three days. The patient reported a habit of consuming raw beef over the past year but denied eating any other raw meat. He owns a restaurant and has been residing in Malaysia for the past year.

His vital signs were within normal limits and he appeared well on examination. Physical examination findings were unremarkable.

His blood investigation was within normal limits. His hemoglobin was 16.2g/dl (Normal range 13.0-17.0 g/dl), white blood cell $5.7 \times 10^9/L$ (Normal range $4-10 \times 10^9/L$) with eosinophils 3% (Normal range 1-6%). His erythrocytes sedimentation rate test (ESR) is 2mm/hr (Normal range 0-15 mm/hr). The whitish material provided by the patient was sent to the Parasitology Unit at the University Malaya Medical Centre for further analysis.

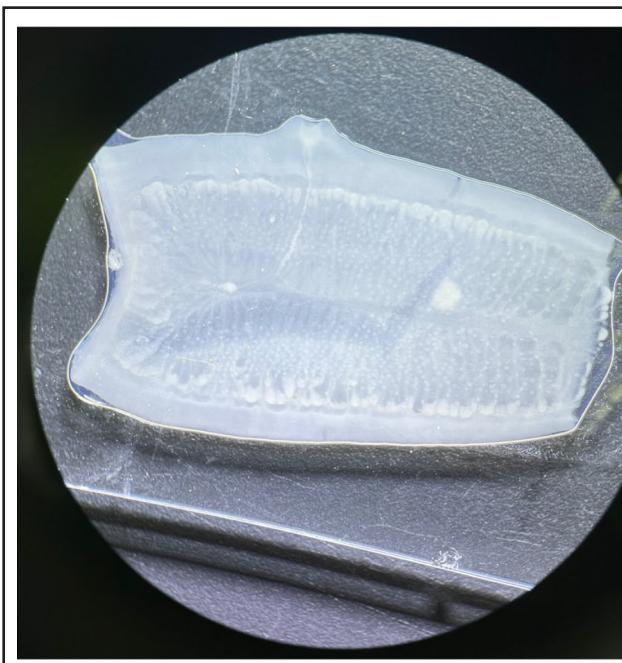
Parasitological examination revealed tapeworm strobila measuring 330 cm in length (Figure 1). Approximately 350 proglottids were identified in the specimen. Despite a thorough search, no scolex was recovered.

Mature gravid proglottid was selected for further analysis (Figure 2a) and stained with India Ink according to the procedure given by Centers for Disease Control and Prevention, 2024 (Figure 2b). Examination under a dissecting microscope identified approximately 30 primary lateral uterine branches per mature proglottid, confirming the diagnosis of *Taenia saginata*. Additionally, stool examination revealed eggs with a thick, radially striated shell and an internal oncosphere containing six refractile hooks, characteristic of *Taenia* species (Figure 3). *Taenia* spp. eggs are typically reported to measure 30–35 μm in diameter (CDC, 2024). Polymerase chain reaction (PCR) and Restriction Fragment Length Polymorphism (RFLP) analysis were performed to confirm the identification of *Taenia* species. Genomic DNA was extracted from gravid proglottids using the DNeasy Blood and Tissue Kit (Qiagen, Hilden, Germany) according to the manufacturer's instructions. The primers and amplification protocol were adopted from González et al. (2002). A negative extraction control (no tissue sample) was

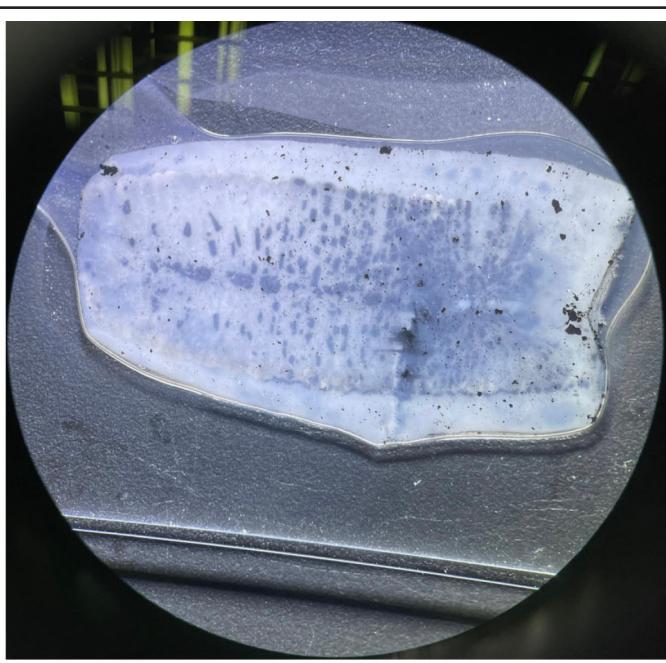
included in both methods to monitor potential contamination. No positive control was included in the PCR assays due to the unavailability of reference *Taenia* DNA. The extracted DNA were amplified using :



Figure 1. Strobila of *Taenia saginata*, measuring approximately 330 cm in length.



(a)



(b)

Figure 2(a). Unstained mature proglottid of *Taenia saginata* showing a prominent lateral genital pore and multiple lateral uterine branches. **(b).** Gravid proglottid of *Taenia saginata* stained with India Ink, highlighting the lateral uterine branches.

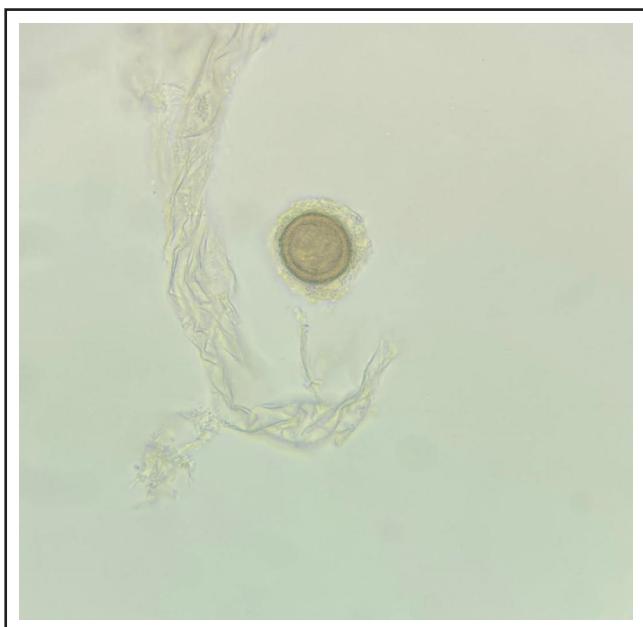


Figure 3. Egg of *Taenia* spp. Eggs typically range in size from 30 to 35 μm in diameter (CDC, 2024).

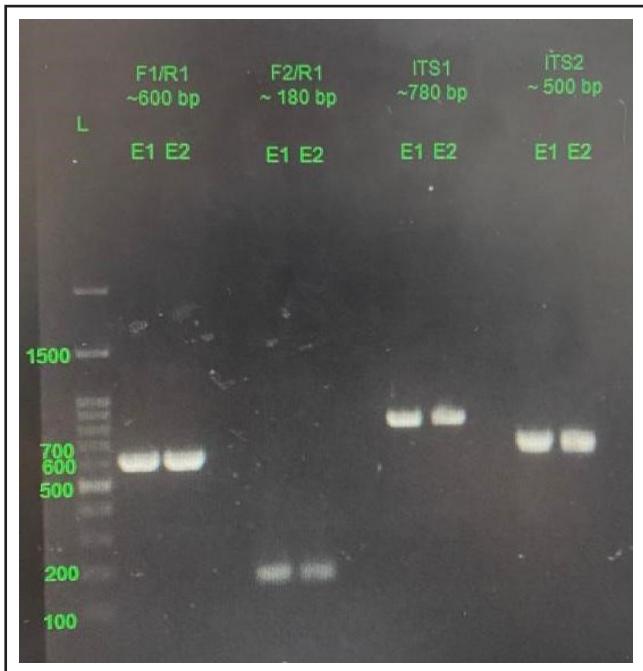


Figure 4. PCR-RFLP. The extracted DNA was amplified by a) F1/R1-PCR, b) F2/R1-PCR, c) ITS1-PCR and d) ITS2-PCR, followed by 2% agarose gel electrophoresis. SYBR Safe DNA Gel Stain was used for visualization. Molecular weight markers (bp) are shown on the left.

- a) **F1/R1-PCR:** Pts7s35f1 and PTs7S35R1 primers. This primer pair specifically amplifies a 600 bp amplicon associated with *Taenia saginata*.
- b) **F2/R1-PCR:** Pts7s35f2 and PTs7S35R1 primers. The 180 bp amplicon is shared by both *T. saginata* and *T. solium*, indicating amplification of a conserved region common to both species.
- c) **ITS1-PCR:** BD1 and 4S primers targeting sequences 18S and 5.8S rDNA subunits. The 760 bp amplicon supports differentiation between *T. saginata* and *T. solium*.

- d) **ITS2-PCR:** NC6 and NC2 primers targeting sequences of 5.8S and 28S rDNA. A 650 bp amplicon specific to *T. saginata* further confirms species identification.

The reactions were amplified using a Bio-Rad thermocycler. The amplified products were digested with various restriction endonucleases and visualized on 2% agarose gels (Figure 4), which were stained with SYBR Safe DNA Gel Stain (Invitrogen, Massachusetts, United States) and visualized using the Gel Doc system (Bio-Rad Laboratories, Hercules, United States). The F2/R1 amplicon was sequenced and compared with GenBank sequences using BLAST, confirming the species identity as *T. saginata* (100%).

The patient independently obtained a 600 mg dose of oral praziquantel from his home country and self-administered the medication. He did not seek further follow-up care thereafter.

DISCUSSION

Taeniasis is the parasitic infection of humans with adult tapeworms of *Taenia saginata* (beef), *T. solium* (pork) or *T. asiatica* (pork). According to the Centre of Disease Control and Prevention (2023) taeniasis is prevalent in Africa, Latin America, South and Southeast Asia. As the sexual reproduction of adult tapeworms only occurs in humans' intestine, humans are the only definitive host for *Taenia* spp. Humans acquired the disease by consuming undercooked pork or beef, which contained the larvae stage of the parasite, also known as cysticerci. Consequently, cysticerci will develop into adult tapeworms in the human intestine over 2 months. Adult tapeworms will then shed off mature, gravid proglottids into the faeces or anus, releasing infective eggs in faeces and hence allow the continuation of vicious infective cycle (Centers for Disease Control and Prevention, 2024).

In our case, the patient is of China nationality who had resided in Malaysia for a year. It has been reported that locals in China consume undercooked beef, raw pork or raw pig liver marinated in salted garlic and sour sauce that puts them at risk of taeniasis (Eichenberger et al., 2020).

In a nationwide survey on taeniasis in China during 2001-2004, the prevalence of taeniasis in China is said to be 0.28%, based on a sample size of 356629 (Coordinating Office of the National Survey on the Important Human Parasitic Diseases, 2005). On the other hand, a survey conducted in Malaysia in 2001 (Abdulla et al., 2002) and 2013 (Nisha et al., 2016) showed that the prevalence of taeniasis in Malaysia is 1.81%. However, this figure may not accurately represent the true prevalence due to the small sample size (~200 people). Moreover, the 110 of the samples were taken from a local indigenous community in Malaysia which harbors 2.7% of *Taenia* spp. (3 out of 110 samples) (Nisha et al., 2016); whereas only 1 out of 111 samples from Kuala Lumpur was positive (Abdulla et al., 2002). There is a vast difference in the prevalence of taeniasis among urban and remote areas and an epidemiology study of larger scale is needed to accurately demonstrate the true prevalence of taeniasis in Malaysia.

Furthermore, his habit of consuming partially cooked beef put him at increased risk of acquiring the disease despite migrating to a country with low endemicity of taeniasis. Such a case could introduce this rare infection into the local population and possibly spark an outbreak, given the high infectivity of *Taenia* eggs. Although the infective dose of *Taenia* spp. is unclear (Public Health Agency of Canada, n.d.), an adult tapeworm can expel over 100 000 infective eggs per day. In addition, the eggs are able to disseminate a wide distance away from the source, based on previous research on serological exposure in endemic areas (Gilman et al., 2012).

Diagnosis of taeniasis is made by a history of consuming raw or undercooked beef, expulsion of proglottids in the faeces and relevant findings on parasitological examination. Despite undergoing colonoscopy after the initial episode of passing out proglottids and yet there was no significant pathology detected. This is not unexpected, as adult *Taenia* worms typically reside in the upper small intestine (jejunum) attached by the scolex, and thus may be missed on colonoscopy. Nevertheless, there are few case reports that proglottids of *Taenia* sp. were found during colonoscopy, some are incidental findings (Patel & Tatar, 2007) and some are part of investigations done after the patient's complaint of passing out proglottids (Kim & Chung, 2017). Although diagnosis of taeniasis can be made by visualization of its eggs in stool FEME, however, it does not allow differentiation between *Taenia* spp. and *Echinococcus* spp., as the eggs are identical morphologically (Centers for Disease Control and Prevention, 2024).

Species differentiation can be done in routine laboratory by visualizing the primary lateral uterine branches (Table 1) or by assessing the number of hooks or presence of rostellum on scolex. A diagnosis of *T. saginata* infection is made by identifying gravid proglottids in the stool that contain 12-30 uterine branches. However, obtaining the scolex in clinical specimens is often difficult.

The preferred treatment for taeniasis includes a single dose of 5-10 mg/kg of oral praziquantel, 2 g of oral niclosamide, or 400 mg of oral albendazole for 3 days (Centers for Disease Control and Prevention, 2024). However, research on the efficacy of albendazole specifically on *T. saginata* (beef tapeworm) remains limited. Albendazole resistant *T. saginata* has also been reported by Mohanty et al. (2017) in India. Our patient completed a 3-day course of albendazole during the first occurrence, but it was ineffective in eliminating the infection. As praziquantel is not readily available in Malaysia, this case highlights the need for further research to evaluate the efficacy of albendazole specifically for treating *T. saginata* infections.

Without subsequent follow-up from the patient, it is difficult to confirm whether the *T. saginata* tapeworm has been completely cleared. It is essential to adhere the CDC's recommendation of repeating stool FEME (fecal examination for microscopic eggs) one month and three months after treatment to assess the clearance of the infection (Centers for Disease Control and Prevention, 2024). In cases where the gravid proglottids recovered clinically are partially destroyed or only contain immature proglottid, identification can be performed using molecular methods at reference laboratories (Mayta et al., 2000). Additionally, it is important to ensure that praziquantel is readily available for effective treatment, should it be necessary.

PREVENTION

To prevent taeniasis, beef should be cooked to an internal temperature of $>63^{\circ}\text{C}$, measured at the thickest part of the meat, and allowed to rest for at least 3 minutes before consumption (Marie & Petri, 2023). Food handlers, especially in endemic areas, should practice good hand hygiene to avoid contaminating food with tapeworm eggs. Travellers to endemic areas with poor sanitation should avoid food that might be contaminated by human faeces.

CONCLUSION

Although taeniasis is rarely encountered in Malaysia, clinicians and laboratory personnel should remain vigilant and familiar with this zoonotic parasite, as its incidence is expected to rise with increased migration.

Patient's may be asymptomatic, with only sign being the passage of proglottids in faeces. Accurate identification of tapeworm to the species level is crucial, as the severity of infection varies. *Taenia solium* is neurotrophic and myotrophic while *T. asiatica* is hepatotropic and viscerotropic, and *T. saginata* generally causes milder symptoms (Centers for Disease Control and Prevention, 2024). Follow-up post-treatment is essential to confirm the clearance of taeniasis. Additionally, further research on the prevalence of taeniasis in Malaysia and the susceptibility of *T. saginata* to albendazole is needed to guide public health preventive measures.

Conflict of interest statement

The author declares that they have no conflict of interests.

Ethical Considerations

Verbal informed consent was obtained from the patient for the clinical details.

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