

## *Hymenolepis diminuta* Infection in an Adult's Lung: A Rare Case Report

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### Abstract

*Hymenolepis diminuta* is a cosmopolitan parasite of rats and mice which is very rare in humans but has been reported from various areas of the world. We report a human case of *Hymenolepis diminuta* pulmonary infection in Jiangsu Province, China and it has never been reported in patient's Lung before. In the process of the diagnosis, Next Generation Sequencing (NGS) technology helps a lot. The infection was treated with albendazole and showed clinical and parasitological cure.

**Keywords:** *Hymenolepis diminuta*; Pulmonary infection; High-throughput sequencing; Albendazole

### Introduction

The zoonotic cestode *Hymenolepis diminuta* (*H. diminuta*) is primarily a rat tapeworm, found in the small intestine of rodents, which are the definitive hosts [1-3].

*H. diminuta* infection in humans is rare, even in developing countries, typically occurring in isolated cases, such as case reports describing a single affected individual [1,4]. Human infection with *H. diminuta* most often occurs from accidental ingestion of stored-grain beetles [5]. Adult worms attach themselves to the mucosa of the small intestine of human, and it passes eggs in the stool of patient [6]. The parasite completes its lifecycle in two hosts. *H. diminuta* infection is reported to be more common among children than adults [7]. Infection is mainly asymptomatic, though rarely symptoms, such as itching, abdominal pain, and mild diarrhea, have been reported [6]. The main diagnosis of the infection is the presence of the eggs in the feces under microscope. The patient in our case is a 49 years old man and begins his illness by cough and asthma. To the best of our knowledge, this is the first documented case that the *H. diminuta* infection found primarily in human lung all over the world.

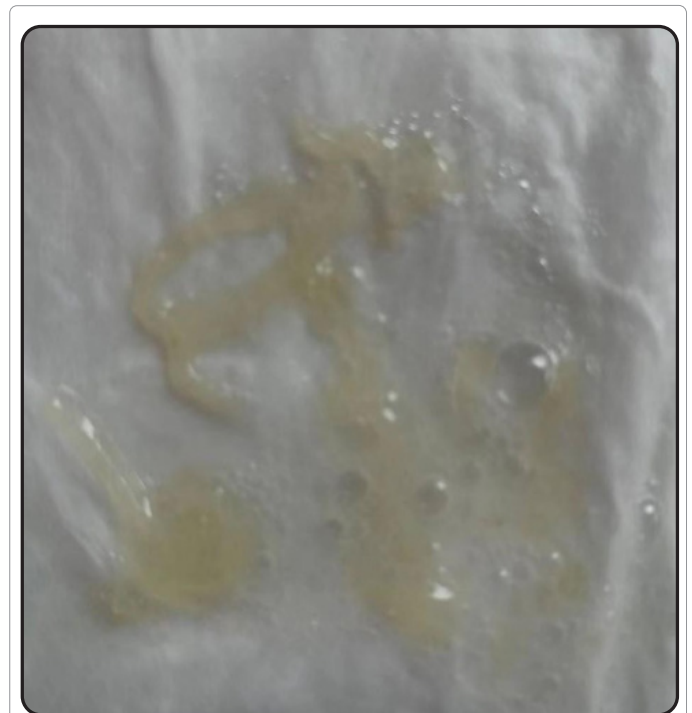
### Case Presentation

In May 2022, a 49-year-old male presented to our hospital (Suqian Hospital of Nanjing Drum Tower Hospital Group) with a history of repeating cough, expectoration, and asthma in recent months. In particular, some thin strips like noodles can be found in his sputum (Figure 1). On examination, the patient weighed 75 kg and was 174 cm in height, no abdominal pain, no vomiting, and no loss of appetite. Digestive system, cardiovascular, and central nervous systems were found to be normal. No other family member had similar complaints.

Chest CT shows lung shadows (Figures 2A and 2B), we considered the possibility of some kind of pathogen infection. We extracted the alveolar lavage fluid and did not find some conventional infection, then we did high-throughput sequencing, also known as Next-Generation Sequencing technology (NGS). The NGS result is *Hymenolepis diminuta* infection (Figure 3). Then, from the patient's stool sample, we identified a spherical, thick-shelled, yellow coloured egg measuring 70 µm in diameter, with six central hooklets without any polar filaments (Figure 4).

The tablet albendazole was prescribed of 400 mg per day for 7 days [5]. The patient tolerated the medication well without any adverse

drug reactions. Following drug therapy, after 15 days two consecutive stool and sputum samples were received and subjected to microscopic examination. Both were found to be negative for ova and cysts. Chest CT shows no shadows in the lung (Figure 2B).



**Figure 1:** Some thin strips like noodles can be found in the patient's sputum and the picture was taken by his phone.

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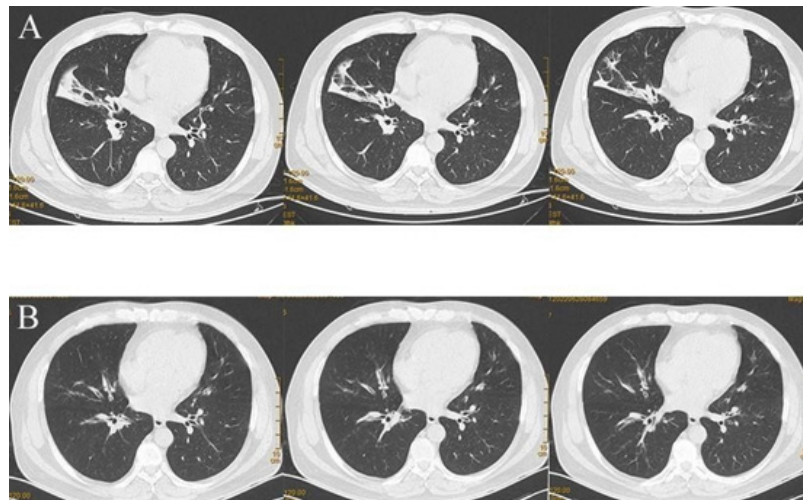


Figure 2: A. Chest CT shows lung shadows before treatment; B. Chest CT shows no shadows in the lung after treatment.

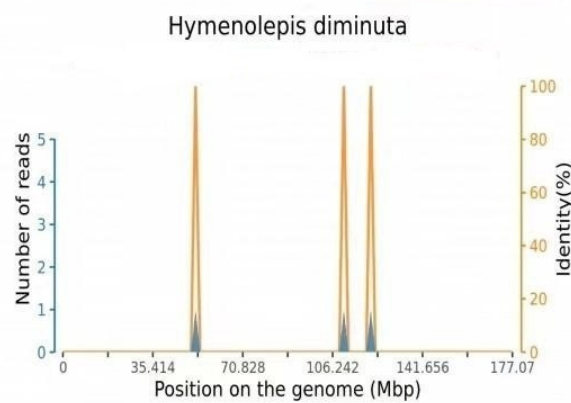


Figure 3: We extracted the alveolar lavage fluid and did high-throughput sequencing, and it showed 3 *Hymenolepis diminuta*. Note: ■ Multiple mapping, ■ Unique mapping, ■ Identity.



Figure 4: *H. diminuta* egg found in the patient's stool at a magnification of X400. The egg contains six central hooklets but no polar filaments

## Results and Discussion

*H. diminuta* has a ubiquitous distribution worldwide, however, it is rarely found in humans [8]. The definitive host as well as natural reservoirs of *H. diminuta* are rodents, i.e., rats and mice [9]. Children and adults from poor socioeconomic group are more prone to infection because of unhygienic practices [10]. Ingestion of the contaminated grains and cereals with infected insects is the main source of infestation. The demonstration of *H. diminuta* eggs in the stool is the essential diagnostic tool. Most of the time this condition may be asymptomatic; however, vague abdominal pain and extraintestinal manifestations such as pruritus, irritation, and eosinophilia may be present [11,12]. Given that most cases of *H. diminuta* infection have been reported in children, it is most likely that children acquire the infection through the ingestion of insects, whereas infection in adults probably occurs via the incidental ingestion of food contaminated with infected insects or the willing ingestion of edible insects, either as part of traditional practices or due to the increased demand for new food sources or exotic dishes. Further studies are needed to identify risk factors for human hymenolepiasis caused by *H. diminuta* [7].

Here, we have reported an uncommonly encountered parasite *H. diminuta* especially in a prime-age man. There are few cases of human infections have been reported from china. It was the first report of human pulmonary infection of *H. diminuta*, based on our knowledge. Majority of the cases are asymptomatic, and the prevalence of infection in the community may be underestimated. Our case begins illness by cough and asthma. This case atypically presented as respiratory symptom and, as far as we know, respiratory symptom has never been reported as a clinical feature of symptomatic *H. diminuta* infection. Therefore, more effort should be put into improving our knowledge of the epidemiology and transmission routes of this uncommon human infection.

## Conclusion

What's more, we make a definite diagnosis for this case by extracting the alveolar lavage fluid through NGS. Due to the atypically present age, area, and other atypical factors. We do not associate the case with parasitization. But NGS technology helps us make a definite diagnosis rapidly, with no delay and avoid misdiagnoses. It suggests that new technology can often surprise you in a big way.

Children who have been infected with *H. diminuta* are most likely to do so by eating insects, whereas adults who become infected are more likely to do so voluntarily or incidentally by eating food that has been contaminated by infected insects or by engaging in traditional practises that involve eating insects, or because there is a greater demand for new food sources or exotic dishes.

Here we report a rare case of pulmonary infestation of *Hymenolepis diminuta* which if not diagnosed and treated properly can lead to transmission. Sanitation and hygiene are essential for prevention of the infection. This study reports the use of NGS technology to accurately diagnose and identify the parasite in addition to the stool microscopic examination for the presence of the ova and cysts. The patient could be effectively treated using albendazole. The study emphasizes on further exploration of transmission and epidemiology of this uncommon human infection.

## Declarations

### Ethical approval

The enrolled patient has been explained in detail about the study

and signed informed consent.

### Competing interests

The authors declare no conflict of interest.

### Authors' contributions

Jingjie Liu and Kang Tian wrote the main manuscript text and Jingjie Liu, Kang Tian and Wangyuan Sun prepared figures. All authors reviewed the manuscript.

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### Availability of data and materials

Not applicable

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