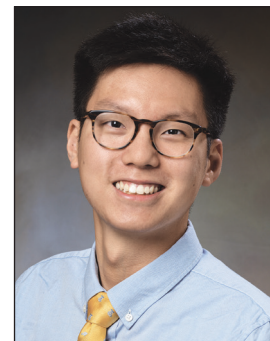


Helminthiasis in Lancaster County

Jeremiah M. Lee, MD

*Family Physician, Family Medicine Residency Program
Penn Medicine Lancaster General Health*



CASE HISTORY

An otherwise healthy 33-year-old patient presents to the primary care office after passing a worm in the stool. Alarmed, they had collected the worm in a medicine bottle and presented it to the physicians.

In recent months, the patient has noticed the stool to be more loose, unusually foul smelling, and having an oily appearance, but it has not been bloody. There was no associated perianal itching. The patient recalls having had bloating and vague abdominal pain intermittently over the past year. There was also a report of a recent upper respiratory infection from which recovery was uncomplicated.

The patient enjoys gardening barefoot and reportedly goes on barefoot walks in Lancaster County Park but has not noticed any rash or foot lesions. They have never traveled outside the country, and there has been no travel outside of Lancaster County in a few years. They only drink filtered water. On review of systems, there is no recent report of fever, chills, headache, nausea, vomiting, joint or back pains, unintentional weight changes, or shortness of breath.

On physical examination, the patient is afebrile with normal vital signs. There is no cervical lymphadenopathy, and the abdomen is soft and non-distended with mild, generalized tenderness. Lung sounds are normal, and a thorough skin exam reveals no rash. The worm,

approximately 1 cm in length, is grossly examined in the medicine bottle (see Fig. 1) and found to be still moving. The worm is then examined on a wet prep on 10x magnification (see Fig. 2).

QUESTION

Based on the patient's history and examination of the organism, what is the most likely diagnosis?

1. Enterobiasis (infection with pinworm)
2. Ascariasis (infection with large roundworm)
3. Necatoriasis (infection with hookworm)
4. Trichuriasis (infection with whipworm)
5. Strongyloidiasis (infection with threadworm)

ANSWER

The correct answer is 3. Necatoriasis, more commonly known as hookworm.

CASE DISCUSSION

After providing a stool sample and labs, the patient was treated with a single dose of albendazole. Interestingly, labs did not show anemia or eosinophilia, and stool studies including trichrome staining and ova and parasites were normal. At a two-week follow-up, the symptoms had completely resolved.

The five answer choices are the most common examples of soil-transmitted intestinal nematode infections,



Fig. 1. Gross image of medicine bottle, containing worm.

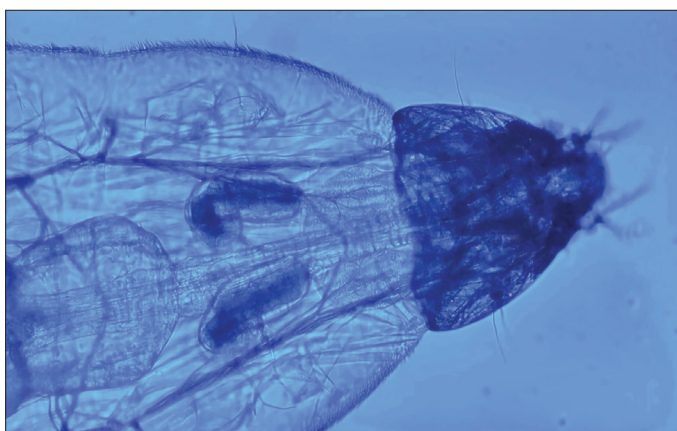


Fig. 2. Microscopic image of worm at 10x magnification.

a large subgroup of helminthiasis. Intestinal nematode infections represent a high global burden of disease predominantly affecting the most resource-challenged communities; nearly two billion people worldwide, a quarter of Earth's population, have one of these infections. They are most common in tropical and subtropical areas, especially sub-Saharan Africa, the Americas, China, and East Asia. Once highly endemic in the southeastern United States over a century ago, developments in sanitation have made these much less common here, although high-quality data regarding the prevalence of these infections in the 21st century are lacking.¹

ADDITIONAL EXPLANATION

1. The most common symptom of enterobiasis, or pinworm infection, is perianal itching; it is most prevalent in school-aged children. Adult *Enterobius vermicularis* organisms measure 8-13 mm long. Enterobiasis is treated with two doses of albendazole 400 mg two weeks apart for the entire household, and transmission is further prevented by washing bedding and clothes.²
2. *Ascaris lumbricoides*, the causative pathogen of ascariasis, is the most prevalent intestinal nematode worldwide. Adult organisms are among the largest of the intestinal nematodes and can be up to 35 cm long and 6 mm in diameter. Treatment is with one dose of albendazole 400 mg.³
3. The two primary hookworm species worldwide are *Necator americanus* and *Ancylostoma duodenale*, with the former predominating in the Americas. An estimated 576-740 million people are affected by hookworm worldwide. Hookworm is transmitted by direct skin penetration of infective larvae living in soil, typically on bare feet. Larvae migrate to blood vessels and settle in pulmonary vasculature. Eight to 21 days following infection, larvae penetrate the pulmonary alveoli and ascend the bronchial tree to the oropharynx, where they are swallowed into the gastrointestinal tract and mature into adult worms. Adults attach themselves to the intestinal wall, often resulting in occult blood loss and iron deficiency anemia. Eosinophilia is a common laboratory manifestation. Chronic nutritional impairment due to hookworm disease is a significant public health concern in underprivileged endemic regions. Diagnosis can be made with microscopy of ova or parasites in stool or PCR assays, but adult helminths can also be identified on gross examination. Adults grow up to 1 cm in length and have characteristic hook-like jaws on microscopy. The preferred treatment for hookworm infection is one dose of albendazole 400 mg.^{4,5}
4. *Trichuris trichiura* is the cause of trichuriasis, or whipworm infection; adults measure up to 4 cm. Treatment is with albendazole 400 mg daily for three days. Single-dose albendazole has insufficient efficacy.⁶
5. Strongyloidiasis (or threadworm infection) is caused by *Strongyloides stercoralis* and is transmitted in a similar manner to hookworm; however, autoinfection is a notable alternative pathway in the lifecycle of *S. stercoralis*. Patients with subclinical strongyloidiasis are at risk of hyperinfection with disseminated disease if cell-mediated immunity is diminished, for example, by corticosteroid administration or infection with human immunodeficiency virus (HIV). Uncomplicated disease is treated with ivermectin (200 mcg/kg daily for one or two days), which has higher efficacy than treatment with albendazole.⁷

REFERENCES

1. Soil-transmitted helminths. Centers for Disease Control and Prevention. February 2, 2022. Accessed October 7, 2022. <https://www.cdc.gov/parasites/sth>
2. Enterobiasis. Centers for Disease Control and Prevention. September 28, 2020. Accessed October 7, 2022. <https://www.cdc.gov/parasites/pinworm>
3. Ascariasis. Centers for Disease Control and Prevention. November 23, 2020. Accessed October 7, 2022. <https://www.cdc.gov/parasites/ascariasis>
4. Hookworm. Centers for Disease Control and Prevention. April 29, 2022. Accessed October 7, 2022. <https://www.cdc.gov/parasites/hookworm>
5. McKenna ML, McAtee S, Bryan PE, et al. Human intestinal parasite burden and poor sanitation in rural Alabama. *Am J Trop Med Hyg*. 2017;97(5):1623-1628.
6. Trichuriasis. Centers for Disease Control and Prevention. December 23, 2020. Accessed October 7, 2022. <https://www.cdc.gov/parasites/whipworm>
7. Strongyloides. Centers for Disease Control and Prevention. December 31, 2018. Accessed October 7, 2022. <https://www.cdc.gov/parasites/strongyloides>

Jeremiah M. Lee, MD
Family Medicine Residency Program
Penn Medicine Lancaster General Health
540 N. Duke St., Lancaster, PA 17602
717-544-4950
Jeremiah.Lee@pennmedicine.upenn.edu