

BMJ Best Practice

Pinworm infection

Straight to the point of care



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Summary

Pinworm infection is the most common helminthic infection in the US.

Although most infected individuals are asymptomatic, perianal itching is the most common clinical presentation.

Diagnosis is made by applying adhesive tape to the perianal area and examining for eggs or adult worms.

Treatment consists of a single dose of an appropriate anthelmintic followed by a repeat dose at 2 weeks.

Definition

Pinworm infection is caused by the roundworm *Enterobius vermicularis*. Infection is largely asymptomatic. The classic clinical presentation is intense perianal itching (pruritus ani) without evidence of systemic inflammation.

Epidemiology

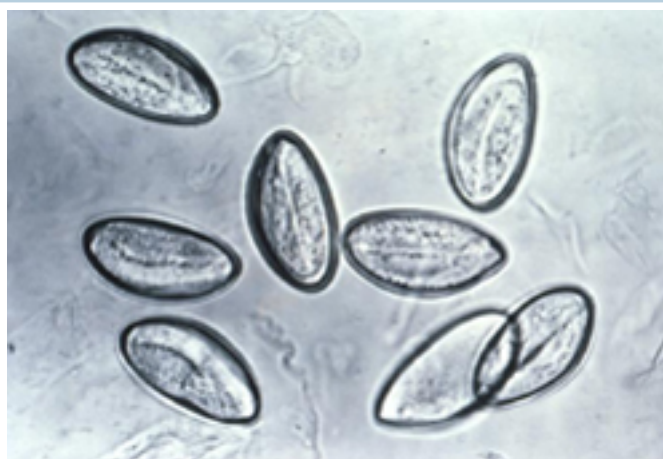
Pinworms represent the most common helminthic infection in the US.[11] Pinworms are found worldwide, although more commonly in temperate regions. An estimated one billion people are infected globally.[12]

Studies in Europe report an estimated prevalence of around 20% among kindergarten and elementary-school aged children.[12] In the highest risk groups, the prevalence may be as high as 50%.[13] There is no difference in rates of infection based on sex, race, or socioeconomic status.[14]

Infection is easily transmitted within classrooms and households, and is most common in school-aged children and their caregivers.[1] [13] Prevalence rates are also higher in institutionalized people.[1]

Etiology

The pinworm, otherwise known as *Enterobius vermicularis*, is a roundworm belonging to the nematode family. The entire life cycle is limited to humans, and there are no intermediate hosts. Infection occurs by ingesting infective pinworm eggs.[1] Transmission of disease occurs via fecal-oral route (including autoinoculation) either person-to-person by contaminated hands or sexual transmission or through contact with items contaminated with eggs such as food, clothing, or bedding.[1] [15] Pinworm eggs can become airborne, suggesting inhalation from air and dust as another route of transmission.[16] Eggs can survive without a human host for up to 2 weeks indoors.[1]



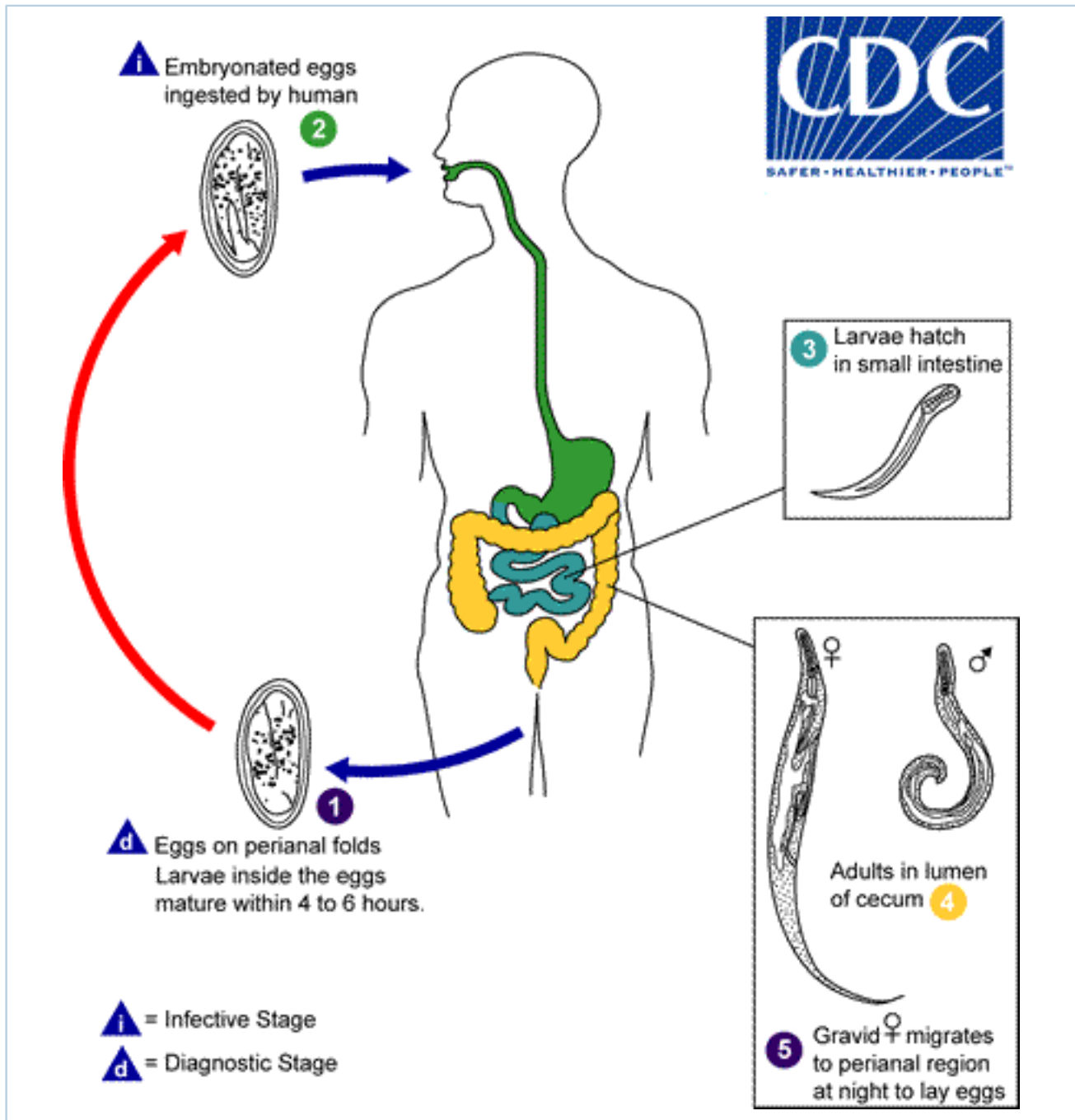
Pinworm egg

Image provided by the CDC Public Health Image Library; used with permission

Pathophysiology

Both male and female adult pinworms live in the colon and rectum. After copulation, gravid female worms migrate out of the anus at night and deposit up to 10,000 eggs on the perianal surface, where they embryonate within 6 hours.[14] This may cause local irritation, itching, and scratching, which contaminates the fingers. Eggs are then ingested by the same host or another individual.[1] Larvae hatch in the small intestine and migrate to the colon, where they mature and begin the cycle again. This entire life cycle takes approximately 2 to 6 weeks.[1]

Occasionally, eggs may hatch on the perianal area, and the larvae may migrate back into the colon, where they mature. There is no extraintestinal phase; therefore, signs of systemic infection such as fever and eosinophilia are uncommon.[12]



Lifecycle of Enterobius vermicularis

Image provided by the CDC Division of Parasitic Diseases and Malaria; used with permission

Case history

Case history #1

A 5-year-old boy presents with complaints of restlessness at night and itching in the perianal area. Otherwise, the child is well with no fever, weight loss, or diarrhea. Physical exam is unremarkable except for some local perianal erythema.

Other presentations

Occasionally, pinworms may migrate to unusual sites and cause ectopic disease. The most common location for ectopic disease is the female genitourinary tract, where vulvar pruritus (pruritus vulvae) may occur.^[1] Rarely, pinworms may ascend into the urethra or vagina and may cause urethritis, vaginitis, or salpingitis.^{[1] [2] [3] [4][5]} Pinworms have been associated with abscess and granuloma formation within the intestines, along the perineal skin, and within the peritoneum.^{[1] [6] [7] [8][9]} Pinworms have been identified in appendiceal tissue after appendectomy and autopsy, but are not thought to cause acute appendicitis.^{[1] [10]}

Approach

Most individuals infected with pinworms are asymptomatic. However, children with symptomatic disease who present for medical care are most likely to complain of perianal itching.

History

Pinworm infection is most common in school-aged children and their caregivers.^{[1] [13]} Intense perianal itching is the most common complaint. This is worse at night and may be associated with restlessness or insomnia.

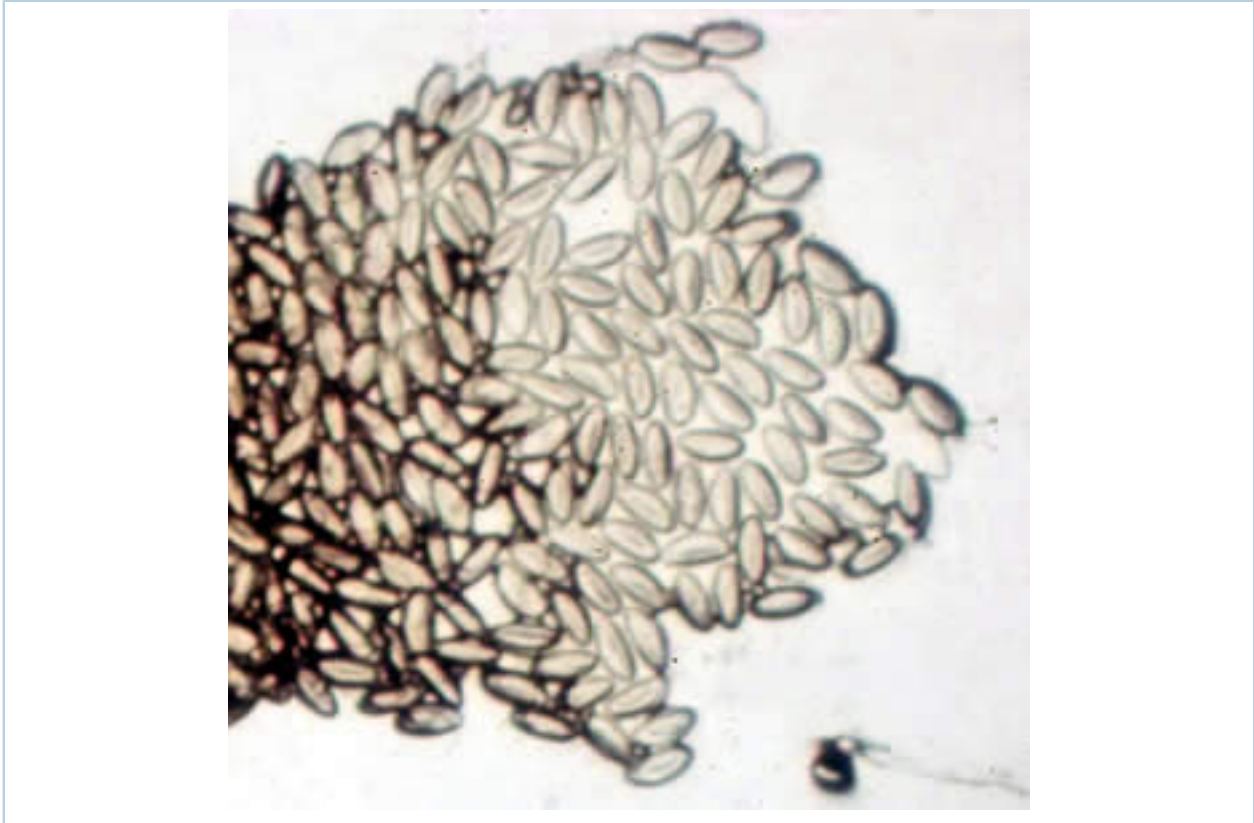
Pinworms are highly transmissible, so known infection in a household, classroom, or institutional contact of an individual with anal pruritus is highly suggestive of disease. Pinworms rarely cause extraintestinal symptoms. The most common location for ectopic disease is the female genitourinary tract, where vulvar pruritus may occur.^[1] History of fever, weight loss, or other systemic signs of infection suggest an alternative diagnosis.

Exam

This is typically normal except for the perianal area, which may be excoriated. Vulvar irritation may also be present. Occasionally, worms may be visualized migrating out of the anus if the child is examined during the night, either by the parent at home or the clinician in the hospital or emergency department setting.

Investigations

The adhesive tape test is used to diagnose pinworm infection.^[11] This test should be performed on at least 3 consecutive days (immediately after awakening and before washing) to maximize sensitivity.^{[1][16]}
^[21]



Enterobius eggs on adhesive tape

Image provided by the CDC Division of Parasitic Diseases and Malaria; used with permission

As eggs are not commonly shed in the stool, examination of stool for ova and parasites is not indicated. As there is no extraintestinal phase of the pinworm life cycle, eosinophilia is absent. Similarly, there is no antibody response and no serologic testing available.^{[1][16][21]}

History and exam

Key diagnostic factors

perianal pruritus (common)

- Perianal itching is the most common presentation of pinworm infection.

perianal erythema (common)

- May be excoriated.

presence of worms (uncommon)

- Occasionally, adult pinworms may be seen on exam, especially if performed at night, when females deposit their eggs on the perianal surface.

Other diagnostic factors

restlessness (common)

- Perianal itching is worse at night and may be associated with restlessness.

insomnia (common)

- Perianal itching is worse at night and may be associated with insomnia.

vulvar pruritus (uncommon)

- Itching may extend from the anus to the vulva.[1]

Risk factors

Strong

school attendance or institutionalization

- Pinworms are easily transmissible and most common in school-aged children. Prevalence rates are also higher in institutionalized people. Outbreaks have occurred in classrooms and in institutions.[1]

Weak

Oral habits like nail biting or thumb sucking

- Autoinoculation can occur via the transfer of eggs to the mouth with hands that have touched or scratched the perianal area. Children who bite their nails or suck their thumbs may therefore experience higher rates of infection.[12] [17] [18] [19] [20]

Investigations

1st test to order

Test	Result
adhesive tape test • The tape test should be performed on any school-aged child complaining of anal pruritus. A piece of transparent adhesive tape should be applied to the perianal area first thing in the morning, prior to bathing or bowel movements. This can then be placed on a slide and examined under a microscope for eggs or adult worms. There are also several commercially available adhesive paddles that may be used.[15] If microscopy is available in the physician's office, eggs may be visualized under low power. • Otherwise, specimens may be sent to most hospital-based and many commercial microbiology laboratories for evaluation. This test should be performed on at least 3 consecutive days to maximize sensitivity. [1][16][21]	identification of eggs or adult worms when examined under a microscope

Differentials

Condition	Differentiating signs / Differentiating tests symptoms	
Inflammatory bowel disease	Typically, presents with prominent gastrointestinal signs as well as evidence of systemic disease such as fever and weight loss.	Colonoscopy/ileoscopy will show mucosal inflammation or ulceration. The biopsies will confirm inflammatory changes.
Dermatitis, atopic	Individuals with pinworm infection should not have evidence of inflammation or excoriation outside of the perineal area.	Eosinophilia is uncommon in pinworm infection but may occur in eczema.
Perirectal abscess	Children with perirectal abscess are more likely to present with fever and pain. Abscess formation is extremely rare in pinworm infection.	Acute-phase reactants are elevated in abscesses. Ultrasound/computed tomography will confirm diagnosis.

Approach

Anthelmintic therapy (e.g., mebendazole, albendazole, pyrantel) is indicated in all patients with evidence of pinworm infection. One dose sufficiently kills adult worms. However, these treatments do not destroy the eggs or larvae. Therefore, a second treatment 2 weeks later is recommended to eradicate worms from newly hatched eggs.[1] [14] [16] [22] Because of the high transmissibility of pinworms, it is important to ensure that all household members are treated when there is an infected child in the home. Treatment should also be offered to exposed sexual partners.[16]

Pregnancy and children <2 years

There is a lack of safety data on the use of these drugs in pregnant women. Consider treatment if the infection is compromising pregnancy (e.g., weight loss). Treatment should be delayed until the third trimester, if possible. The World Health Organization allows use of these drugs in the second and third trimesters of pregnancy; however, they acknowledge that the risk of treatment needs to be balanced against the risk of disease progression in the absence of treatment.[23]

None of these drugs has been studied extensively in children younger than 2 years of age.[1] [23] Consultation with an infectious disease specialist is recommended to weigh the risks and benefits of treatment in young children.

Prevention of spread and reinfection

Given the fecal-oral route of transmission, thorough hand hygiene is the most effective method of prevention.[16] Hand washing reduces autoinfection and transmission to household contacts, especially when food is being prepared or consumed. Children should be discouraged from sucking their thumbs, biting their nails, and scratching themselves. Keeping nails trimmed may also reduce the egg burden on fingers. Sheets and undergarments of infected individuals should be washed promptly and should not be shaken, in order to avoid dissemination of eggs. Infected individuals should shower every morning, should use a shower rather than a bath, and should not co-bathe with others.[1] [16] [24]

Recurrent infection

Recurrence is common, but is due to reinfection rather than poor efficacy of anthelmintic agents. Retreatment should be with the same agent.[1] [16]

Treatment algorithm overview

Please note that formulations/routes and doses may differ between drug names and brands, drug formularies, or locations. Treatment recommendations are specific to patient groups: [see disclaimer](#)

Acute (summary)	
symptomatic patients + family members	
1st	anthelmintic
plus	hygiene measures

Treatment algorithm

Please note that formulations/routes and doses may differ between drug names and brands, drug formularies, or locations. Treatment recommendations are specific to patient groups: [see disclaimer](#)

Acute

symptomatic patients + family members

1st anthelmintic

Primary options

» **mebendazole**: children ≥ 2 years of age and adults: 100 mg orally as a single dose, may repeat in 2 weeks

OR

» **albendazole**: children ≥ 2 years of age and adults: 400 mg orally as a single dose, may repeat in 2 weeks

Secondary options

» **pyrantel**: 11 mg/kg orally as a single dose, maximum 1000 mg/dose; may repeat in 2 weeks

» Anthelmintics should be given to kill adult worms residing in the gastrointestinal tract.

» A single oral dose is administered at the time of diagnosis. As these drugs are not ovicidal, a second dose is indicated 2 weeks after the first.[1] [16] [22] Two-dose therapy achieves cure rates of greater than 90%.[6]

» There is a lack of safety data on the use of these drugs in pregnant women. Consider treatment if the infection is compromising pregnancy (e.g., weight loss). Treatment should be delayed until the third trimester, if possible. The World Health Organization allows use of these drugs in the second and third trimesters of pregnancy; however, they acknowledge that the risk of treatment needs to be balanced against the risk of disease progression in the absence of treatment.[23]

» None of these drugs has been studied extensively in children younger than 2 years of age.[1] [23] Consultation with an infectious disease specialist is recommended to weigh the risks and benefits of treatment in young children.

Acute

» Recurrence is common, but is due to reinfection rather than poor efficacy of anthelmintic agents. Retreatment should be with the same agent.^{[1] [16]}

plus

hygiene measures

Treatment recommended for ALL patients in selected patient group

» Given the fecal-oral route of transmission, thorough hand hygiene is the most effective method of prevention.^[16] Hand washing reduces autoinfection and transmission to household contacts, especially when food is being prepared or consumed. Children should be discouraged from sucking their thumbs, biting their nails, and scratching themselves. Keeping nails trimmed may also reduce the egg burden on fingers. Sheets and undergarments of infected individuals should be washed promptly and should not be shaken, in order to avoid dissemination of eggs. Infected individuals should shower every morning, should use a shower rather than a bath, and should not co-bathe with others.^{[1] [16] [24]}

Patient discussions

Given the fecal-oral route of transmission, thorough hand hygiene is the most effective method of prevention.^[16] Hand washing reduces autoinfection and transmission to household contacts, especially when food is being prepared or consumed. Children should be discouraged from sucking their thumbs, biting their nails, and scratching themselves. Keeping nails trimmed may also reduce the egg burden on fingers. Sheets and undergarments of infected individuals should be washed promptly and should not be shaken, in order to avoid dissemination of eggs. Infected individuals should shower every morning, should use a shower rather than a bath, and should not co-bathe with others.^{[1] [16][24]}

Monitoring

Monitoring

No long-term follow-up is recommended. If symptoms recur, testing and treatment should be repeated.

Prognosis

The long-term prognosis following pinworm infection is excellent.

Treatment guidelines

International

Yellow Book: Enterobiasis/pinworm#(<https://wwwnc.cdc.gov/travel/page/yellowbook-home>) [16]

Published by: Centers for Disease Control and Prevention

Last published: 2023

Parasites - enterobiasis (also known as pinworm infection): resources for health professionals (https://www.cdc.gov/parasites/pinworm/health_professionals/index.html) [23]

Published by: Centers for Disease Control and Prevention

Last published: 2019

Red Book: Pinworm Infection (Enterobius vermicularis) (<https://publications.aap.org/redbook>) [1]

Published by: American Academy of Pediatrics

Last published: 2021

Key articles

- Kimberlin DW, Barnett ED, Lynfield R, et al, eds. Red Book: 2021-2024 report of the committee on infectious diseases. 32 nd ed. Elk Grove Village, IL: American Academy of Pediatrics; 2021 [internet publication]. Full text (<https://publications.aap.org/redbook/book/347/chapter-abstract/5755005/Pinworm-Infection-Enterobius-vermicularis>)
- Centers for Disease Control and Prevention. CDC Yellow Book 2024: health information for international travel. Section 5: travel-associated infections and diseases - enterobiasis / pinworm. May 2023 [internet publication]. Full text (<https://wwwnc.cdc.gov/travel/yellowbook/2024/infections-diseases/enterobiasis-pinworm>)

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Images

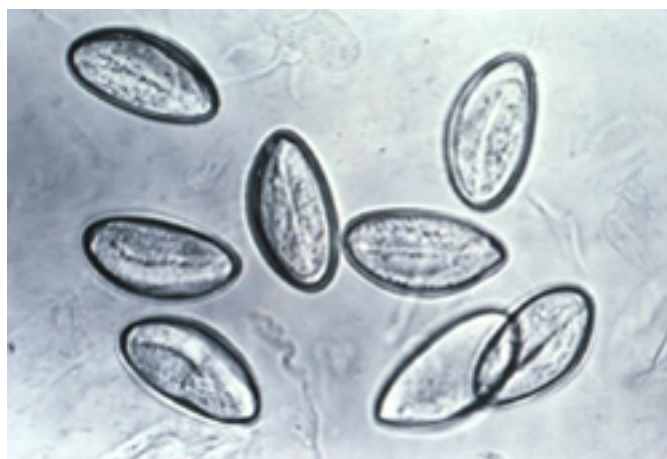


Figure 1: Pinworm egg

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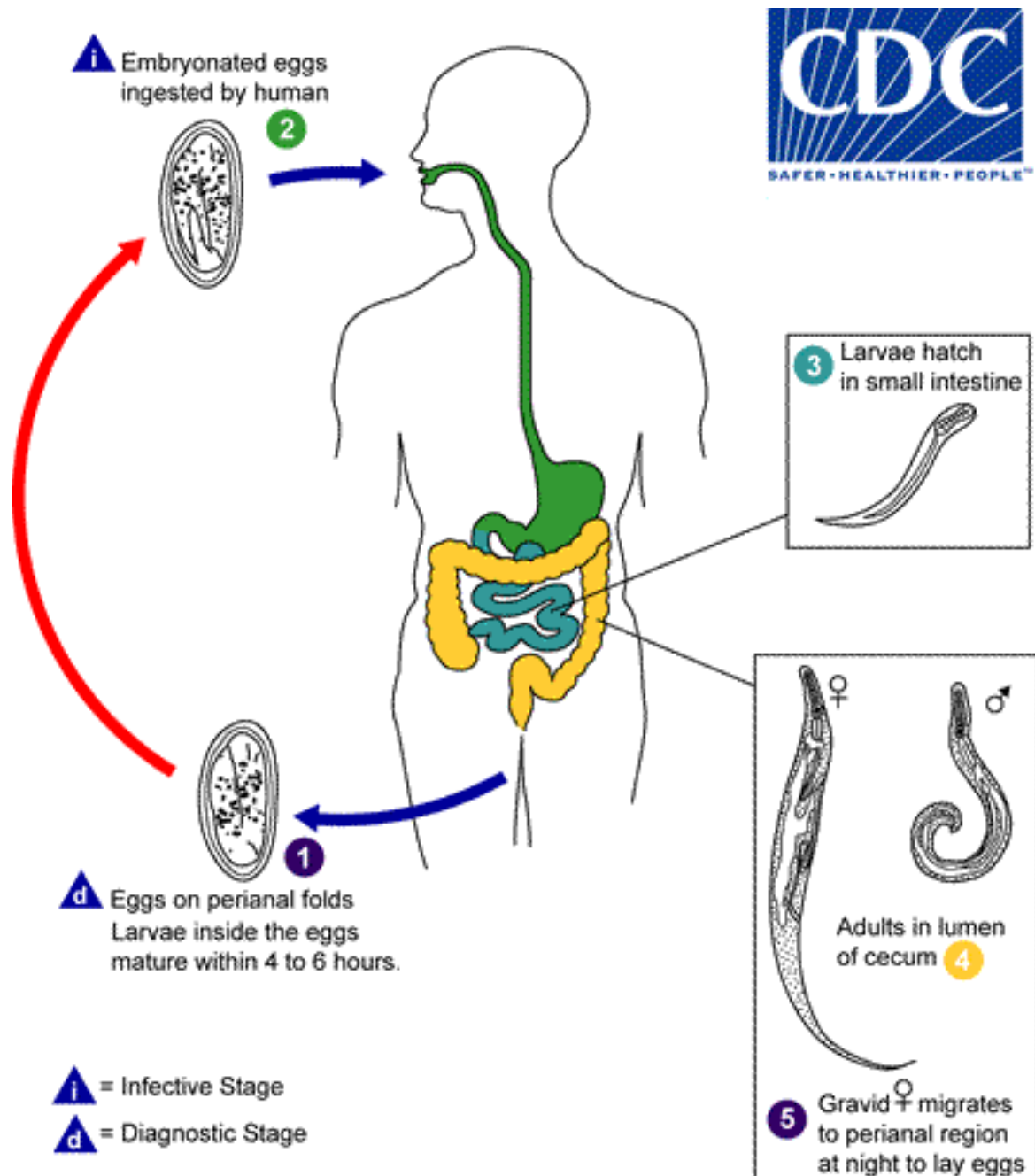


Figure 2: Lifecycle of *Enterobius vermicularis*

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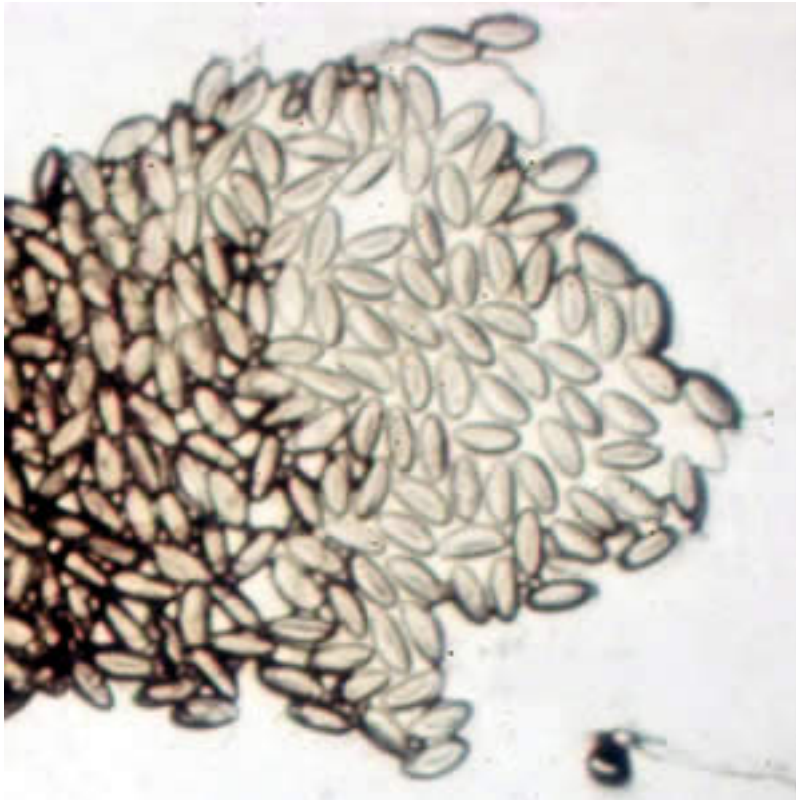


Figure 3: Enterobius eggs on adhesive tape

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BMJ accepts no responsibility for misinterpretation of numbers which comply with this stated numerical separator standard.

This approach is in line with the guidance of the [International Bureau of Weights and Measures Service](#).

Figure 1 – BMJ Best Practice Numeral Style

5-digit numerals: 10,000

4-digit numerals: 1000

numerals < 1: 0.25

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Contact us

+ 44 (0) 207 111 1105

support@bmj.com

BMJ

BMA House

Tavistock Square

London

WC1H 9JR

UK

BMJ Best Practice

Contributors:

// Authors:

Michael J. Smith, MD, MSCE

Professor of Pediatrics

Duke University School of Medicine, Durham, NC

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// Peer Reviewers:

Randal Rockney, MD

Associate Professor of Pediatrics and Family Medicine

Department of Pediatrics, Hasbro Children's Hospital, Providence, RI

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