

# What's Eating You?

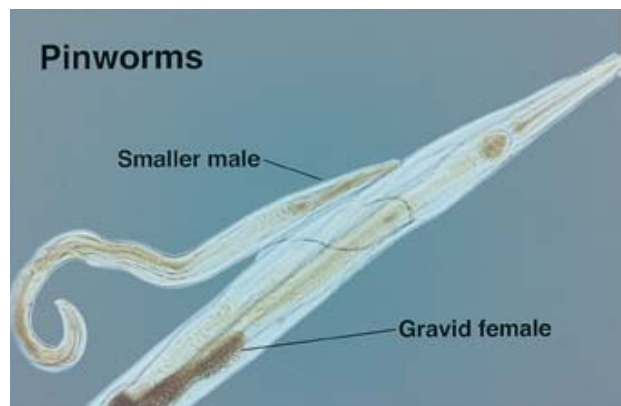
## *Enterobius vermicularis* (Pinworms, Threadworms)

Dirk M. Elston, MD

**E***nterobius vermicularis* (pinworm) infestation remains common in most of the world, including industrialized nations. In some areas of the United States and western Europe, prevalence rates as high as 100% have been recorded.<sup>1,2</sup> Pinworm infestation commonly presents with anal pruritus, which often is more severe at night or in the early morning. Enuresis and alterations in bowel habits are common manifestations, as are insomnia, anorexia, weight loss, and abdominal cramping. Pinworm infestation may predispose to urinary tract infection in girls.

Pinworm infestations often are asymptomatic, and pruritus ani may be more common in individuals with underlying skin disease, such as atopic dermatitis or psoriasis. Although pinworm infestation is more common in children, adults may become infested through oral-fecal contamination or after handling children's clothing or sheets. Because ova commonly are found under children's fingernails,<sup>3</sup> finger sucking is strongly associated with pinworm infestation in children.

Microscopic preparations are a prerequisite to establishing the diagnosis of pinworm infestation. Transparent adhesive-tape preparations taken from perianal skin and examined under a microscope provide a convenient and effective means of establishing the diagnosis. At night, the adult female pinworm migrates to the anus of the host to lay eggs. Therefore, the optimal time to gather samples is in the early morning before the patient has bathed or passed a bowel movement. The transparent tape



**Figure 1.** Pinworm eggs are embryonated, lack bile staining, and resemble rugby balls flattened on one side.

must be clear, not “magic transparent” tape, which has a frosted appearance. The tape should be tapped repeatedly against the perianal skin and mounted, like a coverslip, on a glass slide. A commercial product with sticky tape on the end of a paddle is available to aid in gathering samples.

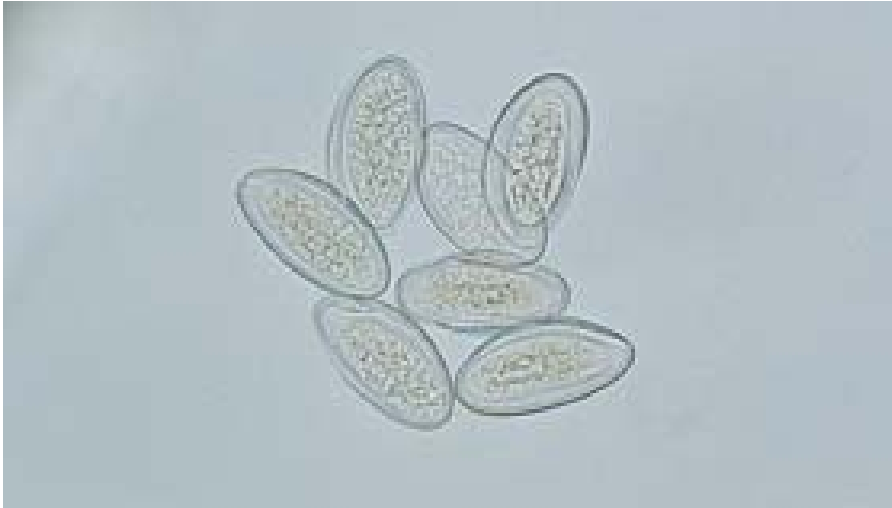
*E vermicularis* eggs are found on the skin rather than in the stool; adult pinworms may appear as white threads in the stool. In general, tape preparations are a better means of establishing the diagnosis of pinworm infestation than stool collections for ova and parasites. Eggs may be recovered in scrapings from under the fingernails in up to 60% of children with pinworm infestation.<sup>4</sup>

Pinworm eggs are embryonated (contain a visible partially developed worm) and have a thick hyaline shell. The shell is shaped like a blunt rugby ball that has been flattened on one long side (Figure 1). Because the eggs are laid directly on perianal skin rather than in the gut, they lack the brown bile-staining characteristic of most other helminth eggs. Typically, samples collected using tape preparation

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**Figure 2.** The female pinworm is much larger than the male and often noted to contain eggs.

will reveal only eggs, though occasionally an adult worm will be identified.

The female pinworm is 9 to 12 mm long and 0.5 mm wide, significantly larger than the male, which is 2 to 5 mm. The female *E vermicularis* has a characteristic blunt and distally expanded "nose" (lateral cephalic alae) and a pointy tail. The reproductive system of the female pinworm is *t*-shaped, and typically shaped eggs are commonly visible within (Figure 2). A diagnostic feature of pinworm infestation is the presence of a proximal constriction followed by a bulbous dilatation of the esophagus (Figure 3). A drop of lactophenol cotton blue can be placed on the slide to help identify the eggs.<sup>5</sup> Other species of threadworm/pinworm exist, though it has been suggested that some, like *Enterobius gregorii* Hugot, are simply immature forms of *E vermicularis*.<sup>6</sup>

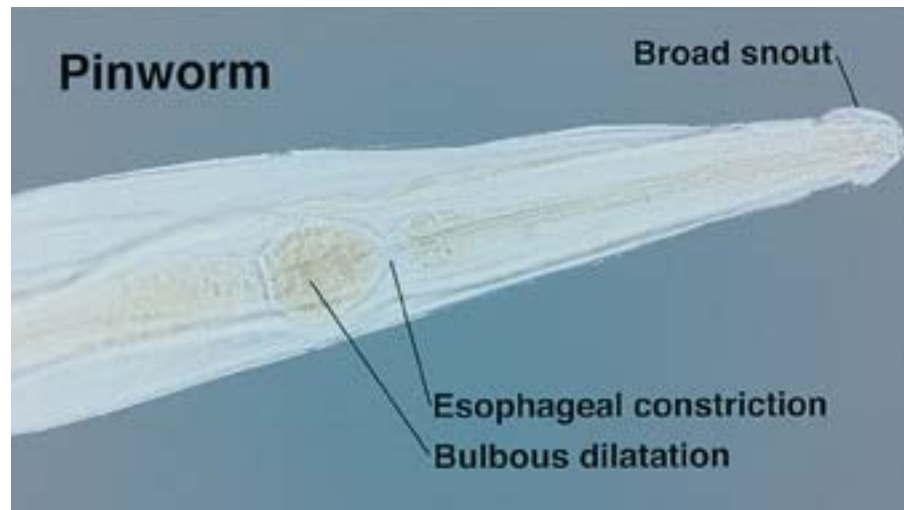
After *E vermicularis* eggs are ingested, they hatch in the stomach and duodenum of the host, and the larvae migrate to the ileum and caecum; copulation occurs in the lower ileum. Most infested patients play host to a few hundred adult worms. Adult *E vermicularis* survive for 37 to 93 days and begin laying eggs at 5 weeks of age. Each female can produce more than 10,000 eggs. Pinworm eggs become infective about 6 hours after deposition. Fecal contamination, especially through scratching, results in repeated oral inoculation and perpetuates the infestation. In areas with high humidity, the eggs remain viable in the environment for days. Pinworm granulomas may occur in the gut, vulva, cervix, uterus, and fallopian tubes.<sup>7-9</sup> Pinworm infestation has presented as postmenopausal bleeding.<sup>10</sup> *E vermicularis* occasionally may cause both appendicitis and salpingitis. Cutaneous

abscesses, especially perianal abscesses, may be caused by pinworm infestation, and cutaneous granulomas may be mistaken histologically for schistosomal granulomas.

*E vermicularis* infestation may be associated with the development of eosinophilic colitis in adults. Symptomatic intestinal infestation is more common in developing countries and among gay men. Patients may present with abdominal pain, hemorrhagic colitis, and eosinophilic inflammation of the ileum and colon. In some cases, large numbers of larval pinworms have been identified in the gut. Larval forms may be difficult to identify morphologically, and the diagnosis may rely on molecular cloning of nematode ribosomal RNA genes.<sup>11</sup> Larval forms of *Enterobius* worms may be mistaken for the rhabditiform larvae of *Strongyloides stercoralis*. One clue to the correct diagnosis is that pinworm larvae are 2 to 3 times the length of *Strongyloides* larvae. Polymerase chain reaction studies for ribosomal RNA genes are useful to confirm the diagnosis after morphologic features have raised the suspicion of larval *Enterobius* infestation. Peripheral eosinophilia may accompany the tissue eosinophilia or may be notably absent.<sup>12</sup>

Children with larval pinworm infestation may present with chronic diarrhea. Again, it is important to note that the larvae in such cases have been misinterpreted as *Strongyloides* larvae. Larval pinworms are about 1.5 mm long (compared to the expected 250- $\mu$ m length of rhabditiform *S stercoralis* larvae). Overnight clearing in a 30% glycerol and 70% alcohol solution will accentuate the lateral alae and spicule of the male pinworm.<sup>13</sup>

Drugs used to treat pinworm infestation include mebendazole, albendazole, piperazine, and pyrantel



**Figure 3.** Close-up view of the female pinworm. Proximal constriction and distal bulbous dilatation of the esophagus is characteristic.

embonate or pamoate. Pyrantel pamoate and mebendazole have been used most commonly in the United States. Mebendazole is active only against adult worms and has limited activity against the eggs. It is generally recommended that all family members should be treated simultaneously,<sup>14</sup> though physicians in Korea have effectively treated infestations in schools by targeting only infested (egg-positive) children when the prevalence of infection is below 30%.<sup>15</sup> Physicians who prescribe antihelminthic drugs should become thoroughly familiar with the drugs. Treatment of pinworm infestation during pregnancy is controversial. In general, treatment should be delayed until after delivery unless the benefits clearly outweigh risks to the mother.<sup>16</sup> The most commonly used antihelminthic agents are listed as Category C drugs.

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