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Chapter 2. Nematoda

1. A clinical sign that may suggest the presence of a filarial nematode infection is:
a. Diarrhea
b. Eosinophilia
c. Jaundice
d. Microcytic anemia

2. The nematode infection that may become more severe through ingestion of infective eggs, especially in infected infants, is:
a. *Ancylostoma duodenale*
b. *Enterobius vermicularis*
c. *Strongyloides stercoralis*
d. *Trichinella spiralis*

3. In the *Ascaris lumbricoides* life cycle, after eggs are ingested, the next stage in the life cycle that must occur before a mature adult can live in the host's intestine is called the:
a. Diagnostic stage
b. Infective stage
c. Liver-lung migration
d. Method of infection

4. Patients who have heavy infections with *Necator americanus* may exhibit all of the following symptoms **EXCEPT:**
a. Diarrhea
b. Larval dermatitis
c. Macrocytic anemia
d. Microcytic anemia

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5. The nematode egg that appears as a barrel-shaped structure with clear polar plugs at each end of the egg belongs to:
a. *Ascaris lumbricoides*
b. *Enterobius vermicularis*
c. *Strongyloides stercoralis*
d. *Trichuris trichiura*

6. A slender round worm measuring 25 cm was recovered from a toilet following a child's trip to the bathroom. The specimen most likely is:
a. *Ascaris lumbricoides*
b. *Enterobius vermicularis*
c. *Strongyloides stercoralis*
d. *Trichuris trichiura*

7. A 7-year-old boy's CBC revealed a microcytic anemia with eosinophilia during an office visit for symptoms of diarrhea. The most likely parasite involved in the infection is:
a. *Enterobius vermicularis*
b. *Necator americanus*
c. *Trichuris trichiura*
d. *Wuchereria bancrofti*

8. Which of the following infections is not diagnosed by finding eggs or lava in fecal specimens?
a. *Ascaris lumbricoides*
b. *Necator* spp.
c. *Trichinella spiralis*
d. *Trichuris trichiura*

9. Which of the following parasitic diseases is a zoonosis?
a. *Ascaris lumbricoides*
b. *Dracunculus medinensis*
c. *Strongyloides stercoralis*

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d. *Trichinella spiralis*

10. Cutaneous larvamigrans is caused by:
a. *Ascaris lumbricoides*
b. *Necator americanus*
c. *Strongyloides stercoralis*
d. *Toxocara canis*

11. The nematode parasite that may complete its life cycle without leaving the host is:
a. *Ascaris lumbricoides*
b. *Necator americanus*
c. *Strongyloides stercoralis*
d. *Toxocara canis*

12. All of the following have life cycles that require larval lung migrations **EXCEPT:**
a. *Ascaris lumbricoides*
b. *Necator americanus*
c. *Strongyloides stercoralis*
d. *Trichuris trichiura*

13. The diagnostic form recovered in feces in *Strongyloides stercoralis* infections is the:
a. Adult worm
b. Egg
c. Filariform larva
d. Rhabditiform larva

14. A soldier returning from Iraq noticed a blister above his ankle that subsequently opened while he was swimming in his family pool. On further examination, he noticed a worm in the open blister. The possible parasite in this lesion is:
a. *Ancylostoma duodenale*

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b. *Dracunculus medinensis*
c. *Toxocara canis*
d. Visceral larva migrans

15. All of the following infections are diagnosed by finding microfilaria in blood **EXCEPT:**
a. *Wuchereria bancrofti*
b. *Onchocerca volvulus*
c. *Loa loa*
d. *Brugia malayi*

16. A microfilaria recovered in a blood sample from a patient from Vietnam had two nuclei at the tip of the tail. The worm was enclosed in a sheath. This parasite is:
a. *Brugia malayi*
b. *Loa loa*
c. *Onchocerca volvulus*
d. *Wuchereria bancrofti*

17. An immigrant from central Africa is exhibiting transient subcutaneous swelling in the arm. A blood smear revealed a sheathed microfilaria with a single row of nuclei present in the posterior of the parasite. The most likely identification is:
a. *Brugia malayi*
b. *Loa loa*
c. *Onchocerca volvulus*
d. *Wuchereria bancrofti*

18. The diagnosis of *Enterobius vermicularis* infection is accomplished by observing:
a. Eggs in feces
b. Eggs recovered from the perianal region
c. Larva in feces
d. Trophozoites in feces

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19. The rhabditiform larva of *Strongyloides stercoralis* has a:
a. Long buccal cavity
b. Sheath
c. Large genital primordium
d. Notched tail

20. Closed fecal sanitation systems had directly led to the reduction of all the following nematode infections **EXCEPT:**
a. Ascariasis
b. Hookworm disease
c. Strongyloidiasis
d. Trichinosis

21. The diagnostic form of this parasite appears as an oval thin-shelled egg with a clear area around the eight-celled immature embryo. This parasite is:
a. *Ascaris lumbricoides*
b. *Enterobius vermicularis*
c. Hookworm
d. *Trichuris trichiura*

22. The nematode infection that is acquired by ingesting a Cyclops (water flea) is:
a. *Dracunculus medinensis*
b. *Enterobius vermicularis*
c. *Necator americanus*
d. *Trichinella spiralis*

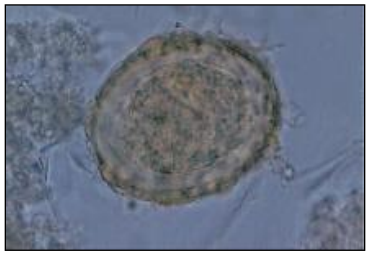
23. Which of the following organisms or infections could be transmitted in the laboratory?
a. *Ascaris lumbricoides*—Ascariasis
b. *Enterobius vermicularis*—pinworm infection
c. *Strongyloides stercoralis*—Strongyloidiasis
d. *Trichuris trichiura*—whipworm infection

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24. Which of the following parasitic diseases can cause blindness?
a. *Brugia malayi*
b. *Loa loa*
c. *Onchocerca volvulus*
d. *Wuchereria bancrofti*

25. Elephantiasis is a clinical symptom associated with:
a. *Brugia malayi*
b. *Loa loa*
c. *Onchocerca volvulus*
d. *Strongyloides stercoralis*

26. Name the parasite shown in the following image:



a. *Ascaris lumbricoides* egg
b. *Enterobius vermicularis* egg
c. Hookworm egg
d. *Trichuris trichiura* egg

27. Name the parasite shown in the following image:

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a. *Ascaris lumbricoides* egg
b. *Enterobius vermicularis* egg
c. Hookworm egg
d. *Trichuris trichiura* egg

28. Name the parasite shown in the following image:



a. *Ascaris lumbricoides* egg
b. *Enterobius vermicularis* egg
c. Hookworm egg
d. *Trichuris trichiura* egg

29. Name the parasite shown in the following image:



a. *Ascaris lumbricoides* egg
b. *Enterobius vermicularis* egg
c. Hookworm egg
d. *Trichuris trichiura* egg

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30. Name the parasite shown in the following image:



a. *Wuchereria bancrofti*—microfilaria
b. Filariform larva
c. Pinworm—female
d. Rhabditiform larva

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***Answer Key for* Chapter 2. Nematoda**

1. A clinical sign that may suggest the presence of a filarial nematode infection is:
a. Diarrhea
b. Eosinophilia
c. Jaundice
d. Microcytic anemia

ANS: B
RATIONALE: Migrating nematodes, especially filarial parasites, are usually associated with blood or tissue eosinophilia.
KEY: Nematoda: life cycle/clinical symptoms | Cognitive level: correlation

2. The nematode infection that may become more severe through ingestion of infective eggs, especially in infected infants, is:
a. *Ancylostoma duodenale*
b. *Enterobius vermicularis*
c. *Strongyloides stercoralis*
d. *Trichinella spiralis*

ANS: B
RATIONALE: *Enterobius vermicularis* infections become more severe due to the pruritus caused by new eggs released by dying females, which leads to autoreinfection through ingestion of these new eggs.
KEY: Nematoda: life cycle | Cognitive level: correlation

3. In the *Ascaris lumbricoides* life cycle, after eggs are ingested, the next stage in the life cycle that must occur before a mature adult can live in the host's intestine is called the:
a. Diagnostic stage
b. Infective stage
c. Liver-lung migration
d. Method of infection

ANS: C
RATIONALE: The liver-lung migration phase of the *Ascaris lumbricoides* life cycle occurs as the larva form migrates from the intestine to the lungs before returning to the intestine to become a mature adult worm. See life cycle, p. 17.

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KEY: Nematoda: life cycle | Cognitive level: recall

4. Patients who have heavy infections with *Necator americanus* may exhibit all of the following symptoms **EXCEPT:**
a. Diarrhea
b. Larval dermatitis
c. Macrocytic anemia
d. Microcytic anemia

ANS: C
RATIONALE: Macrocytic anemia does not occur because this disease is caused by a vitamin B_{12} deficiency. Hookworm infection is a cause of microcytic anemia, which may result from reduced plasma iron levels due to red blood cell loss; heavy worm burdens may result in 100 ml of blood loss per day.
KEY: Nematoda: disease condition | Cognitive level: correlation

5. The nematode egg that appears as a barrel-shaped structure with clear polar plugs at each end of the egg belongs to:
a. *Ascaris lumbricoides*
b. *Enterobius vermicularis*
c. *Strongyloides stercoralis*
d. *Trichuris trichiura*

ANS: D
RATIONALE: *Trichuris trichiura* eggs appear as a barrel-shaped structure with clear polar plugs at each end. See drawing and photograph.
KEY: Nematoda: diagnostic form | Cognitive level: recall

6. A slender round worm measuring 25 cm was recovered from a toilet following a child's trip to the bathroom. The specimen most likely is:
a. *Ascaris lumbricoides*
b. *Enterobius vermicularis*
c. *Strongyloides stercoralis*
d. *Trichuris trichiura*

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ANS: A
RATIONALE: *Ascaris lumbricoides* measure 22 to 35 cm in length and are often recovered in feces. The adult worm is active and may migrate up the esophagus as well. See life cycle, p. 17.
KEY: Nematoda: diagnostic form | Cognitive level: correlation

7. A 7-year-old boy's CBC revealed a microcytic anemia with eosinophilia during an office visit for symptoms of diarrhea. The most likely parasite involved in the infection is:
a. *Enterobius vermicularis*
b. *Necator americanus*
c. *Trichuris trichiura*
d. *Wuchereria bancrofti*

ANS: B
RATIONALE: *Necator* spp. often causes iron-deficient anemia. Diarrhea and eosinophilia are common symptoms.
KEY: Nematoda: disease symptoms | Cognitive level: correlation

8. Which of the following infections is not diagnosed by finding eggs or lava in fecal specimens?
a. *Ascaris lumbricoides*
b. *Necator* spp.
c. *Trichinella spiralis*
d. *Trichuris trichiura*

ANS: C
RATIONALE: *Trichinella spiralis* larvae are ingested in undercooked meat. Freed larvae invade muscle tissue and encyst. Diagnosis is based on finding encysted larvae in biopsied muscle.
KEY: Nematoda: diagnosis | Cognitive level: recall

9. Which of the following parasitic diseases is a zoonosis?
a. *Ascaris lumbricoides*
b. *Dracunculus medinensis*
c. *Strongyloides stercoralis*

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d. *Trichinella spiralis*

ANS: D
RATIONALE: *Trichinella spiralis* infection is a zoonosis. See life cycle, p. 23; the normal hosts include carnivorous mammals.
KEY: Nematoda: life cycle | Cognitive level: recall

10. Cutaneous larva migrans is caused by:
a. *Ascaris lumbricoides*
b. *Necator americanus*
c. *Strongyloides stercoralis*
d. *Toxocara canis*

ANS: B
RATIONALE: Free-living filariform larvae of *Necator* spp. may invade broken skin. See life cycle, p. 19.
KEY: Nematoda: life cycle | Cognitive level: correlation

11. The nematode parasite that may complete its life cycle without leaving the host is:
a. *Ascaris lumbricoides*
b. *Necator americanus*
c. *Strongyloides stercoralis*
d. *Toxocara canis*

ANS: C
RATIONALE: *Strongyloides stercoralis* is parthenogenic; therefore, fertile eggs hatch inside the host and may become infective without leaving the host.
KEY: Nematoda: life cycle, p. 21 | Cognitive level: recall

12. All of the following have life cycles that require larval lung migrations **EXCEPT:**
a. *Ascaris lumbricoides*
b. *Necator americanus*
c. *Strongyloides stercoralis*
d. *Trichuris trichiura*

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ANS: D
RATIONALE: *Trichuris trichiura* eggs are swallowed and hatch to become mature adults in the intestine. All of the parasites mentioned in choices A through C have migrations through the lungs in order to complete the life cycle. See individual life cycle diagrams; A=p. 17, B=p. 19, C=p. 21, D=p. 15.
KEY: Nematoda: life cycle | Cognitive level: recall

13. The diagnostic form recovered in feces in *Strongyloides stercoralis* infections is the:
a. Adult worm
b. Egg
c. Filariform larva
d. Rhabditiform larva

ANS: D
RATIONALE: Eggs released by the adult worm hatch in the intestinal mucosa, releasing immature rhabditiform larvae.
KEY: Nematoda: life cycle, p. 21 | Cognitive level: recall

14. A soldier returning from Iraq noticed a blister above his ankle that subsequently opened while he was swimming in his family pool. On further examination, he noticed a worm in the open blister. The possible parasite in this lesion is:
a. *Ancylostoma duodenale*
b. *Dracunculus medinensis*
c. *Toxocara canis*
d. Visceral larva migrans

ANS: B
RATIONALE: The soldier was returning from an endemic area for *D. medinensis.* This parasite produces a blister that ruptures in water, so larvae may be released.
KEY: Nematoda: life cycle, p. 25 | Cognitive level: correlation

15. All of the following infections are diagnosed by finding microfilaria in blood **EXCEPT:**
a. *Wuchereria bancrofti*
b. *Onchocerca volvulus*
c. *Loa loa*
d. *Brugia malayi*

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ANS: B
RATIONALE: Microfilaria of *Onchocerca volvulus* are found in the dermis, with adults residing in subcutaneous nodules.
KEY: Nematoda: life cycle, p. 27; Filariae | Cognitive level: recall

16. A microfilaria recovered in a blood sample from a patient from Vietnam had two nuclei at the tip of the tail. The worm was enclosed in a sheath. This parasite is:
a. *Brugia malayi*
b. *Loa loa*
c. *Onchocerca volvulus*
d. *Wuchereria bancrofti*

ANS: A
RATIONALE: Microfilariae are identified by examining their morphologic features. The presence or absence of structures such as sheaths and nuclei in the posterior end of the parasite are characteristics used to identify microfilaria. *Brugia malayi* may be identified when two nuclei are found at the tip of the parasite's tail that is enclosed in a sheath.
KEY: Nematoda: diagnostic form | Cognitive level: application

17. An immigrant from central Africa is exhibiting transient subcutaneous swelling in the arm. A blood smear revealed a sheathed microfilaria with a single row of nuclei present in the posterior of the parasite. The most likely identification is:
a. *Brugia malayi*
b. *Loa loa*
c. *Onchocerca volvulus*
d. *Wuchereria bancrofti*

ANS: B
RATIONALE: Microfilariae are identified by examining their morphologic features. The presence or absence of structures such as sheaths and nuclei in the posterior end of the parasite are characteristics used to identify microfilaria. *Loa loa* is identified when a sheathed organism with a single row of nuclei extending to the tip of the tail of the parasite is observed.
KEY: Nematoda: diagnostic form | Cognitive level: application

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18. The diagnosis of *Enterobius vermicularis* infection is accomplished by observing:
a. Eggs in feces
b. Eggs recovered from the perianal region
c. Larva in feces
d. Trophozoites in feces

ANS: B
RATIONALE: The female worm leaves the anus and dies, releasing eggs into the perianal region.
KEY: Nematoda: identification | Cognitive level: recall

19. The rhabditiform larva of *Strongyloides stercoralis* has a:
a. Long buccal cavity
b. Sheath
c. Large genital primordium
d. Notched tail

ANS: C
RATIONALE: *Strongyloides stercoralis* larvae can be identified when a large genital primordium is noted. A short buccal cavity is also noted. The parasite's eggs hatch in the intestinal mucosa of the host. Larvae are noted in fecal specimens.
KEY: Nematoda: identification | Cognitive level: correlation

20. Closed fecal sanitation systems had directly led to the reduction of all of the following nematode infections **EXCEPT:**
a. Ascariasis
b. Hookworm disease
c. Strongyloidiasis
d. Trichinosis

ANS: D
RATIONALE: Trichinosis is acquired by eating infected pork. The other parasitic infections have fecal-oral components in the life cycle. Sanitary systems reduce human exposure to contaminated feces.
KEY: Nematoda: identification | Cognitive level: correlation

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21. The diagnostic form of this parasite appears as an oval thin-shelled egg with a clear area around the eight-celled immature embryo. This parasite is:
a. *Ascaris lumbricoides*
b. *Enterobius vermicularis*
c. Hookworm
d. *Trichuris trichiura*

ANS: C
RATIONALE: The described egg is seen in feces in hookworm infections.
KEY: Nematoda: identification | Cognitive level: recall

22. The nematode infection that is acquired by ingesting a Cyclops (water flea) is:
a. *Dracunculus medinensis*
b. *Enterobius vermicularis*
c. *Necator americanus*
d. *Trichinella spiralis*

ANS: A
RATIONALE: *Dracunculus medinensis* infection is acquired by drinking water containing an infected water flea.
KEY: Nematoda: life cycle, p. 25 | Cognitive level: recall

23. Which of the following organisms or infections could be transmitted in the laboratory?
a. *Ascaris lumbricoides*—Ascariasis
b. *Enterobius vermicularis*—pinworm infection
c. *Strongyloides stercoralis*—Strongyloidiasis
d. *Trichuris trichiura*—whipworm infection

ANS: B
RATIONALE: Only pinworm eggs become infective after being released into the local environment (in 4 to 6 hours). All others require exposure to soil before embryonating.
KEY: Nematoda: life cycle, p. 13 | Cognitive level: correlation

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24. Which of the following parasitic diseases can cause blindness?
a. *Brugia malayi*
b. *Loa loa*
c. *Onchocerca volvulus*
d. *Wuchereria bancrofti*

ANS: C
RATIONALE: Although *Loa loa* is referred to as the *eyeworm,* it does not produce blindness because it does not invade other eye structures (only blood vessels) as do the microfilariae of *Onchocerca volvulus.*
KEY: Nematoda: disease manifestations | Cognitive level: correlation

25. Elephantiasis is a clinical symptom associated with:
a. *Brugia malayi*
b. *Loa loa*
c. *Onchocerca volvulus*
d. *Strongyloides stercoralis*

ANS: A
RATIONALE: *Brugia malayi* and *Wuchereria bancrofti* microfilaria both cause elephantiasis in long-standing infections by obstructing lymphatic ducts. *Loa loa* and *Onchocerca volvulus* live in subcutaneous locations; microfilaria moves through blood vessels, causing pathology in the face and eyes. *Strongyloides stercoralis* lives in the intestine, and larval forms migrate through the liver and lungs, eventually returning to the GI tract.
KEY: Nematoda: pathology and life cycle | Cognitive level: correlation

26. Name the parasite shown in the following image:
a. *Ascaris lumbricoides* egg
b. *Enterobius vermicularis* egg
c. Hookworm egg
d. *Trichuris trichiura* egg

ANS: A
RATIONALE: This view is of an *Ascaris lumbricoides* egg. The heavy, albuminous outer-shell coating indicates that this is a fertile egg.
KEY: Nematoda: parasite identification | Cognitive level: recall

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27. Name the parasite shown in the following image:
a. *Ascaris lumbricoides* egg
b. *Enterobius vermicularis* egg
c. Hookworm egg
d. *Trichuris trichiura* egg

ANS: C
RATIONALE: This view is of a hookworm egg. Hookworm eggs cannot be identified to the species level. The final identification relies on recovering the adult worm.
KEY: Nematoda: parasite identification | Cognitive level: recall

28. Name the parasite shown in the following image:
a. *Ascaris lumbricoides* egg
b. *Enterobius vermicularis* egg
c. Hookworm egg
d. *Trichuris trichiura* egg

ANS: B
RATIONALE: This view is of an *Enterobius vermicularis* (pinworm) egg. These eggs have the characteristic flattened side.
KEY: Nematoda: parasite identification | Cognitive level: recall

29. Name the parasite shown in the following image:
a. *Ascaris lumbricoides* egg
b. *Enterobius vermicularis* egg
c. Hookworm egg
d. *Trichuris trichiura* egg

ANS: D
RATIONALE: This view is of a *Trichuris trichiura* (whipworm) egg. This egg has the characteristic tray shape.
KEY: Nematoda: parasite identification | Cognitive level: recall

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30. Name the parasite shown in the following image:
a. *Wuchereria bancrofti*—microfilaria
b. Filariform larva
c. Pinworm—female
d. Rhabditiform larva

ANS: D
RATIONALE: This view is the larval form seen in feces in *Strongyloides stercoralis* infections. Eggs resembling those of hookworms may occasionally be found as well, but the usual diagnostic form is the rhabditiform larva.
KEY: Nematoda: parasite identification | Cognitive level: recall

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