PFIZER ATLAS OF VETERINARY CLINICAL PARASITOLOGY

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The hosts for each parasite are identified at the top of each page by the following icons representing dog, cat, and/or human hosts.

INTERNAL PARASITES

WHIPWORMS

Trichuris vulpis

Length of Life Cycle = 3 Months

WHIPWORM

Infective eggs hatch to larvae and mature to adult worms in 74 to 87 days in the cecum.

Mature worms pass eggs in the feces.

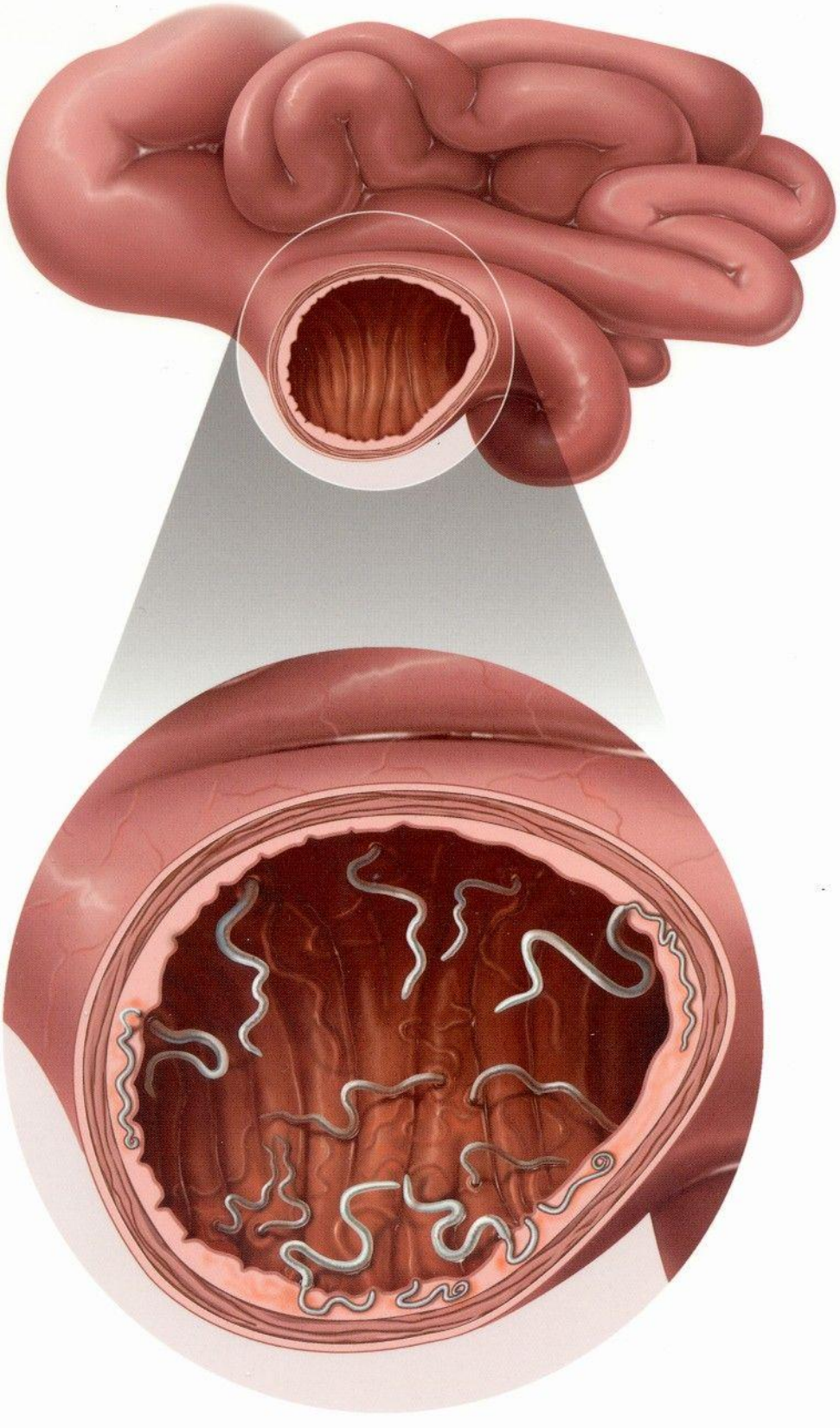
The dog ingests infective eggs found in soil.

Infective larvae develop in 2 to 4 weeks within the egg.

WHIPWORMS

Trichuris vulpis

WHIPWORM INFECTION



Normal cecum and the ileocecal junction of the small and large intestine

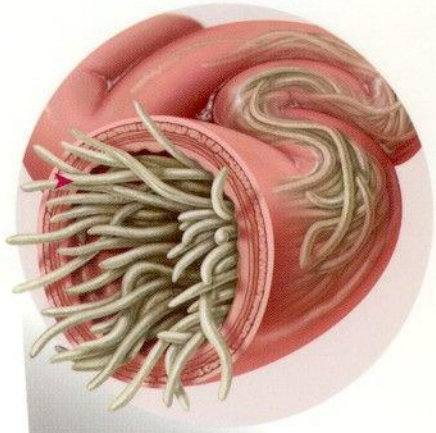
Infected cecum with numerous whipworms embedded in the mucosa

ROUNDWORMS

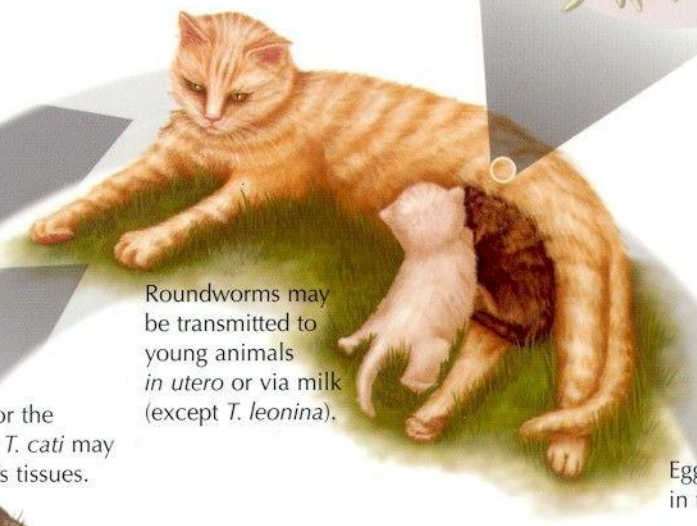
Toxocara canis, Toxocara cati*,* and *Toxascaris leonina**

Length of Life Cycle = T. canis, *approximately 4 to 5 Weeks;* T. cati *and* T. leonina, *≅55 Days*

ROUNDWORMS



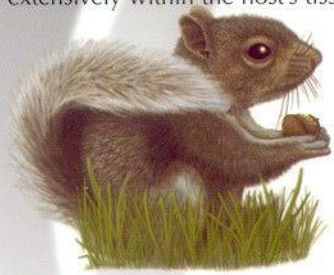
Adult roundworms live in the small intestine.



Roundworms may be transmitted to young animals *in utero* or via milk (except *T. leonina*).

Eggs are passed in the feces.

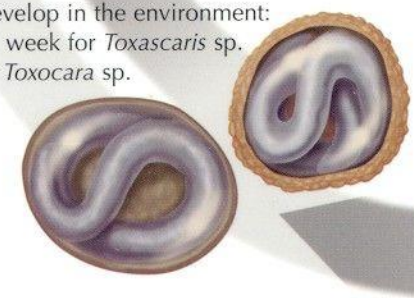
The hosts ingest the infective eggs or the transport host. Larvae of *T. canis* or *T. cati* may migrate extensively within the host's tissues.



The transport hosts ingest infective eggs; larvae encyst in tissues.

Toxocara cati egg

Infective eggs develop in the environment: approximately 1 week for *Toxascaris* sp. and 4 weeks for *Toxocara* sp.



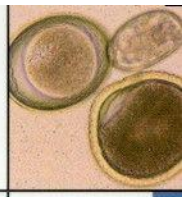
Toxocara canis egg

Toxascaris leonina egg

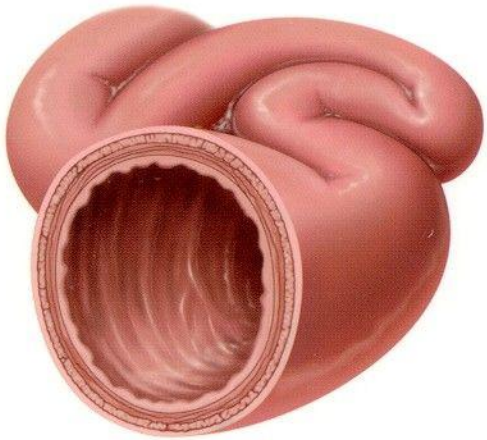
* Larvae of both *T. canis* and *T. cati* may infect many organ systems in humans (visceral larva migrans); *Toxascaris leonina* is of no zoonotic significance.

ROUNDWORMS

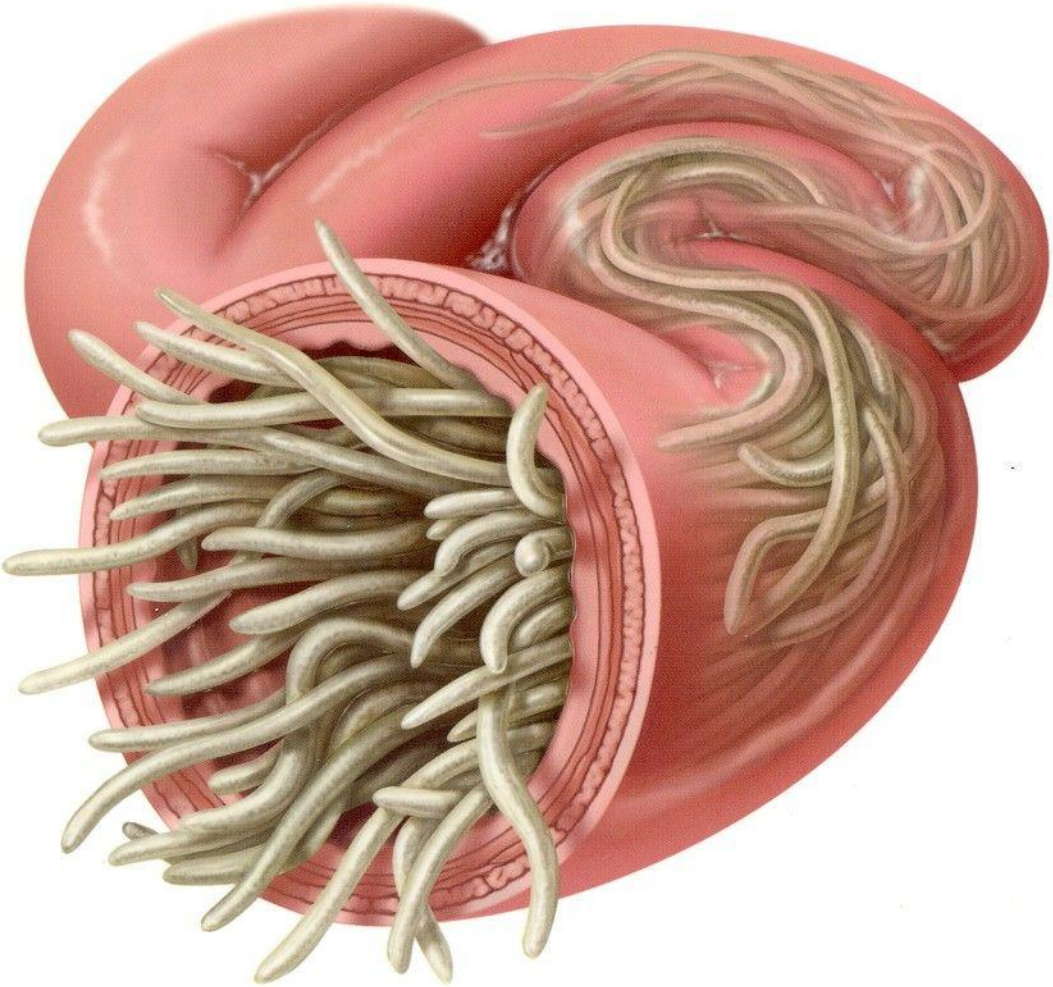
Toxocara canis, Toxocara cati, and *Toxascaris leonina*



ROUNDWORM INFECTION



Normal small intestine



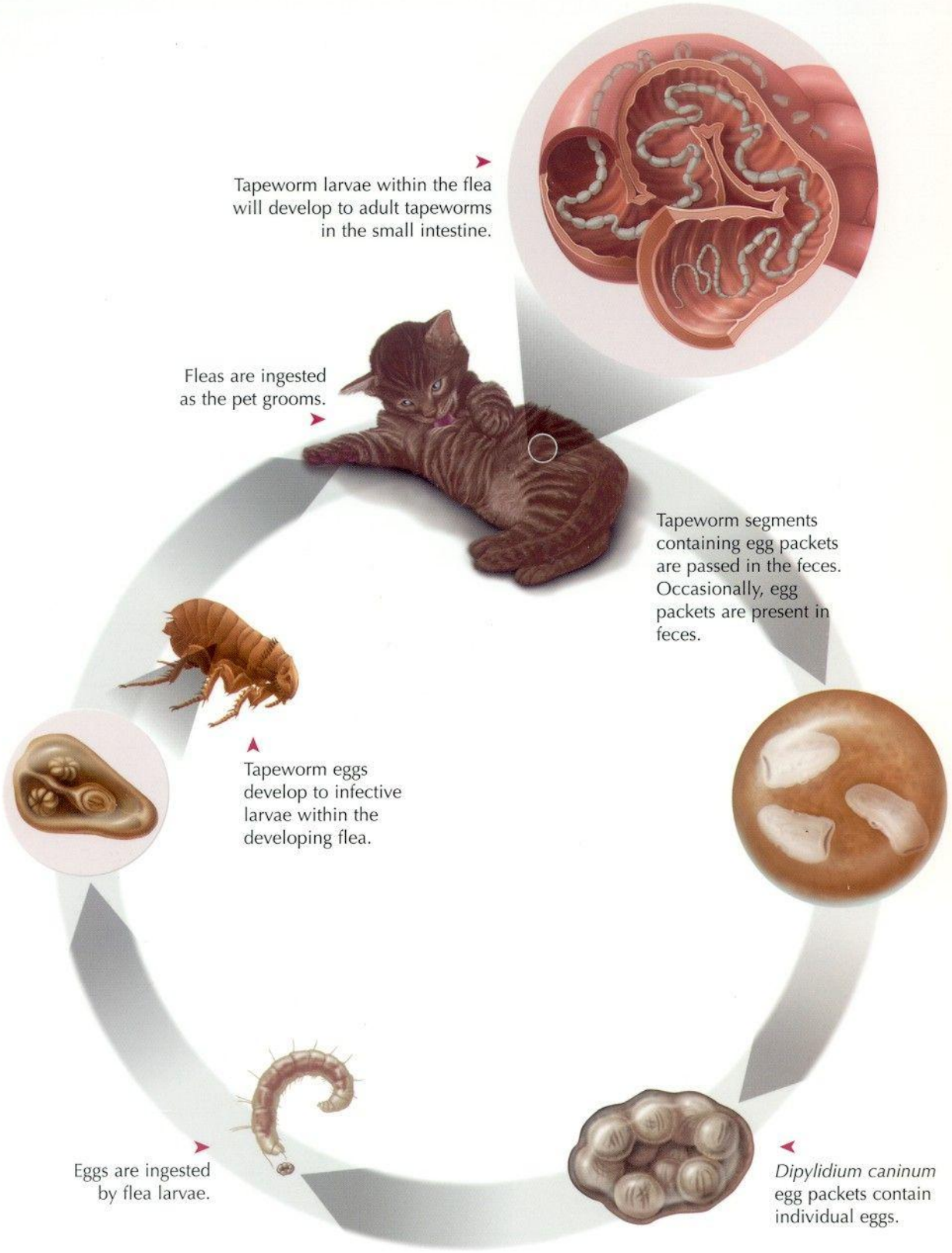
Small intestine infected with roundworms

DIPYLIDIUM TAPEWORMS

Dipylidium caninum

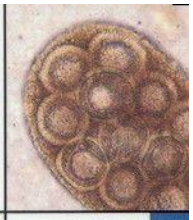
Length of Life Cycle = Approximately 3 Weeks

DIPYLIDIUM TAPEWORM



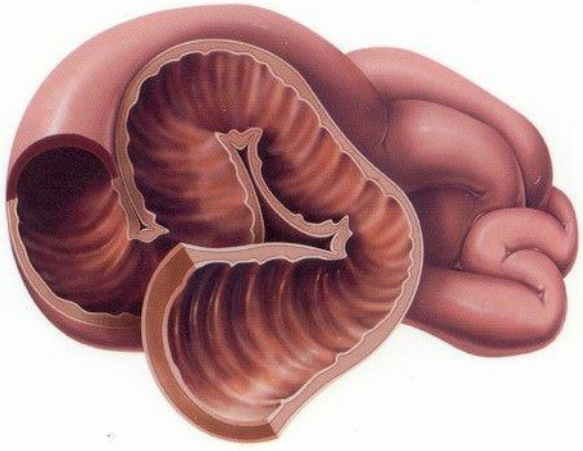
DIPYLIDIUM TAPEWORMS

Dipylidium caninum

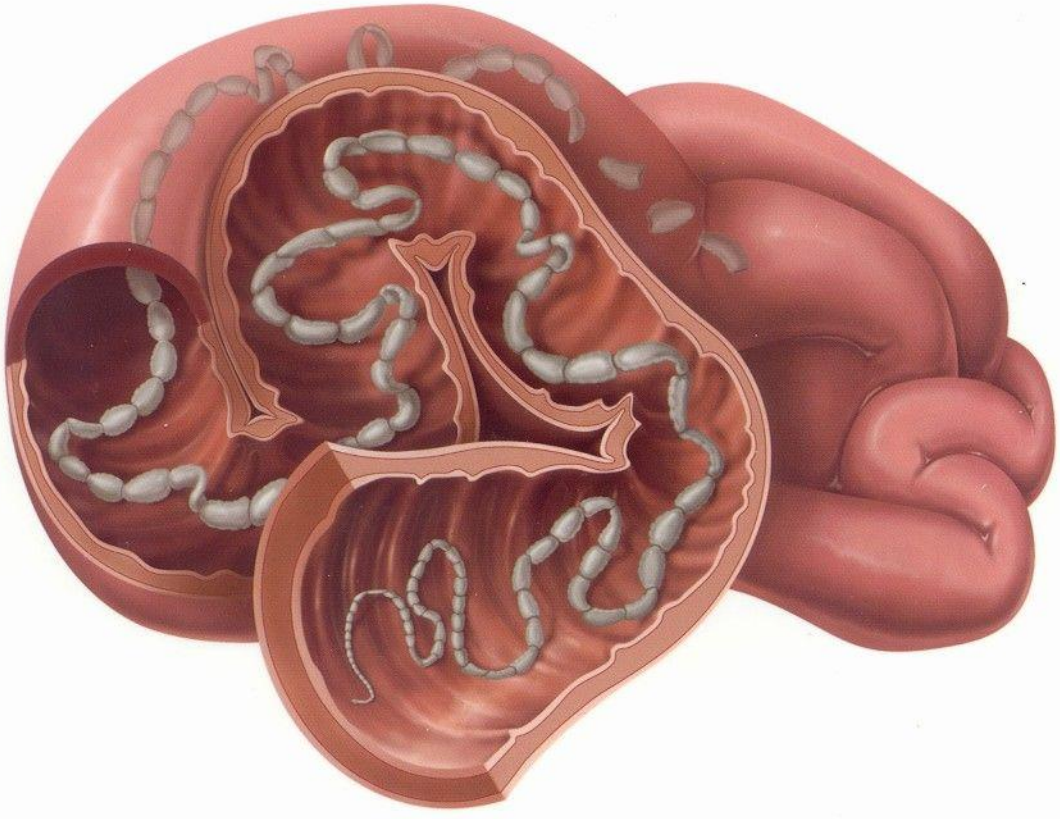


DIPYLIDIUM TAPEWORM INFECTION

Normal small intestine



Small intestine infected with tapeworms

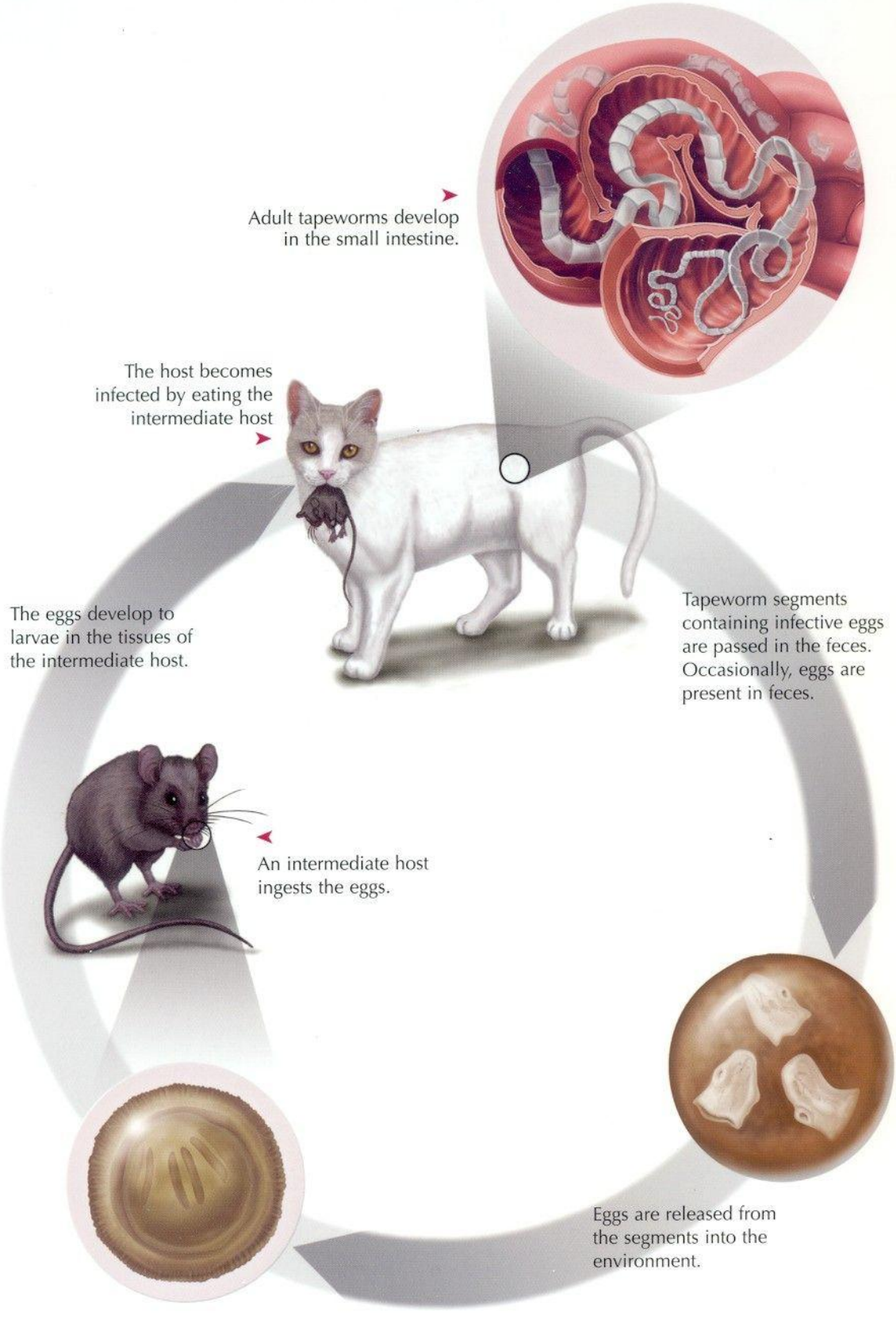


TAENIA TAPEWORMS

Taenia spp.

Length of Life Cycle = 7 to 8 Weeks

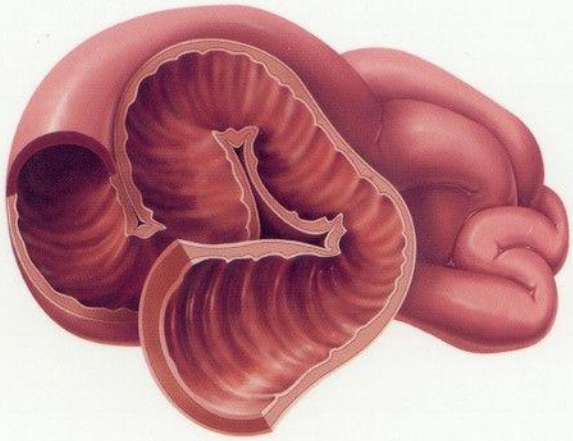
TAENIA TAPEWORM



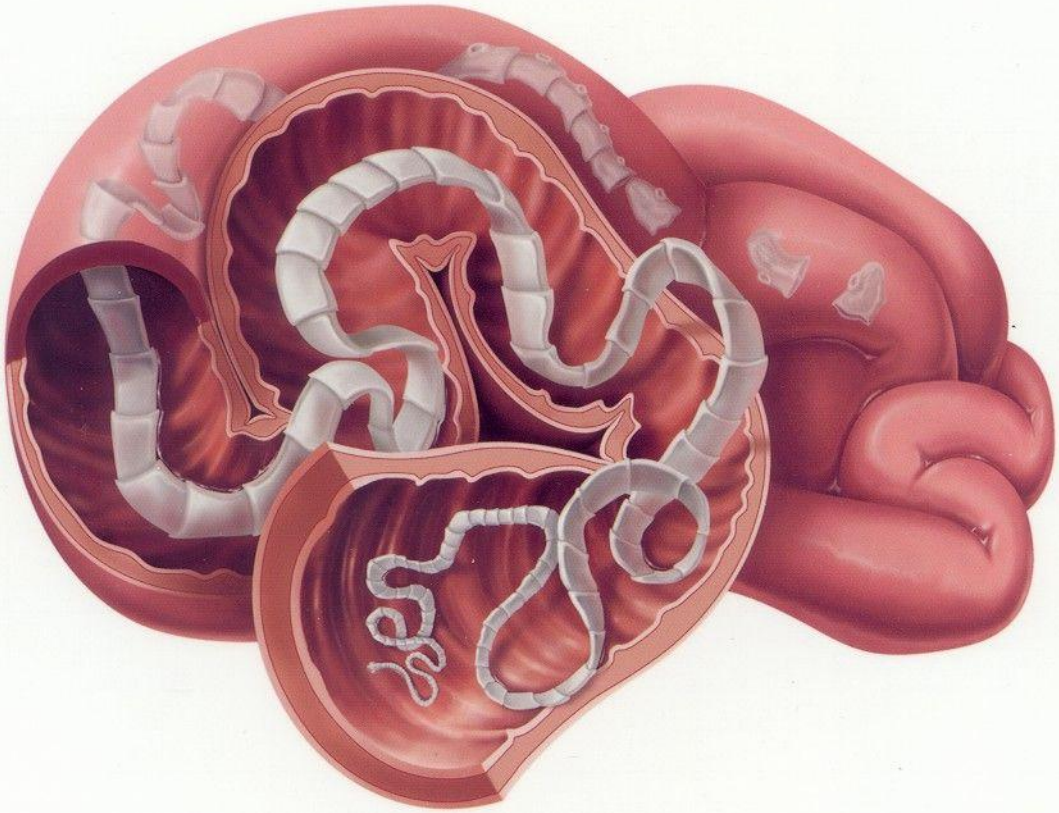
TAENIA TAPEWORMS

Taenia spp.

TAENIA TAPEWORM INFECTION



Normal small intestine



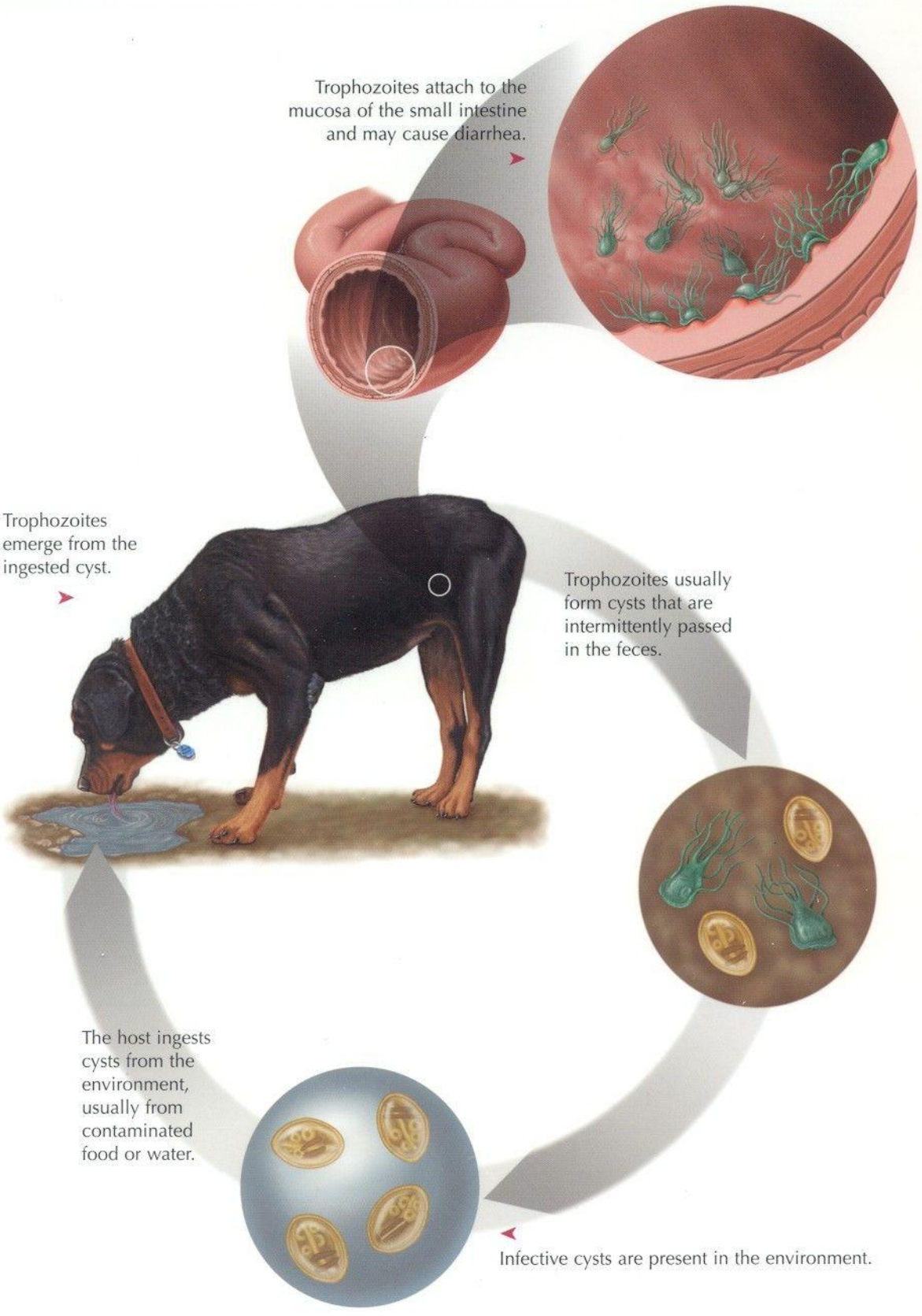
Small intestine infected with tapeworms

GIARDIA

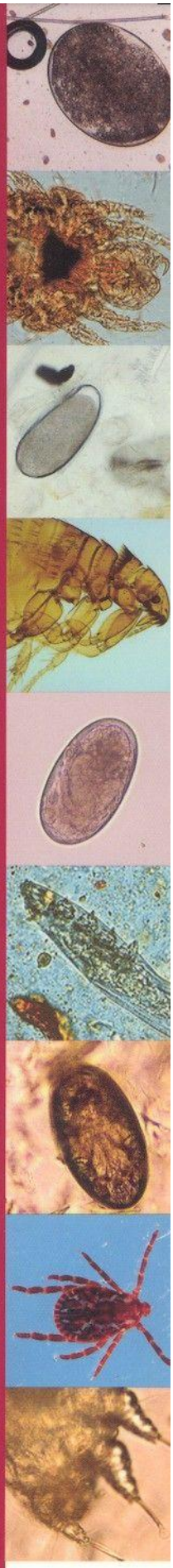
Giardia spp.

Length of Life Cycle = 1 Week

GIARDIA



EXTERNAL PARASITES



FLEAS

Ctenocephalides felis

Length of Life Cycle = 2 Weeks to Many Months

FLEA

Adult flea remains on the dog or cat host, feeding and producing eggs.

Adult fleas emerge from the cocoon in search of a blood meal

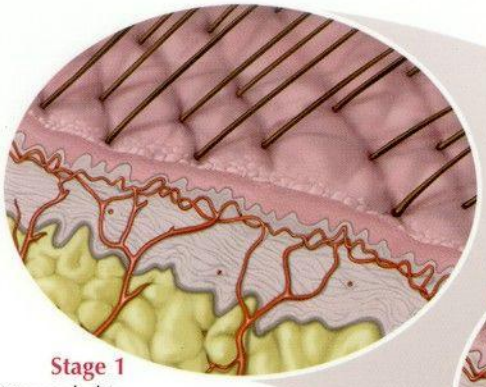
Larvae develop into pupae inside a debris-coated, silk-like fiber cocoon (cross section).

Larvae feed on adult flea feces which fall off the host and organic debris present in the environment.

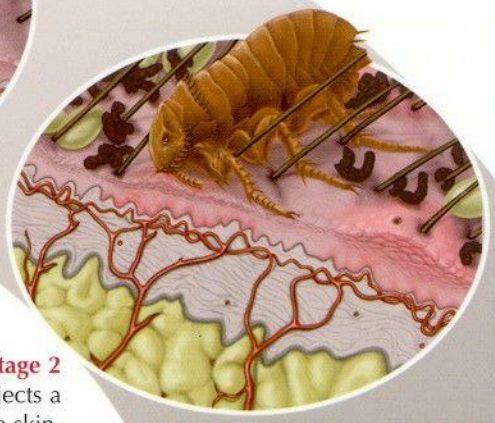
Eggs fall off of the host animal and larvae hatch within 2 to 5 days.

For each flea on the host, there are hundreds of eggs, larvae, and newly emerged adults, concentrated in the environment (carpet, bedding, soil, decaying vegetation, etc.).

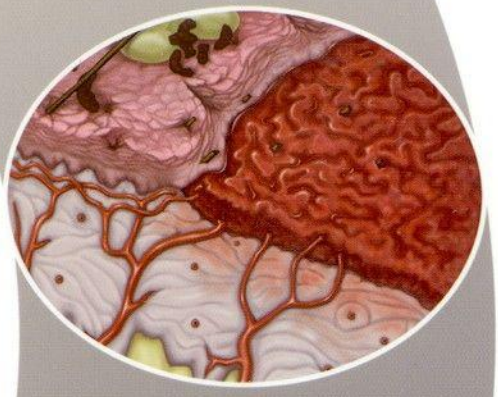
FLEA ALLERGY DERMATITIS



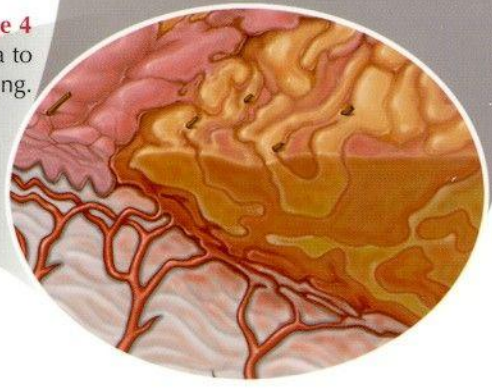
Stage 1
Normal skin



Stage 2
When a flea bites, it injects a small amount of saliva into the skin, causing an inflammatory reaction



Stage 3
In animals that are allergic to the flea saliva, the reaction is more pronounced, causing intense itching. Scratching may cause increased inflammation and hair loss.



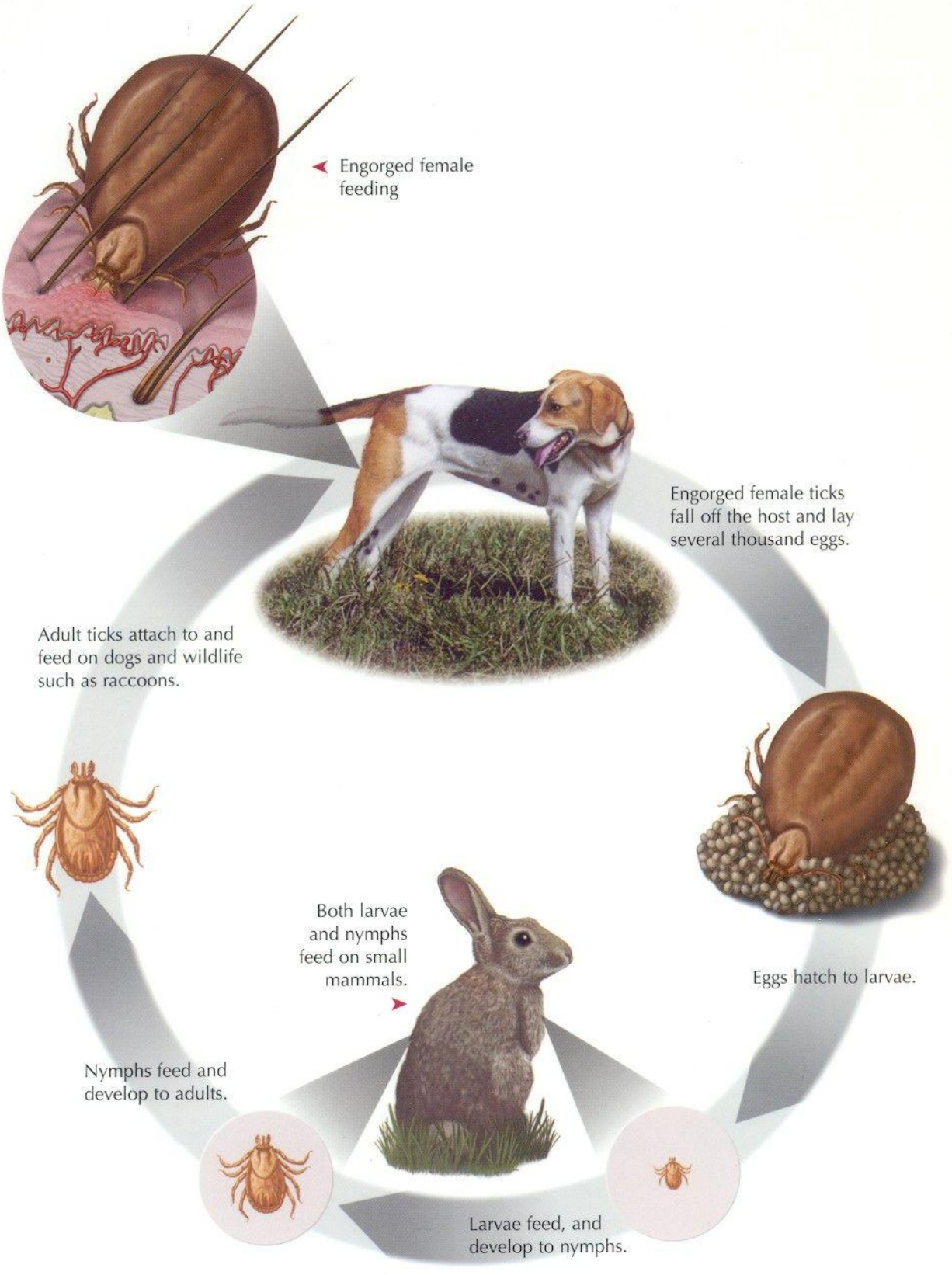
Stage 4
Bacterial infection is a common sequela to skin trauma caused by scratching.

AMERICAN DOG TICKS

Dermacentor variabilis

Length of Life Cycle = 1 to 2 Years

AMERICAN DOG TICK



BROWN DOG TICKS

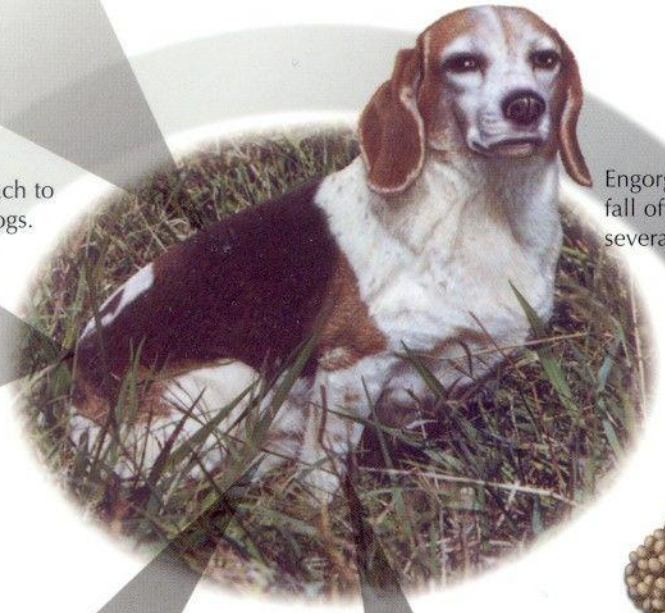
Rhipicephalus sanguineus

Length of Life Cycle = 3 Months to 1 Year

BROWN DOG TICK

Engorged female feeding

Adult ticks attach to and feed on dogs.



Engorged female ticks fall off the host and lay several thousand eggs.

Eggs hatch to larvae.

Larvae and nymphs feed on dogs and other small mammals.

Larvae feed and develop to nymphs.

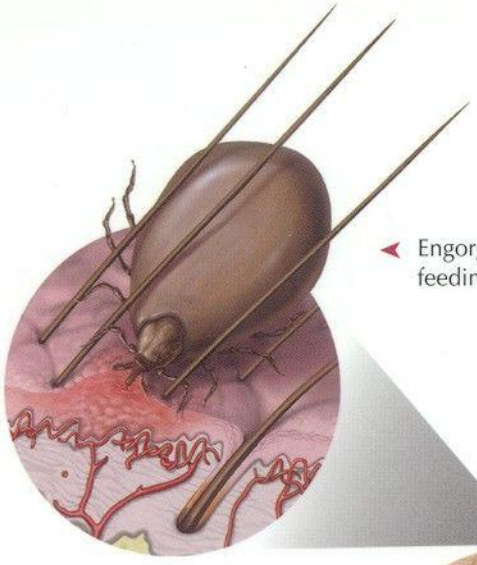
Nymphs feed and develop to adults.

DEER TICKS

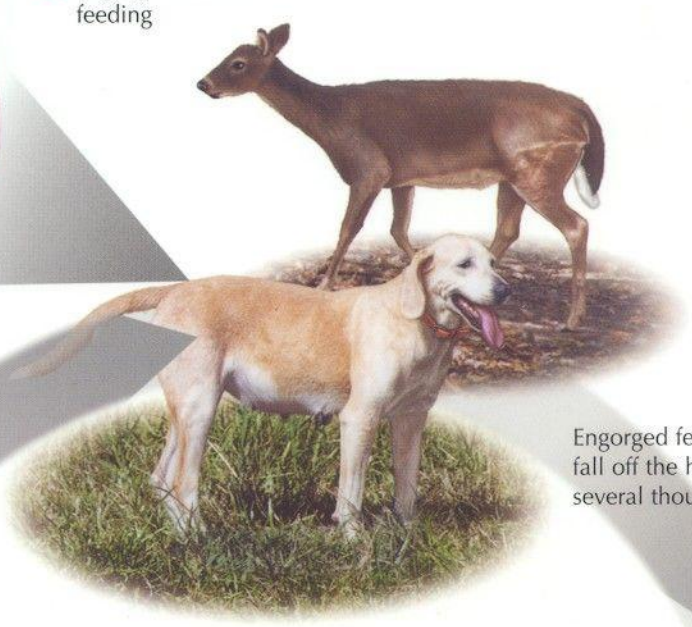
Ixodes scapularis (Syn. dammini)

Length of Life Cycle = 1 to 2 Years

DEER TICK



Engorged female feeding



Engorged female ticks fall off the host and lay several thousand eggs.

Eggs hatch to larvae.

Larvae feed and develop to nymphs.

Nymphs feed on mice, wildlife, dogs, cats, and humans, and develop to adults.

Larvae feed on mice, the reservoir for Lyme disease organisms.

Adult ticks attach to and feed on dogs, white-tailed deer, and other animals.

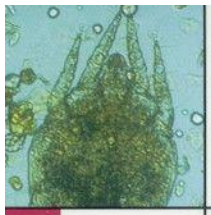
COMMON TICKS COMPARED

AMERICAN DOG TICK*

BROWN DOG TICK*

DEER TICK*

* These ticks are found infrequently on cats and humans, but they do occur.

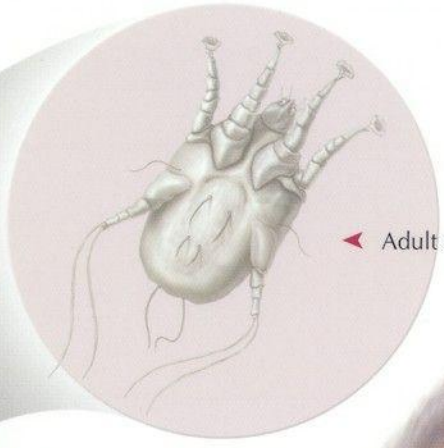


EAR MITES

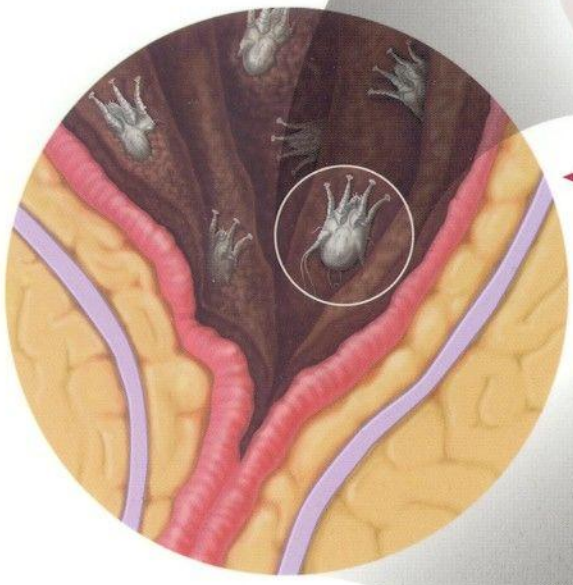
Otodectes cynotis

Length of Life Cycle = 3 to 4 Weeks

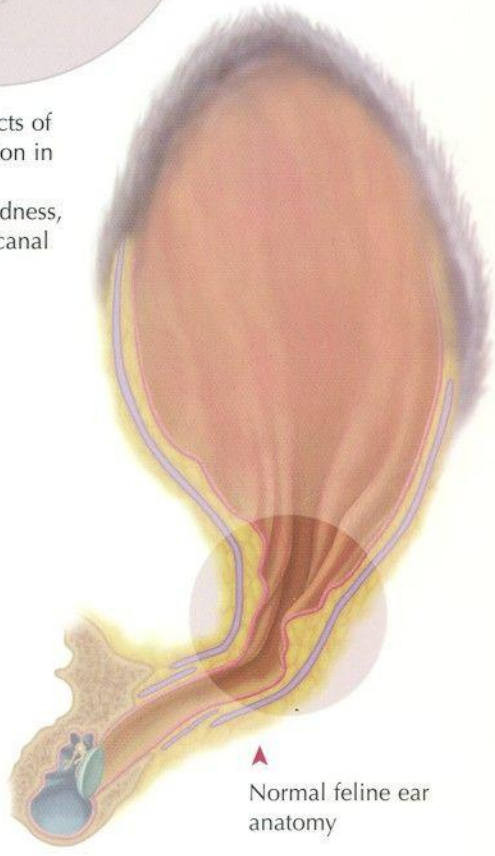
EAR MITE



Adult *Otodectes cynotis* mite



Cat displays effects of ear mite infestation in the ear canal—inflammation, redness, and swelling of canal structures.

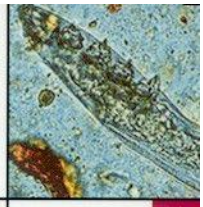


Normal feline ear anatomy

Ear mites may be found on body sites other than the ear canal. Animals become infested by passive contact with infested animals.

DEMODEX MITES

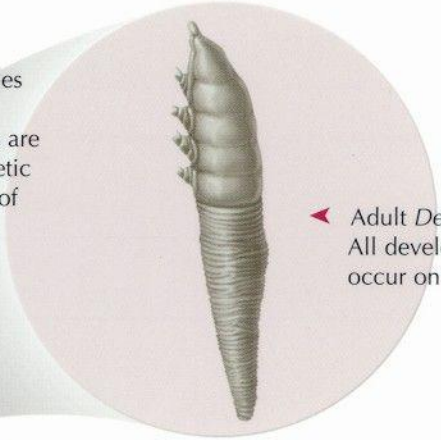
Demodex canis



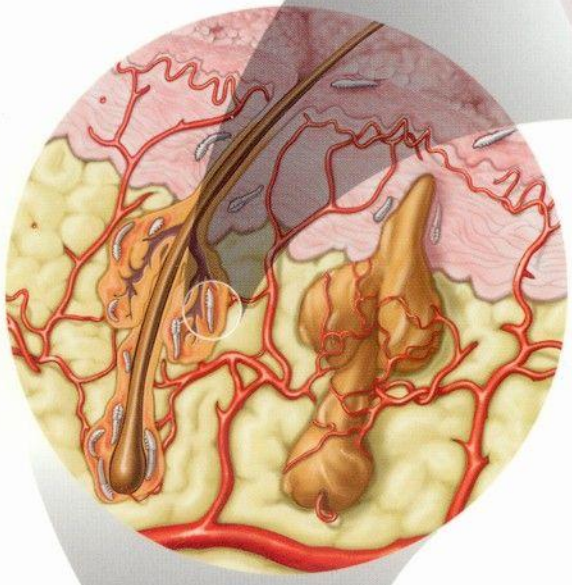
Length of Life Cycle = 20 to 35 Days

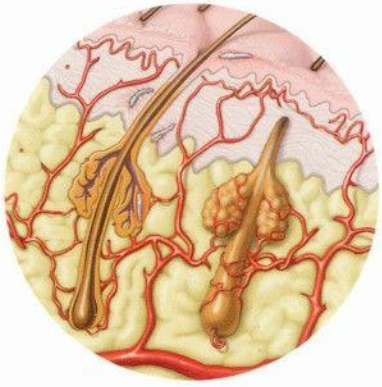
DEMODEX MITE

Demodex mites live and reproduce in the hair follicles and sebaceous glands. Increased numbers of mites are seen in animals with a genetic predisposition or disorders of the immune system.

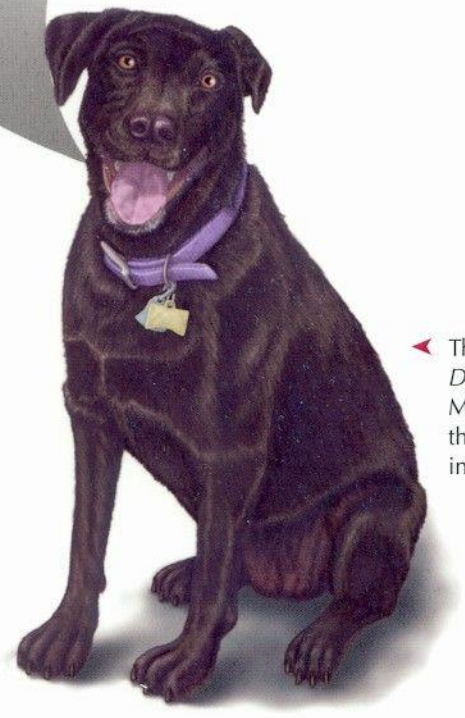


Adult *Demodex* mite
All developmental stages occur on the same host.





Normal canine skin.
Dogs normally have low numbers of mites.



The entire life cycle of the *Demodex* mite occurs on the host. Mites are acquired by puppies through intimate contact with their infested mother.

CHEYLETIELLA MITES

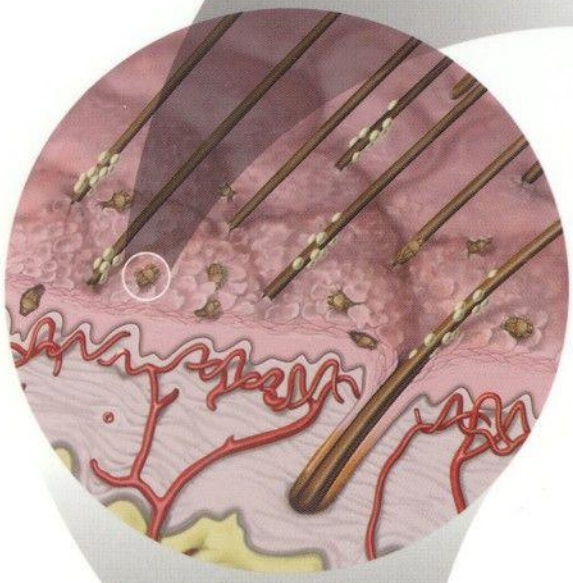
Cheyletiella yasguri, *Cheyletiella blakei*, and *Cheyletiella parasitovorax*

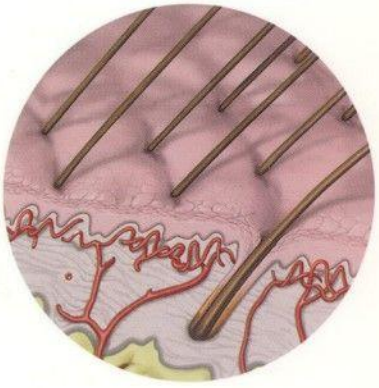
Length of Life Cycle = 3 to 5 Weeks

CHEYLETIELLA MITES*

Cheyletiella mites live on the surface of the skin where they feed and reproduce. The mites are contagious to other animals and can survive in the environment.

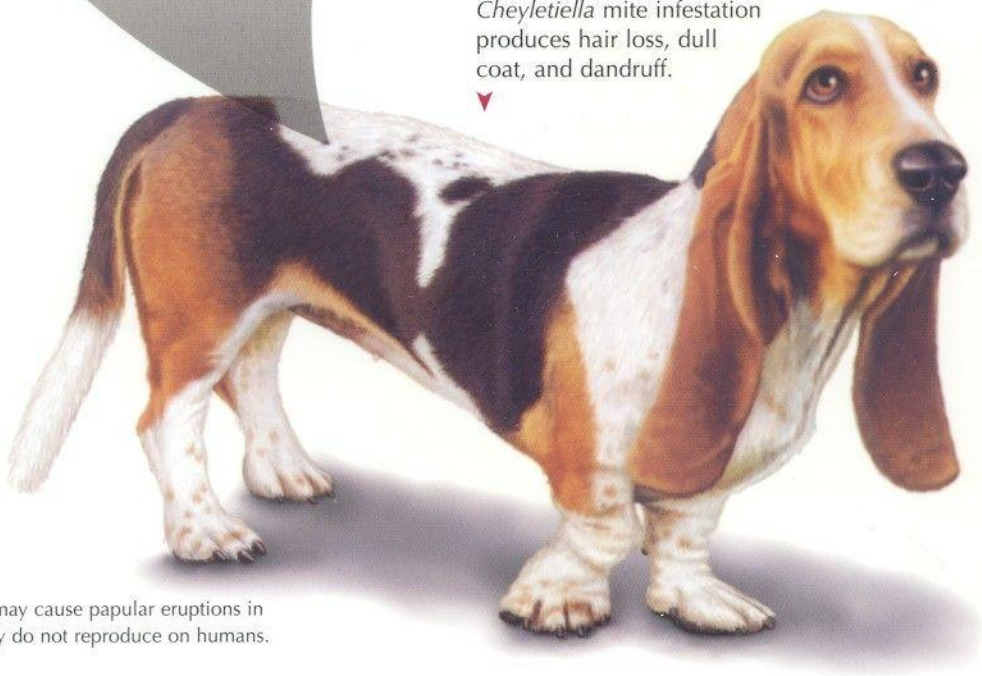
Adult *Cheyletiella* mite





Normal canine skin

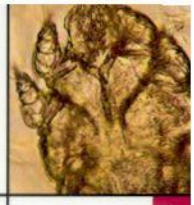
Cheyletiella mite infestation produces hair loss, dull coat, and dandruff.



* *Cheyletiella* may cause papular eruptions in humans. They do not reproduce on humans.

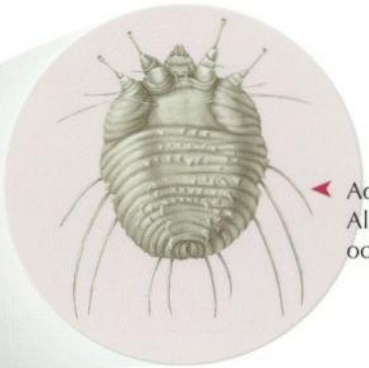
SARCOPTES MITES

Sarcoptes scabiei



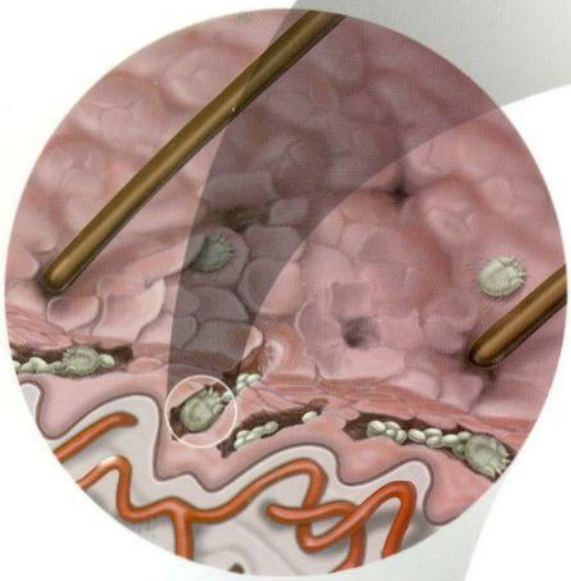
Length of Life Cycle = 17 to 21 Days

SARCOPTES MITE*



Adult *Sarcoptes* mite
All developmental stages occur on the same host.

Sarcoptes mites tunnel in the skin causing intense itching.

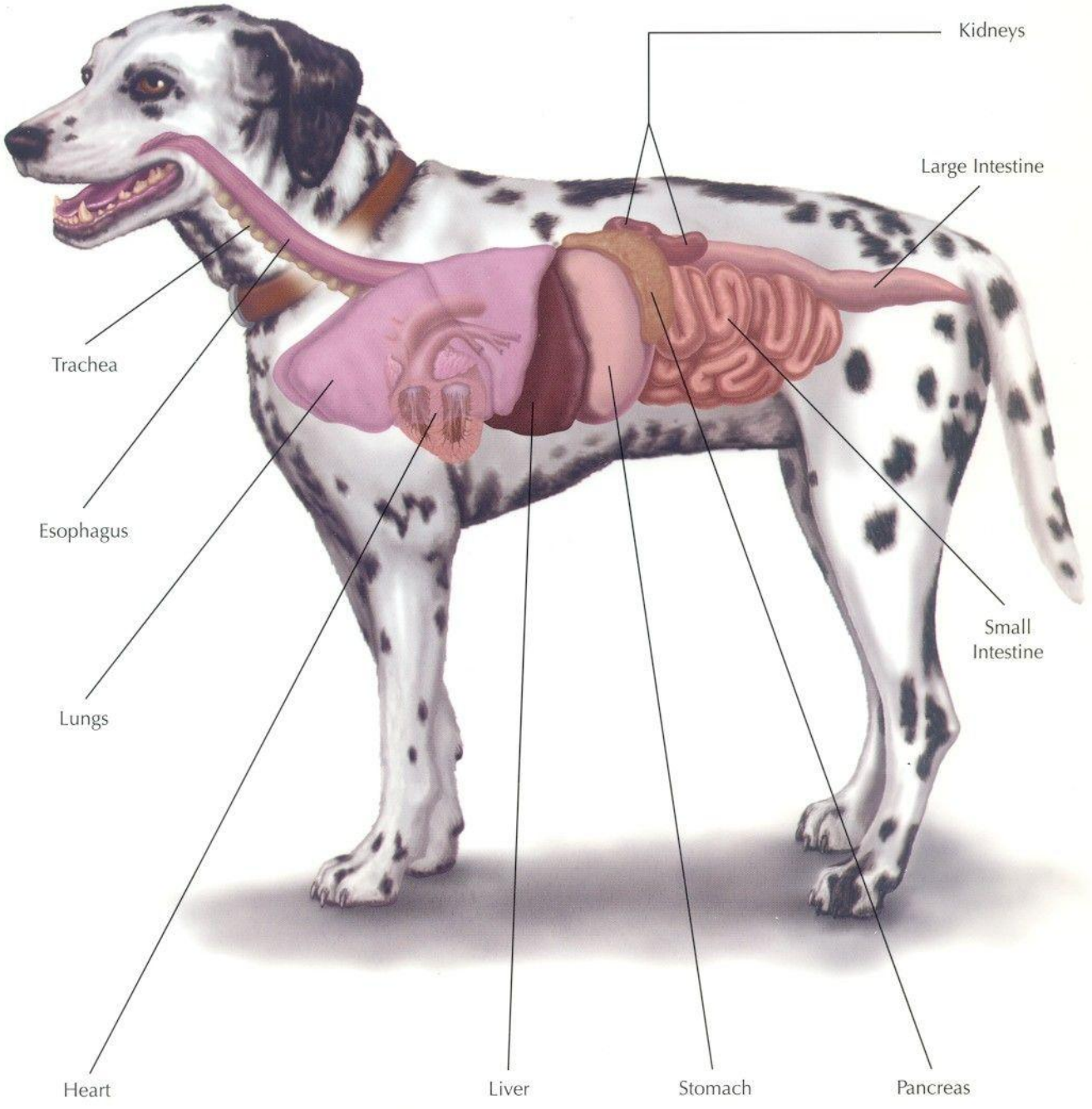


Normal canine skin

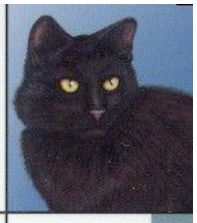
Sarcoptes lesions often start on the elbows and ear margins. The disease is highly contagious to other dogs, cats, or humans.

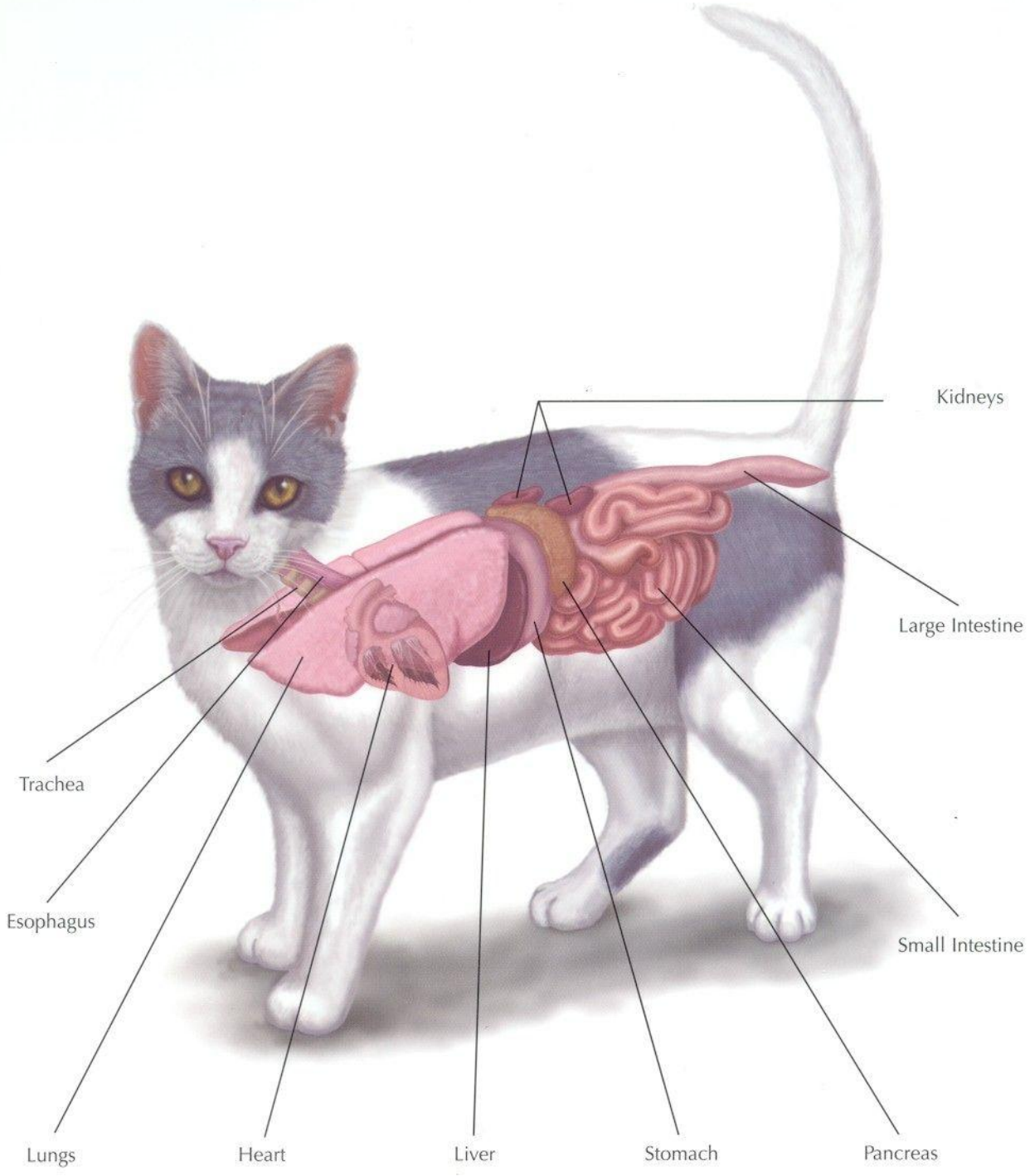
* *Sarcoptes* may produce severe transient pruritis in humans but disease is usually self-limiting.

CANINE INTERNAL ORGANS



FELINE INTERNAL ORGANS



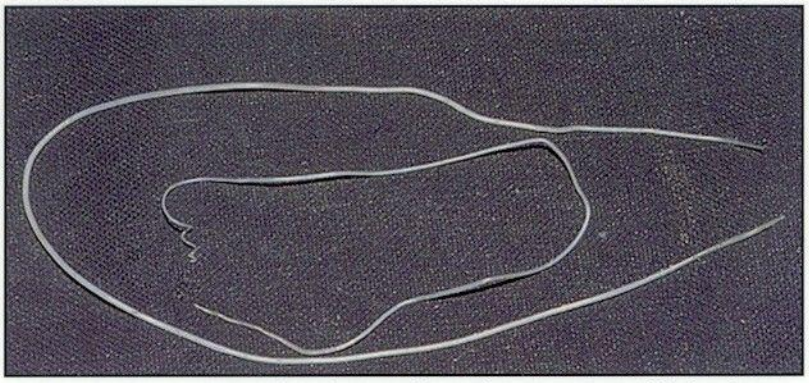


UNDER THE MICROSCOPE

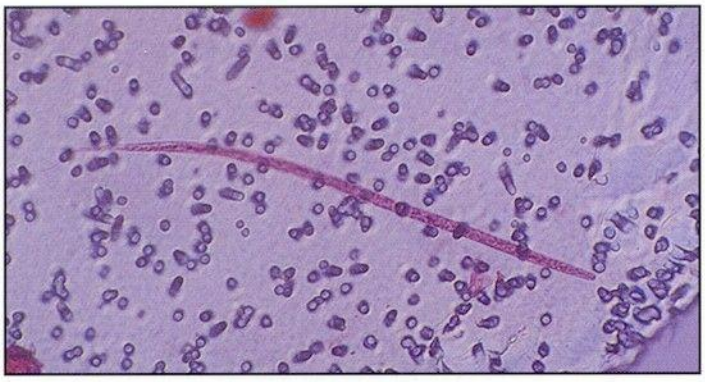
The egg of *Toxocara canis* is placed beside each parasite for scale.

PARASITES FOUND IN BLOOD

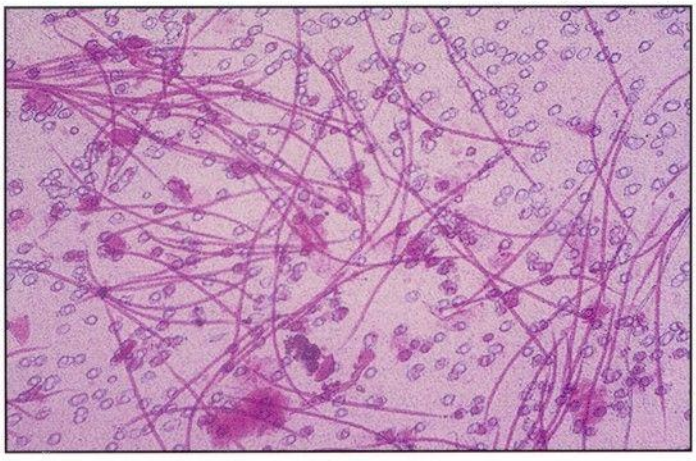
Dirofilaria immitis



Adult male heartworm with corkscrew-like tail is in center; adult female is on outside.



Single microfilaria of *D. immitis* (Difil® Filter Test)



Microfilaria of *D. immitis* (Difil® Filter Test)

Anterior ends of microfilaria of *Dipetalonema reconditum* (left) and *D. immitis* (Modified Knott Test)

Alaria canis

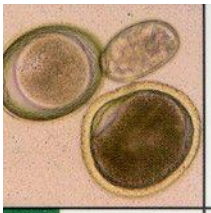
Egg of *Alaria canis*

Aleurostrongylus abstrusus

Close-up of tail of *A. abstrusus*

First-stage larva of *Aleurostrongylus abstrusus*

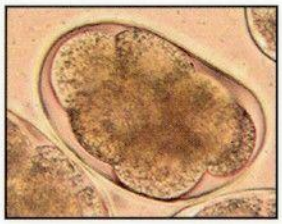
The egg of *Toxocara canis* is placed beside each parasite for scale.



PARASITES FOUND IN FECES

Ancylostoma spp.

The egg of *Ancylostoma caninum*



The egg of *Uncinaria stenocephala*

The egg of *A. caninum;* oocysts of *Isospora canis*

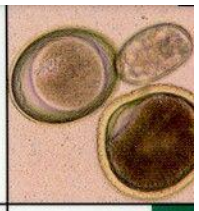
The egg of *Ancylostoma braziliense*

The egg of *Ancylostoma tubaeforme*

Eggs of *A. caninum* and *T. vulpis*

Fecal flotation preparation containing eggs of *A. caninum*, *T. vulpis*, *U. stenocephala*, and *Eucoleus (Capillaria)* spp.

The egg of *Toxocara canis* is placed beside each parasite for scale.



Eucoleus (Capillaria) aerophila

Egg of Eucoleus (*Capillaria*) *aerophila* *(respiratory tract)*

Eucoleus (Capillaria) boehmi

Surface of egg of *Eucoleus (Capillaria) boehmi*

Egg of *Eucoleus (Capillaria) boehmi* *(nasopharynx)*

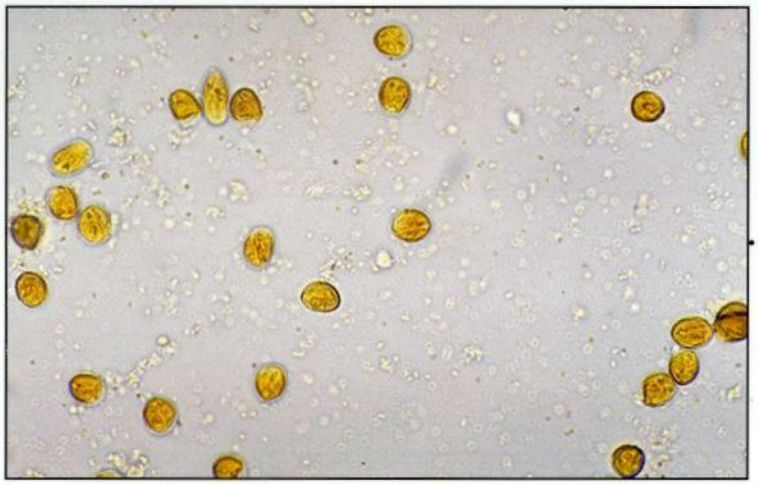
Dipylidium caninum

Dipylidium caninum egg packet containing numerous eggs

The egg of *Toxocara canis* is placed beside each parasite for scale.

PARASITES FOUND IN FECES

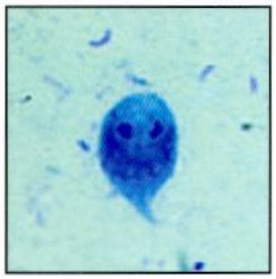
Giardia spp.



Cysts of *Giardia* spp. (zinc sulfate flotation, iodine stain)

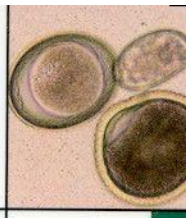
Close-up of cysts of *Giardia* spp. (zinc sulfate flotation, iodine stain)

Cyst of *Giardia* spp. (Sheather's sucrose flotation)

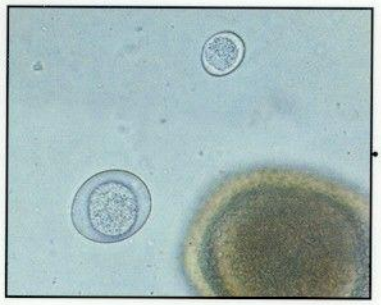


Stained trophozoite of *Giardia* spp. (fecal smear)

The egg of *Toxocara canis* is placed beside each parasite for scale.



Isospora canis



Oocysts of *Isospora canis* (left), *I. ohioensis* (top), and egg of *T. canis* (right)

Isospora felis

Oocysts of *Isospora felis*

Isospora felis, Isospora rivolta

Oocysts of *Isospora felis* (larger) and *Isospora rivolta* (smaller)

Oocysts of *Isospora felis* (smaller), and egg of *Toxocara cati*

Neospora caninum

Oocysts of *Neospora caninum* (*arrows*)

Paragonimus kellicoti

Egg of the lung fluke *Paragonimus kellicoti*

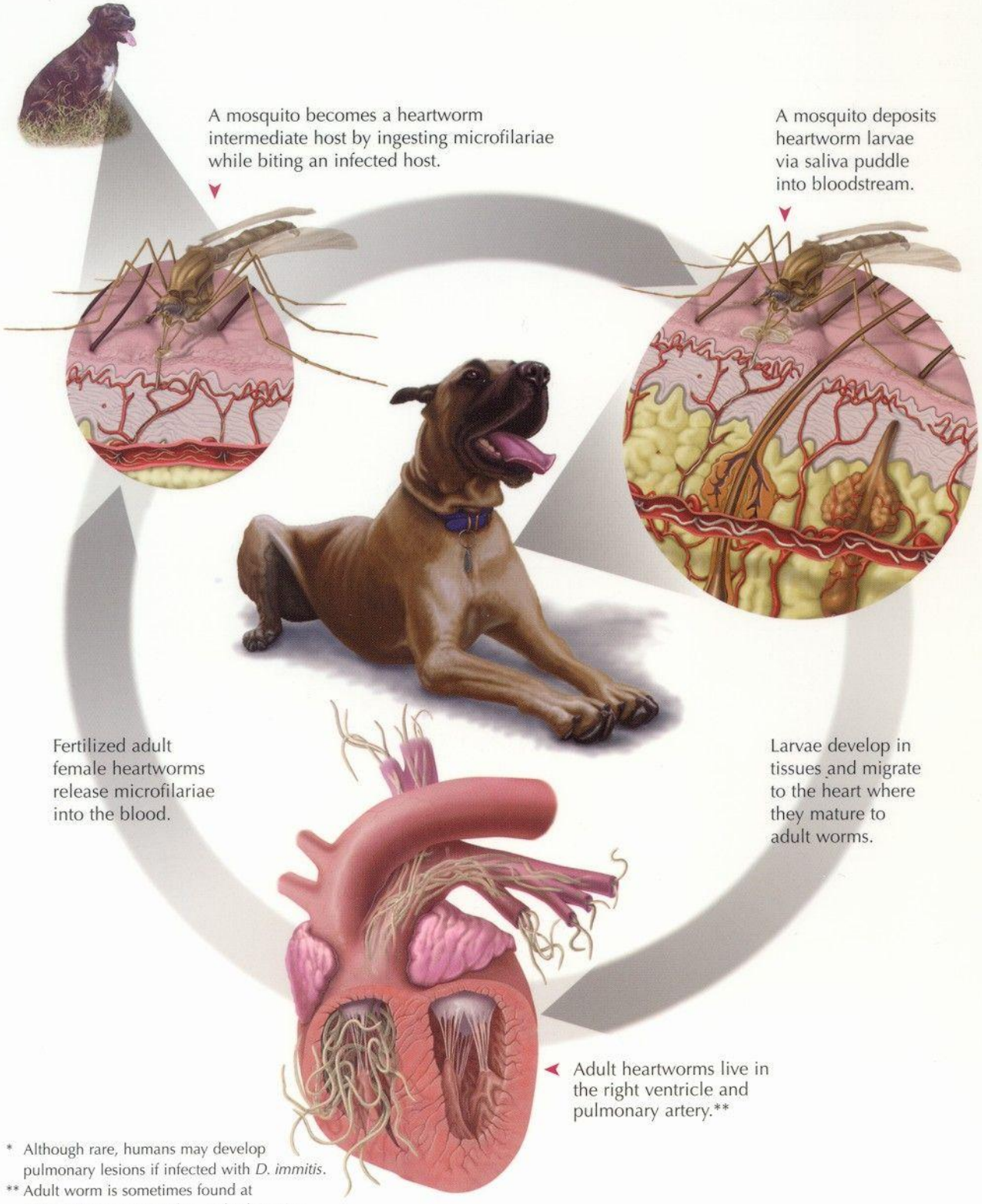
The egg of *Toxocara canis* is placed beside each parasite for scale.

HEARTWORMS—CANINE

Dirofilaria immitis

Length of Life Cycle = Approximately 6 Months

CANINE HEARTWORM*



* Although rare, humans may develop pulmonary lesions if infected with *D. immitis*.

** Adult worm is sometimes found at ectopic sites, eg, eye, skin, or body cavity.

PARASITES FOUND IN FECES

Physaloptera spp.

Egg of *Physaloptera* spp.

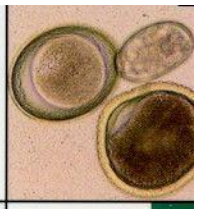
Sarcocystis spp.

Sporocytes of *Sarcocystis* spp.

Spirometra mansonoides

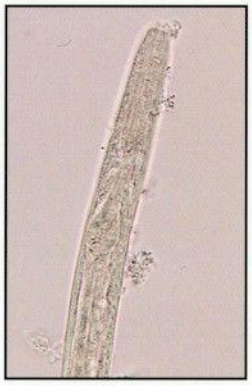
Egg of the tapeworm *Spirometra mansonoides*

The egg of *Toxocara canis* is placed beside each parasite for scale.



Strongyloides stercoralis

First-stage larvae of *Strongyloides stercoralis*



Anterior end of *Strongyloides stercoralis*

Taenia spp.

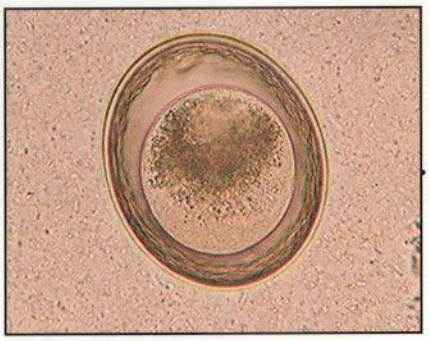
Egg of *Taenia* spp. Eggs of *Echinococcus* spp. are similar, and thus are not easily differentiated from those of *Taenia* spp.

Ruptured egg of *Taenia* spp. Note the exposed hexacanth embryo.

The egg of *Toxocara canis* is placed beside each parasite for scale.

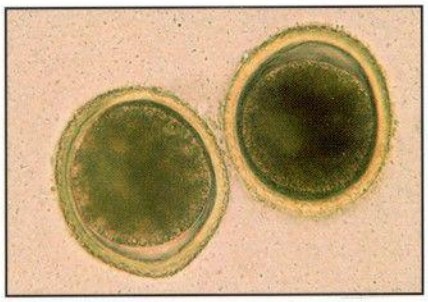
PARASITES FOUND IN FECES

Toxascaris leonina



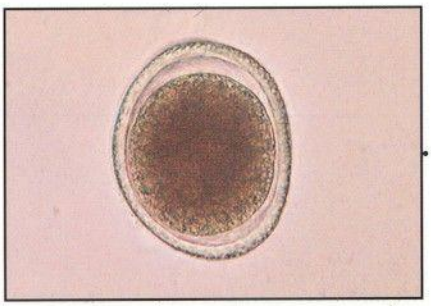
Egg of *Toxascaris leonina*

Toxocara canis

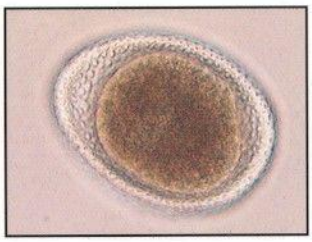


Eggs of *Toxocara canis*

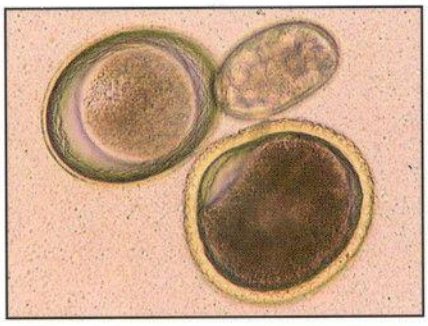
Toxocara cati



Egg of *Toxocara cati*



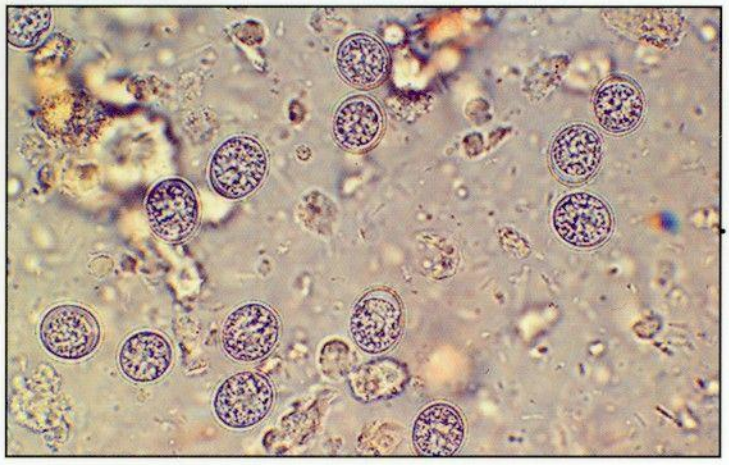
Surface of egg of *Toxocara cati*



Eggs of *Toxocara canis*, *Toxascaris leonina*, and *Ancylostoma caninum*

The egg of *Toxocara canis* is placed beside each parasite for scale.

Toxoplasma gondii



Oocysts of *Toxoplasma gondii*

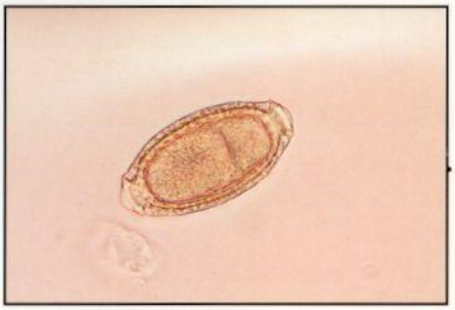
Trichuris vulpis

Egg of *Trichuris vulpis*

The egg of *Toxocara canis* is placed beside each parasite for scale.

PARASITES FOUND IN URINE

Pearsonema (Capillaria) feliscati

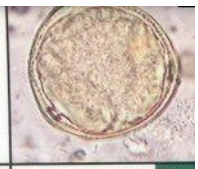


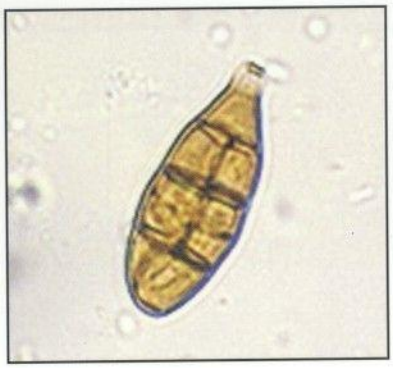
Egg of *Pearsonema (Capillaria) feliscati*

Surface of egg of *Pearsonema (Capillaria) feliscati*

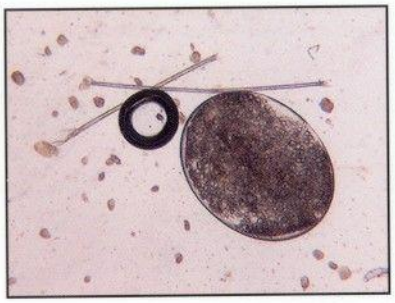
Egg of *Pearsonema (Capillaria) plica*

The egg of *Toxocara canis* is placed beside each parasite for scale.





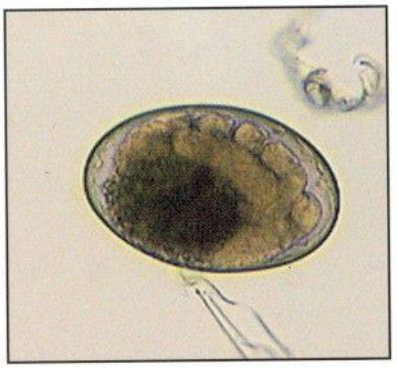
Soil fungus—Common fecal pseudoparasite



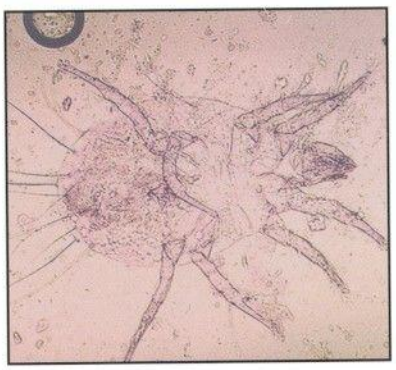
Hair, air bubble, and flea egg—fecal pseudoparasites

Tree pollen—fecal pseudoparasite

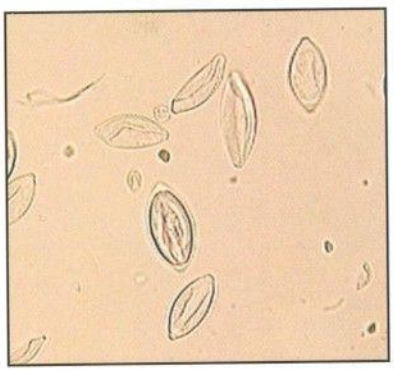
Egg of rodent tapeworm—appears in feces as result of predation



Mite egg—fecal pseudoparasite

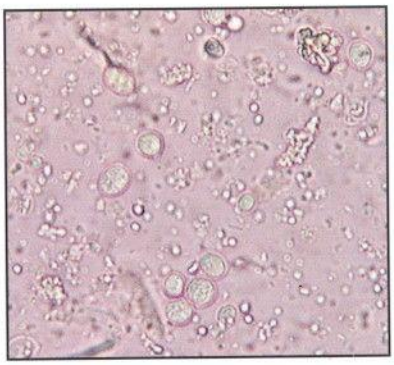


Grain mite and air bubble—fecal pseudoparasites

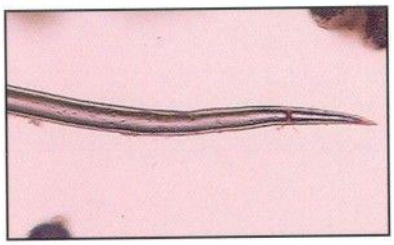


Sporocysts of *Monocystis* or *Rhyncocystis (earthworm parasites)*—appears in feces as result of ingestion

Pine pollen—fecal pseudoparasite



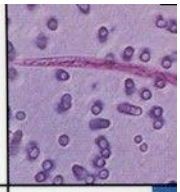
Yeast—fecal pseudoparasite



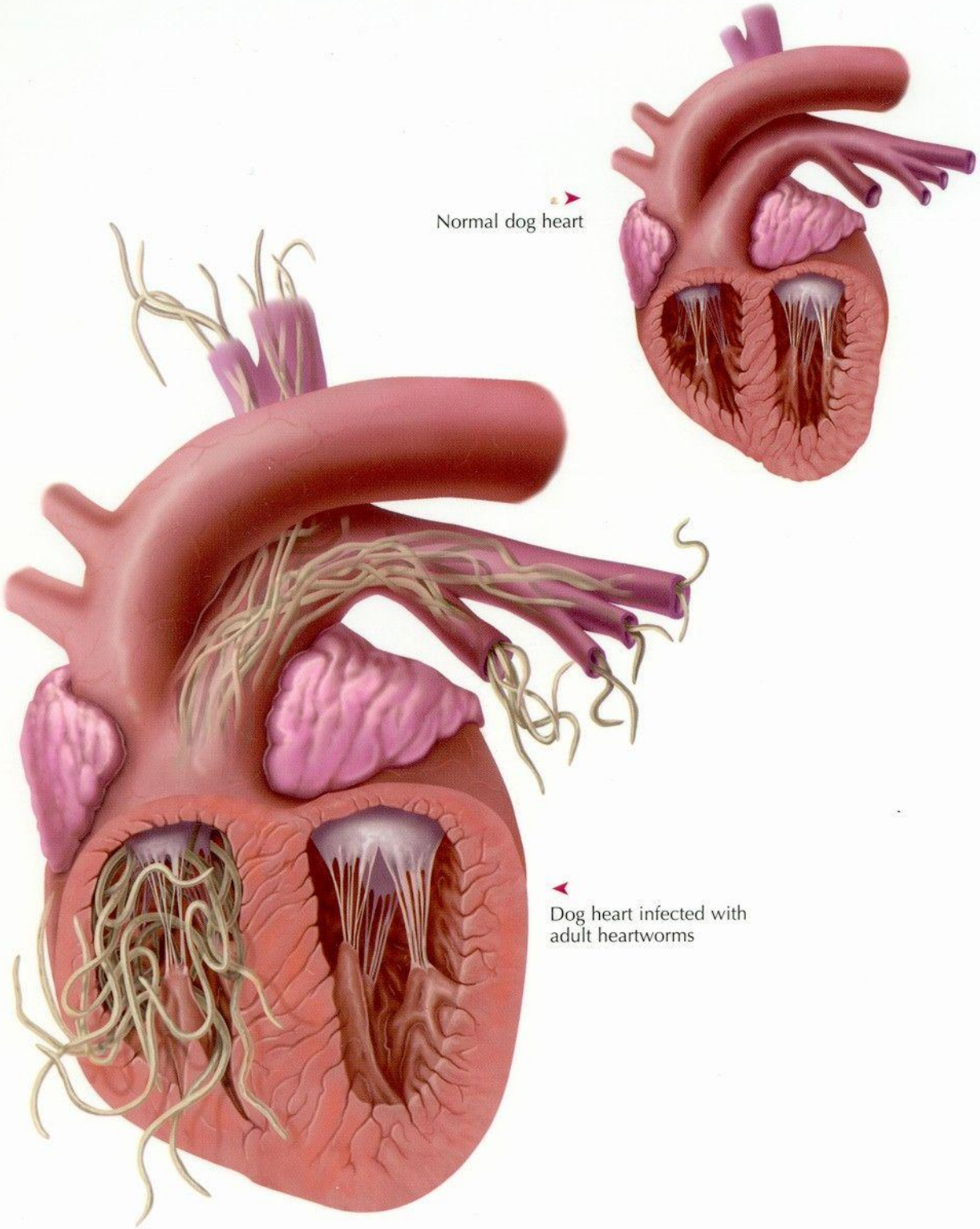
Plant hair—fecal pseudoparasite

HEARTWORMS—CANINE

Dirofilaria immitis



CANINE HEARTWORM INFECTION

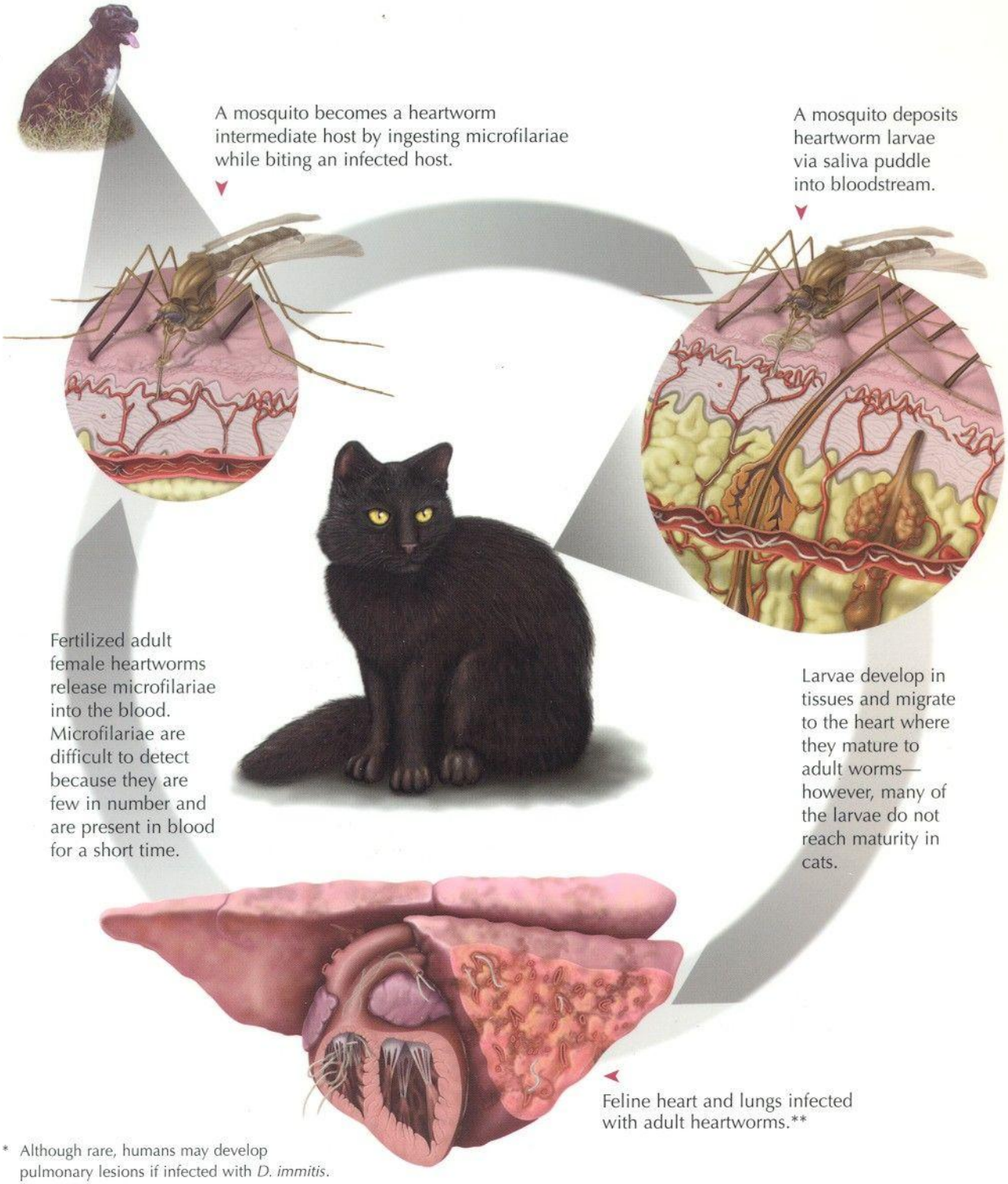


HEARTWORMS—FELINE

Dirofilaria immitis

Length of Life Cycle = Approximately 8 Months

FELINE HEARTWORM*



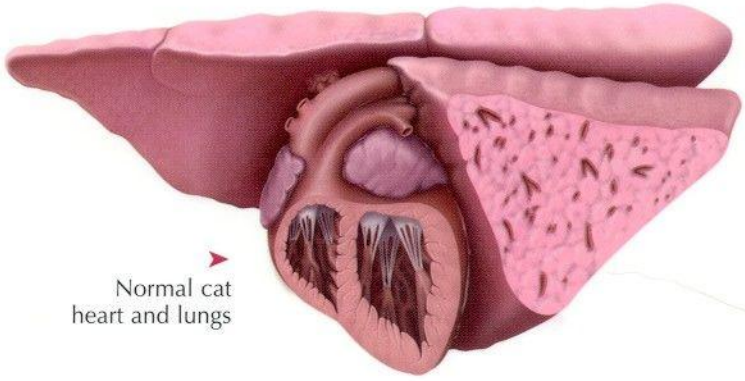
* Although rare, humans may develop pulmonary lesions if infected with *D. immitis*.

** Adult worm is sometimes found at ectopic sites, eg, peripheral arteries, body cavity, or central nervous system.

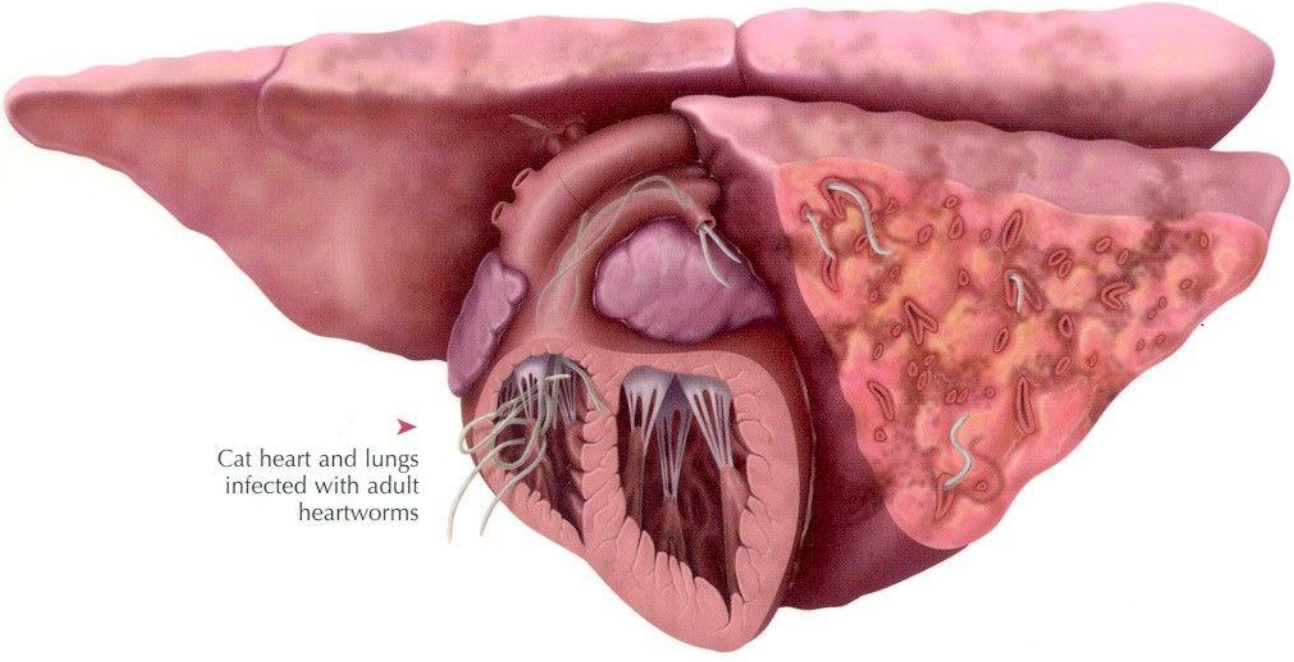
HEARTWORMS—FELINE

Dirofilaria immitis

FELINE HEARTWORM INFECTION



Normal cat heart and lungs



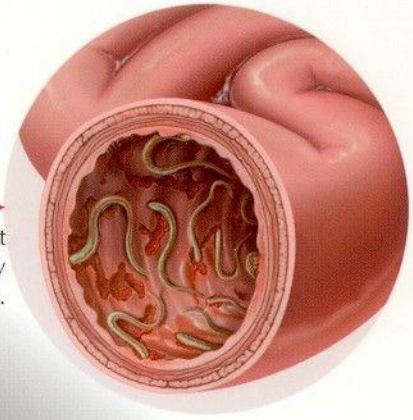
Cat heart and lungs infected with adult heartworms

HOOKWORMS

Ancylostoma caninum, Ancylostoma braziliense,** and *Ancylostoma tubaeforme**

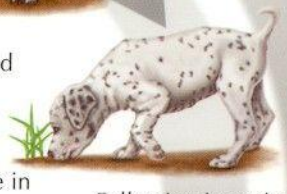
Length of Life Cycle = 3 to 4 Weeks

HOOKWORMS

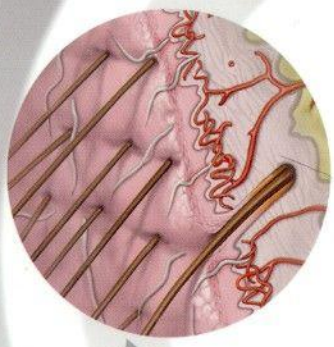


Larvae mature to adult hookworms that reside in the small intestine, where they can cause significant blood loss.

Young animals may be infected during nursing via milk, by ingestion of infective larvae in the soil, or by skin penetration.



Following ingestion of infective larvae in the mother's milk, puppies begin passing eggs in the feces in as little as 2 weeks.



Infective larvae are ingested or penetrate the skin and may migrate extensively.

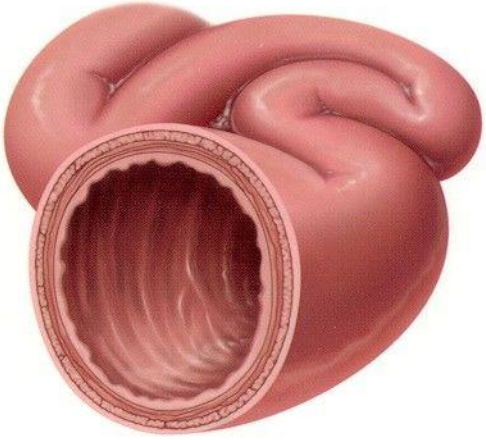
Eggs hatch and larvae develop to infective stage.

* The life cycles for *A. tubaeforme and A. braziliense* are similar to that shown for *A. caninum*; *A. tubaeforme* is generally found only in cats; *A. caninum* and *A. braziliense* are found in both dogs and cats; larvae of *A. braziliense* and *A. caninum* may cause human cutaneous larva migrans and rarely, eosinophilic enteritis.

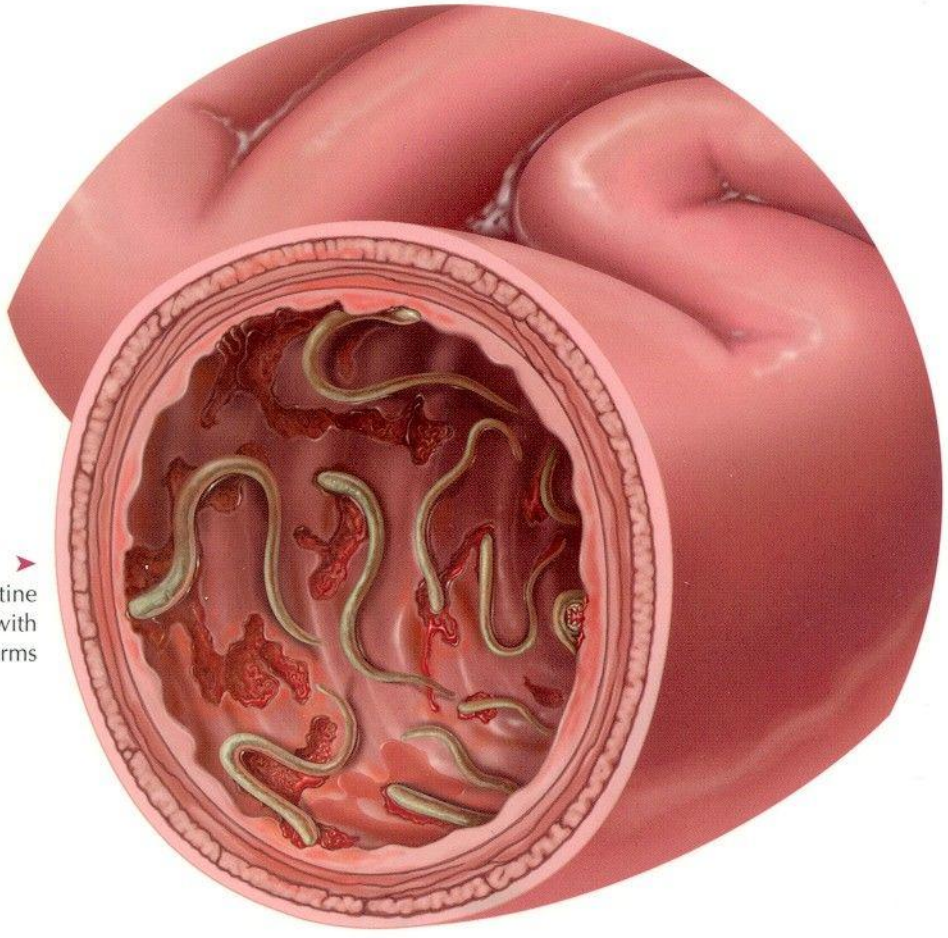
HOOKWORMS

Ancylostoma caninum, Ancylostoma braziliense, and *Ancylostoma tubaeforme*

HOOKWORM INFECTION



Normal small intestine



Small intestine infected with hookworms