

H-C.7

THORNY-HEADED WORMS



C-1.7



C-2.7

What are thorny-headed worms?

Thorny-headed worms (Phylum: Acanthocephala) are small parasitic worms which have retractable hooks located at the front of the worm. These hooks are used to anchor the worms to tissues. Seals can get thorny-headed worms from eating crustaceans or fish (intermediate hosts), infected with immature (larval) life stages of the worm (see thorny-headed worms of fish in section H-A.6).

Thorny-headed worms in seals are of the genus *Corynosoma*. *C. validum* has been reported in bearded seals. *C. reductum*, *C. strumosum* and *C. wegneri* have been reported in ringed seals.

What do thorny-headed worms look like?

Thorny-headed worms are most often found in the intestines rather than the stomach. These worms do not typically occur in large numbers.

Worms are firmly attached to the lining of the intestine by their hooks and can not be easily wiped off. Sometimes, the undigested ear bones (otoliths) of consumed fish look somewhat similar to the thorny-headed worm, but can be readily identified since they wipe off easily from the surface and are hard stone-like objects.

What species are affected?

All seals may have these parasites.

Thorny-headed worms may cause small sores (ulcers) at the point of attachment. These parasites are generally thought to have little effect on their hosts unless they are present in large numbers or occur in non-typical hosts.

Human health concerns

None. You can not get this parasitic worm from consuming wildlife.

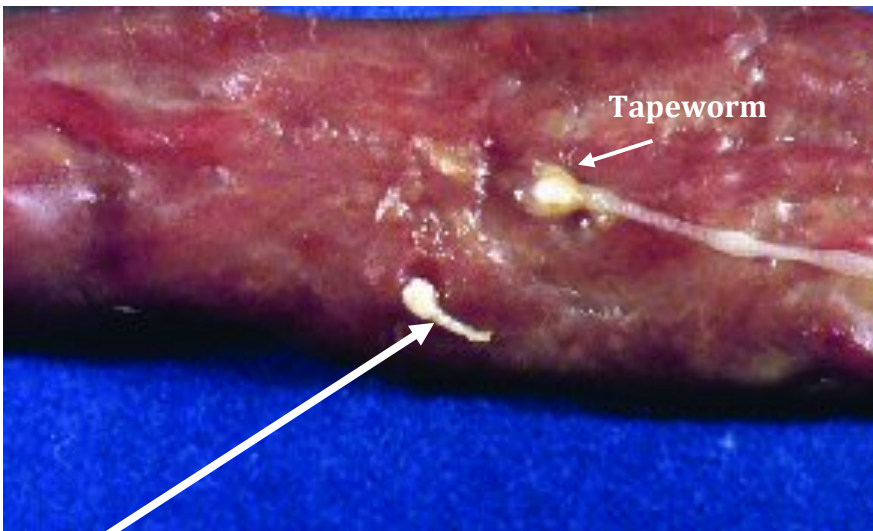
H-C.7

Safety of the meat for dogs

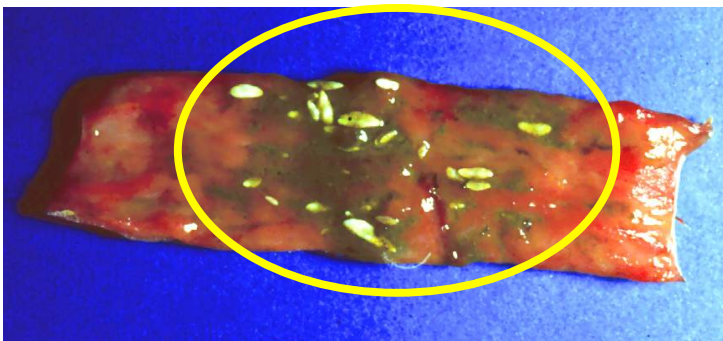
- ❖ The meat is safe to feed to dogs.

Samples to collect

- ❖ Collect a piece of the digestive tract containing the parasites or just the parasites themselves.



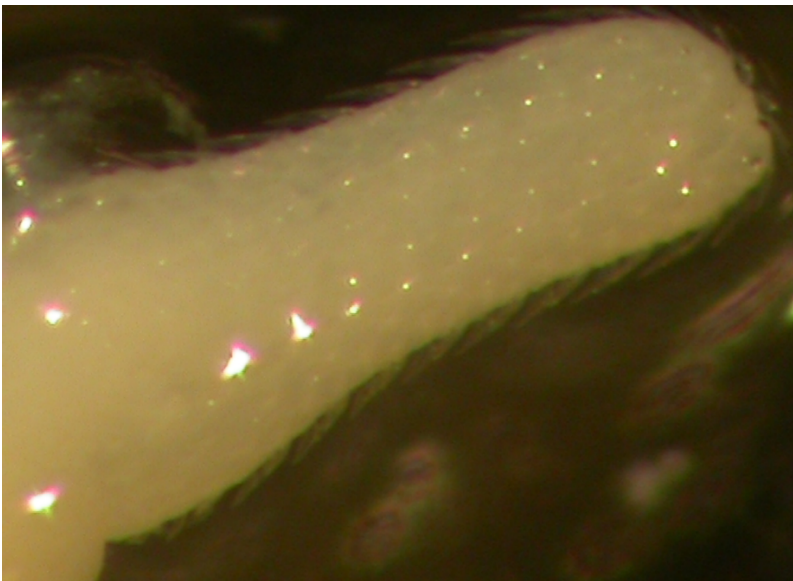
Thorny-headed worm in the intestine of a ringed seal. (Photo credit: Dr. J. Geraci).



Fish ear bones (otoliths) in the intestine of a Ringed seal. Note: Otoliths can be readily distinguished from thorny-headed worms in that you can wipe ear bones off the surface easily. Thorny-headed worms are firmly anchored to the tissue. (Photo Credit: Dr. J. Geraci)

H-C.7

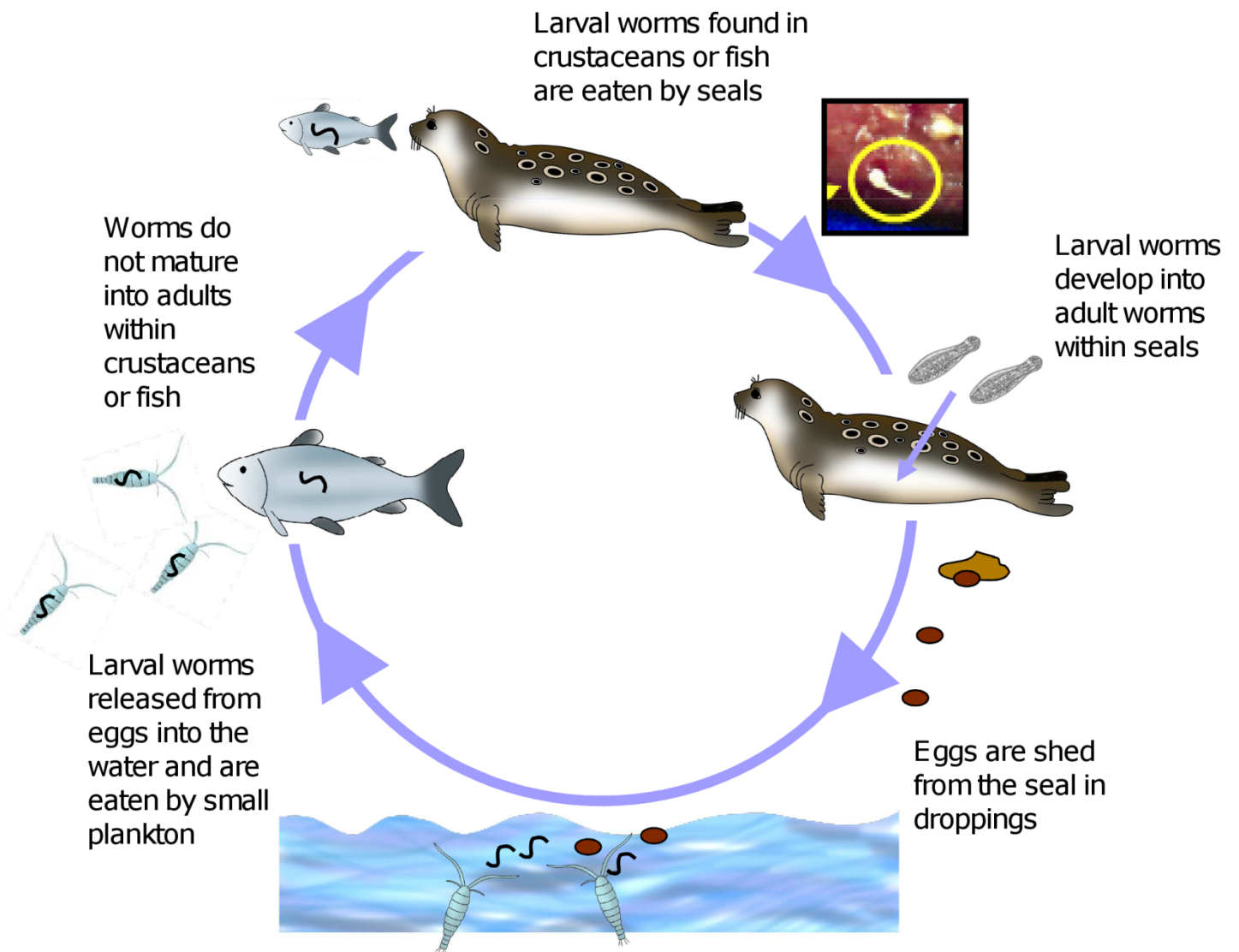
THORNY-HEADED WORMS, CONT'D.



Close-up views through a microscope of Acanthocephalans found in the intestine of a seal. (Photo credits: Manon simard; Makivik Corporation)

H-C.7

Thorny-Headed Worm Life Cycle



H-C.8

LIVER FLUKES



C-1.8



C-2.8



D-1.8

What are liver flukes?

Liver flukes (trematodes) are flat, oval-shaped parasitic worms somewhat similar in shape to leeches, but often smaller. Several different species of flukes are found in the bile and pancreatic tubes (ducts), and surrounding tissues of marine mammals.

The liver fluke *Orthosplanchnus arcticus* is known to occur in the ringed seal.

What species are affected?

Probably all marine mammals are susceptible to flukes.

Infection has been reported as extremely common in harbour porpoises on the East coast of the USA and flukes have also been reported in a bearded seal off the coast of Alaska.

In general, there is little information available on their occurrence in marine mammals in the Arctic.

Human health concerns

None. Meat is safe to consume.

Safety of the meat for dogs

The meat is safe to feed to dogs.

Samples to collect

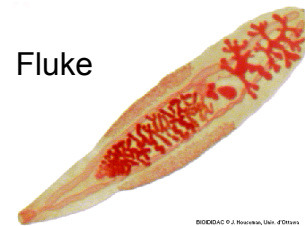
Collect the liver and pancreas.

Parasites may also be collected and preserved in alcohol.

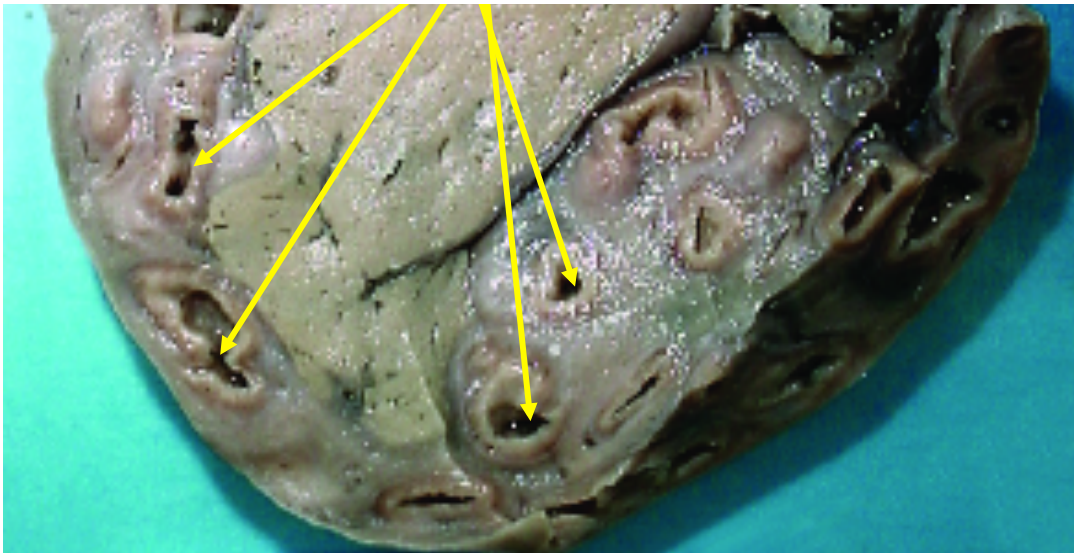
H-C.8

What to look for

- ❖ Liver flukes are often found in fluid-filled capsules within the liver. These capsules often contain two or more flukes. The parasites may cause redness and swelling (inflammation) and scar tissue (fibrosis) of the bile duct and pancreatic duct. This inflammatory process may spread into the surrounding liver and pancreas. If this inflammation and fibrosis is significant enough, the function of these organs may be affected.
- ❖ This could be a factor in poor body condition or death in some affected animals.

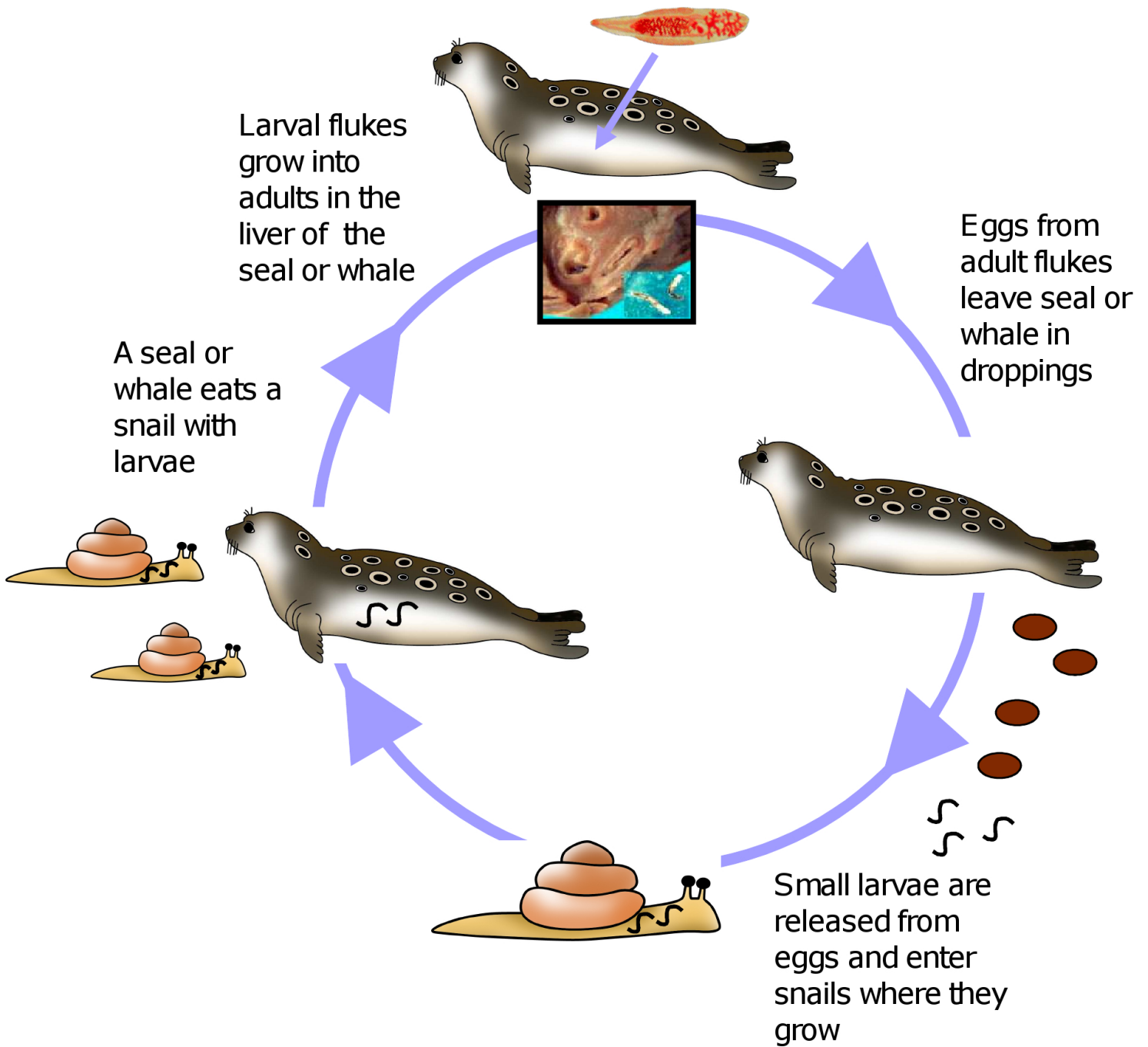


Fluid-filled capsules in a ringed seal caused by liver flukes.
(Photo credit: Dr. L. Measures)



H-C.8

Liver Fluke Life Cycle



H-C.9

LUNGWORMS



C-1.9



C-2.9



D-1.9

What are they?

Lungworms are parasitic worms roundworms, or nematodes.

Lungworms are white, thread-like, generally less than 7 cm in length and can be found in the lungs. Sometimes the worm may die well before the animal is harvested. In these cases, the lung tissue right around the worm may also die creating small grey lumps of dead tissue up to 2 cm in diameter.

Lungworms can damage the lung and make it difficult to breathe. Sometimes, animals will be seen coughing after they have moved quickly. Lungworms are a cause of pneumonia in seals (see pneumonia in section H-G.7). Animals with lungworms may appear weak, thin, and have matted, dull hair.

Lungworms occur in the airways and some very small species can cause small lumps in the lung tissue.

Lungworm species found in seals are different from the many different species that can occur in whales.

Otostrongylus circumlitus is common in young seals. These are large lungworms that can be seen when butchering the animal.

Parafilaroides sp. are small worms that require a microscope to be seen. However, small white lumps may be seen in the lungs of seals infected with this species of lungworm.

H-C.9

What species are affected?

- ❖ Lungworms occur in seals and whales.

Human health concerns

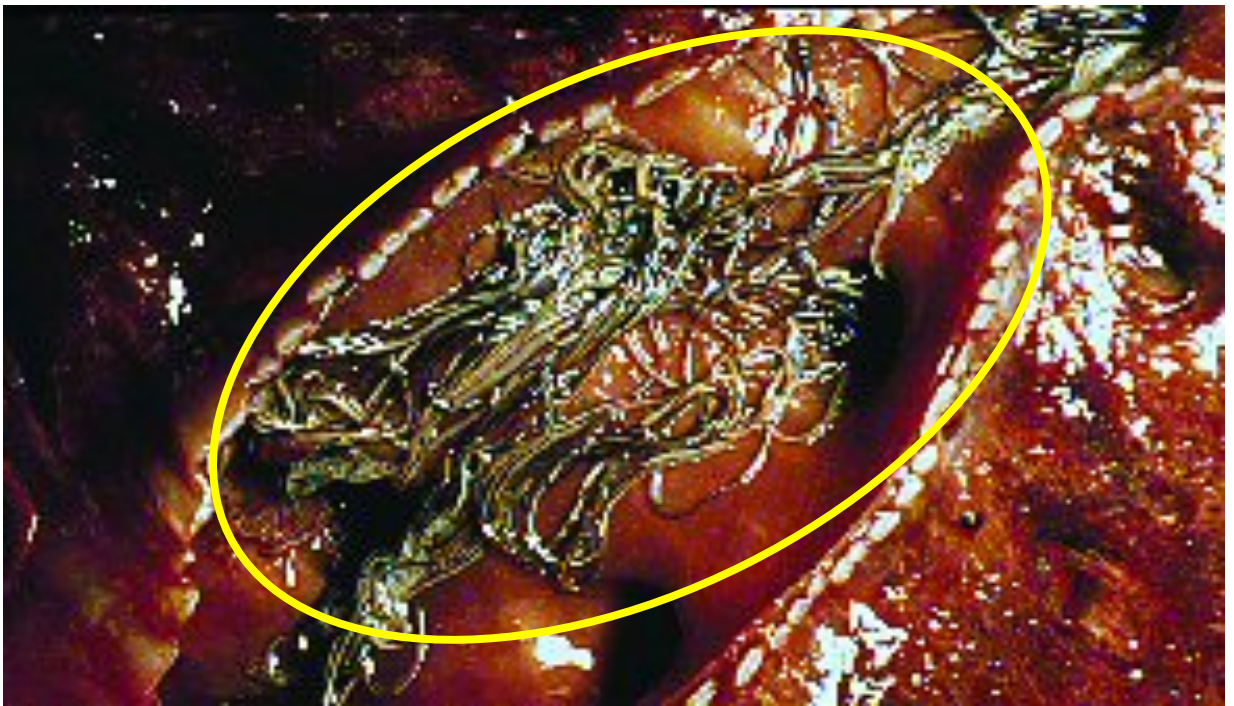
- ❖ You can not get lungworms from handling, butchering or eating an animal which has lungworms.

Safety of the meat for dogs

- ❖ Meat can be fed to dogs.

Samples to collect

- ❖ Collect a portion of the lung with worms or the whole worms themselves.



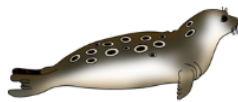
Lungworms seen in an opened airway. (Photo credit: Dr. J. Geraci).

H-C.10

STOMACH WORMS in SEALS and WHALES



C-1.10



C-2.10



D-1.10

What are stomach worms?

Stomach worms are roundworms (nematodes) whose adult stage is found in the stomach.

Stomach worms attach themselves to the lining of the stomach, or in some cases just beyond the stomach at the start of the intestines. They may cause local irritation where they are found and may even burrow deeply into the lining of the stomach and cause ulcers or a more widespread irritation of the stomach lining (hemorrhagic gastritis).

The species of roundworms found in seals and other pinnipeds likely differs from the species found in the toothed whales (Odontocete).

Anisakidae nematodes are found in immature (larval) stages in fish (intermediate hosts), and mature into adults within seals and whales (final hosts). Larval stages are transmitted to seals and whales when they eat infected fish. The larval worms mature to adults and complete their life cycle in the seal or whale (see roundworms of fish in section H-A.4).

What species are affected?

Any mammal is susceptible.

Human health concerns

It is not recommended to eat infected stomach or intestines raw. If this is the only abnormality, the rest of the animal should be OK to eat.

Safety of the meat for dogs

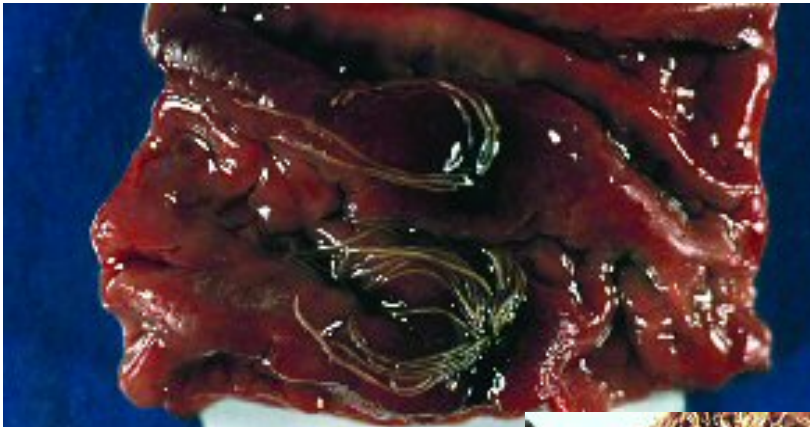
It is not recommended to feed infected stomach or intestines raw. If this is the only abnormality, the rest of the animal should be OK to eat.

H-C.10

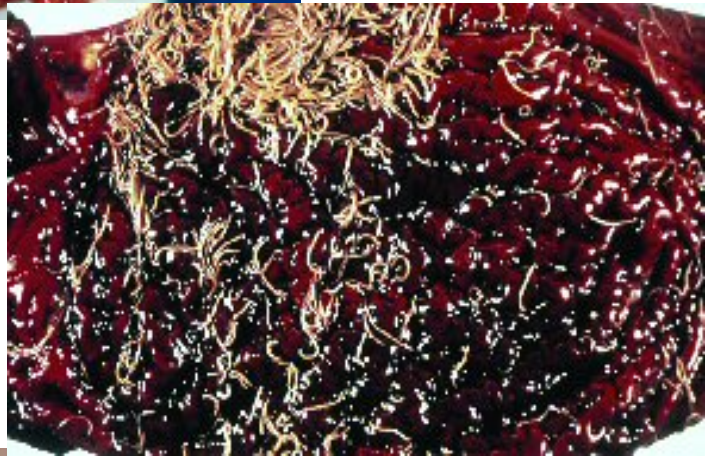
Samples to collect

- ❖ Collect the entire stomach or the affected portions of the stomach with worms. As a second choice, the worms themselves may be collected without a sample of the stomach, and stored in alcohol.

Stomach worms causing ulceration. (Photo credit: Dr. J. Geraci).



Stomach worms causing hemorrhage, redness and swelling (inflammation). (Photo credit: Dr. J. Geraci).



Anisakidae roundworm in a ringed seal intestine. (Photo credit: Manon Simard; Makivik Corporation)

H-C.11

HEARTWORM



C-2.11

What is heartworm?

Heartworms are parasitic roundworms (nematodes) found in the right side of the heart and also the blood vessels leading to the lungs of seals. These heartworms are of the species *Acanthocheilonema spirocauda*.

Adult worms produce small, immature offspring (microfilariae). Microfilariae travel in the bloodstream. The host for the immature worm (intermediate host), the seal louse, feeds on the blood of seals where it picks up the microfilariae (see seal lice in section H-C.3). Microfilariae are transmitted to other seals through the bite of an infected louse. Once transmitted to the seal, microfilariae move to the heart of the seal, mature, and begin the cycle again.

Lice move from seal to seal, spreading infection, during close contact (e.g. mother to pup).

What species are affected?

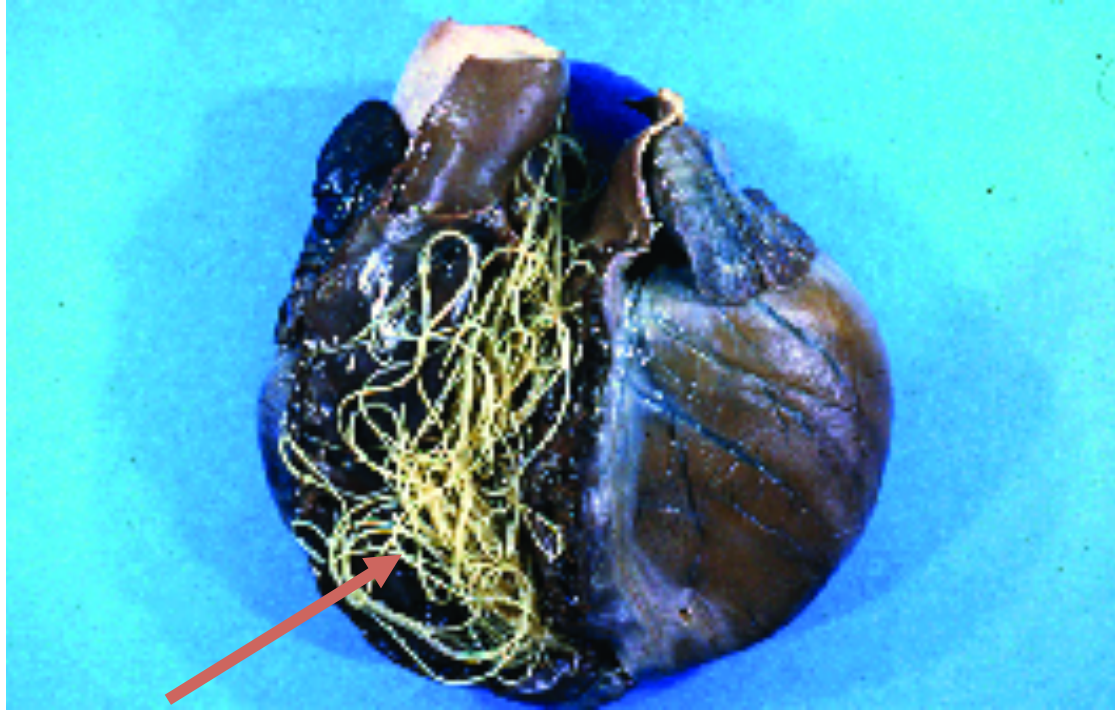
Heartworm occurs in ringed, harbour, harp, and hooded seals. It has not been found in grey or bearded seals.

What does heartworm look like?

Worms are long and slender and many may be found in the heart at one time. The heart must be opened to see the worms.

Worms may also be present in the lungs and the arteries leading to the lungs. The worm can cause damage to the heart, arteries and lungs.

H-C.11



Heartworm in a seal heart. (Photo credit: Dr. J. Geraci)

Human health concerns

- ❖ None. The worms are not transmissible to people. The meat is safe to eat.

Safety of the meat for dogs

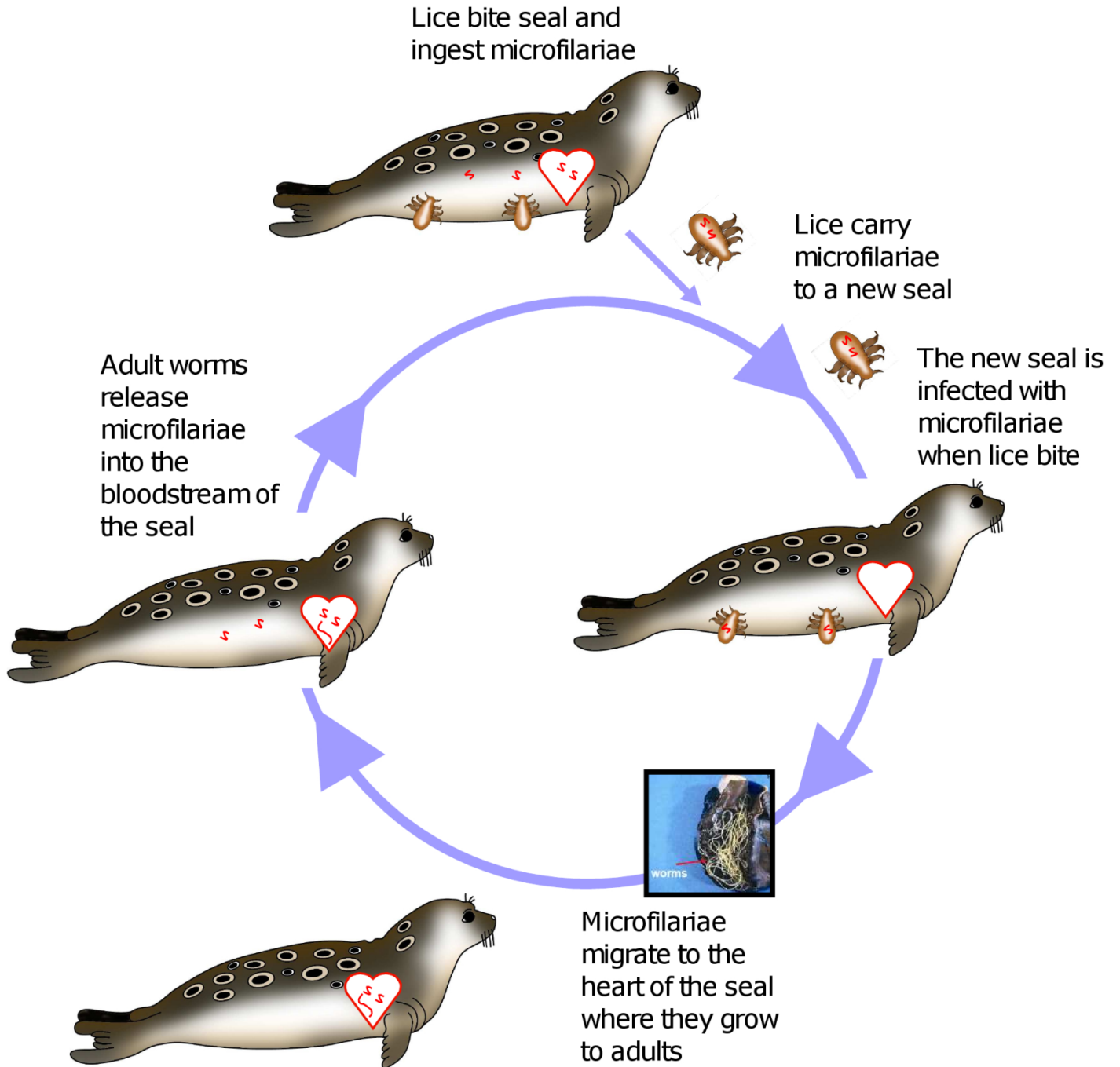
- ❖ The meat is safe to feed to dogs.

Samples to collect

- ❖ The entire heart with worms, along with the lungs, is ideal.
- ❖ Samples of entire, intact worms may be used for identification of the species involved.

H-C.11

Heartworm Life Cycle



H-C.12

TRICHINELLOSIS



C-3.2



F-3.2

What is trichinellosis?

- ❖ Trichinellosis is an infection with the roundworm parasite *Trichinella* sp. This parasite is transmitted when an animal (meat eater) eats the meat (muscle) of another animal containing *Trichinella* larvae. These larvae are found within tiny, invisible sacs (cysts) in the muscle. The cysts dissolve in the stomach of the meat eater and larvae develop into adults in its intestines, where they reproduce. Approximately one week after the animal eats cysts, adult female *Trichinella* begin to shed larvae. These larvae get into the bloodstream and enter the muscle tissues throughout the body. In muscle, particularly the diaphragm, the muscles between the ribs (intercostals) and the large muscle of the jaw (masseter), larvae form cysts that can remain in a resting form for many years. When the affected animal is killed or dies and the muscle is eaten the cycle begins anew.
- ❖ In the Arctic, *Trichinella* cysts occur commonly in polar bear and walrus and less frequently in ringed, bearded, and harp seals, and beluga.

How is trichinellosis detected in animals?

- ❖ The cysts are small and not visible with the naked eye, and there usually are no visible changes in the appearance of the meat.
- ❖ Cysts are detected by microscopic examination of muscle tissue.

H-C.12

Human health concerns

- ❖ Humans can become infected by eating uncooked meat containing *Trichinella* larvae. The sickness in people may involve vomiting, diarrhea, abdominal pain, fever, muscle aches, and rash. Severity of disease depends in part on how many larvae were eaten and on previous exposure. Several outbreaks in humans have occurred in the eastern Arctic as a result of eating uncooked walrus meat.
- ❖ Infected meat can be safely eaten if it is cooked thoroughly, which will destroy the larvae. Meat is safe if it is cooked to a grey colour, the juices run clear, or the internal temperature reaches 170 degrees Fahrenheit.
- ❖ Freezing will not kill larval cysts. Cysts may survive at freezing temperatures for many months. Salting, fermenting, smoking, drying, or microwaving meat may not kill cysts.
- ❖ Both Nunavik and Nunavut have a trichinellosis prevention program and will test harvested walrus meat prior to consumption to ensure safety.
- ❖ Contact your local Hunter and Trapper Organization / Association or local health officer to learn more about this program. Depending on the region, the local coordinator for the trichinellosis prevention program may be able to hand out tags which are used to identify butchered segments of the harvested animal distributed to family members and / or friends. In this way, results from the testing can be quickly and easily relayed to those sharing an individual animal.
- ❖ Those who have eaten an untested animal (i.e., walrus, polar bear) and have become sick should go to the local nursing station to be examined.

Safety of the meat for dogs

- ❖ It is not recommended to feed dogs raw walrus or polar bear meat.

Samples to collect

- ❖ Collect muscle, especially tongue, jaw, or diaphragm.

H-C.13

BOTULISM



C-3.3

What is botulism?

- ❖ Botulism is caused by eating meat that contains bacteria which produces a strong poison (toxin). This bacterium can grow on improperly prepared igunaq (aged meat) from walrus or seal and occasionally on misiraq (aged oil from blubber).
- ❖ Botulism can be life-threatening and causes progressive body weakness with nerve and muscle paralysis starting in the face (eyes, throat and mouth) spreading down to the neck, arms and respiratory muscles.
- ❖ Botulism is most often associated with improperly aged or fermented walrus meat, but can occur in other types of meats when improper methods of aging, fermenting, canning, drying or pickling are used.
- ❖ Botulism is caused by *Clostridium botulinum*, a spore-producing bacterium.
- ❖ These spores are commonly found in soils and in freshwater and marine sediments and in the stomach content of marine mammals.
- ❖ Care must be taken when aging or fermenting meats from walrus. If the aging is not done properly (often the temperature of the meat during aging is too warm), then these spores can multiply and produce the strong poison that affects the nervous system (neurotoxin).
- ❖ Meat that has not been properly aged, canned, dried or pickled can be contaminated with the botulism neurotoxin. Eating this meat can make you very sick and may lead to death.

Risk factors

H-C.13

- ❖ The following conditions increase the risk of botulism occurring:
 - Aging or storing the food at temperatures above 4°C (refrigerator temperature)
 - Storage of food in air tight containers such as plastic or glass
 - If any of the meat or any other part of the animal being prepared for food is allowed to touch the ground or the contents of the animal's stomach before it is stored or aged. This could contaminate the meat with spores of the bacteria which could multiply during the aging process
 - Igunaq should be prepared by experienced producers only. New producers need to learn from the more experienced ones.

How is botulism detected in meat?

- ❖ It is very difficult to tell from looking at the meat if it has been contaminated with the botulism neurotoxin. It is not recommended to eat meat you are not sure has been properly handled.
- ❖ Suspected meats can be tested for botulism by sending samples of the meat to authorized laboratories. These laboratories will test for the presence of *Clostridium botulinum* as well as the neurotoxin.
- ❖ Unfortunately, most cases of foods contaminated with botulism go unnoticed until someone gets sick and the suspected food is tested.

Signs and symptoms of botulism

- ❖ Sickness typically occurs 12-36 hours after eating contaminated food.
- ❖ Symptoms include nausea, vomiting, diarrhea, and abdominal pain. This is often followed shortly by dry mouth, blurry vision, double vision, drooping of the eyelids, difficulty or pain in swallowing, difficulty in speaking, urinary retention, intestinal paralysis, fainting or almost fainting and difficulty breathing. If you are experiencing any of these symptoms after eating meat which was aged, fermented, canned, dried or pickled, then go as soon as you can to the local nursing station.

Is it safe to feed to dogs?

- ❖ Dogs can get botulism just like people. It is not recommended to feed any meat to dogs suspected to be contaminated with botulism.

Samples to collect

- ❖ Consult the local nursing station, health worker or local HTO / HTA.