

Trichinella

(*Trichinella* spp.)

in Alberta

Common name

trichinosis,
trichinellosis,
trichiniasis,
trichinelliasis

Scientific name

a nematode
(roundworm),
Trichinella spp.

What's Bugging Wild Critters?

Fact sheet #18:
Trichinella



Significance

Trichinella spiralis and its close relatives live in a wide range of birds and mammals throughout the world. Although wildlife generally are not harmed, infections in humans can be fatal.

What? Where? How?

An association among rats, people, pigs, and *Trichinella* has been known for centuries. Pigs and rats often shared the same pigsty—a situation that proved very fortunate for a nematode that spent much of its life as a muscle cyst waiting to be eaten. You see, rats eat dead pigs and pigs eat dead rats—a perfect system, from the worm's perspective!! Humans were infected when they ate raw or poorly cooked pork. Fortunately, in the last century, advances in the housing and feeding of pigs as well as increased knowledge about the dangers of eating raw pork resulted in the disappearance of *Trichinella* from domestic pigs in much of the world. However, close investigation has shown that these worms now live in a variety of wild carnivores and rodents around the world.

At least three species of *Trichinella* probably live in various wildlife species in Alberta. The taxonomy is difficult and new patterns of geographic distribution are still being identified. Currently, it is considered likely that *Trichinella nativa* occurs in northern Alberta, whereas *T. spiralis* and *Trichinella* T6 occur in the south. Larvae of *T. nativa* are particularly hardy and can withstand freezing temperatures for at least four years.

Transmission Cycle

Adult *Trichinella* are tiny (2-4 mm long!) inhabitants of the intestine. Each female can produce up to 500 larvae that burrow into blood vessels along the intestine and are carried to muscles throughout the body. They prefer active muscles such as those in the diaphragm, tongue, and jaw. The minute larvae (less than 1/10th of a millimetre) burrow into individual muscle cells and cause changes that feed the larvae and protect them from the immune system! "Infected" cells are called "nurse cells".

The nurse cell is surrounded by a thin tissue layer that isolates it from other cells but allows life-giving nutrients to pass through to the larva. Once safely inside a functional nurse cell, each larva can survive for years and years, probably for the life of the infected mammal. The larvae are reactivated only in the acid conditions that occur within the stomach of a mammal or bird. Thus, further developments are put on hold until the muscles containing nurse cells are eaten, usually by a carnivore or scavenger. In the carnivore, the larvae leave the nurse cells, enter the gut, then mature as adults, reproduce, and die. Within one month, all of the adults are dead and gone from the intestine!

There are some wonderful adaptations that increase the survival of *Trichinella* larvae and contribute to maintaining the worldwide distribution of these nematodes. By creating the nurse cells that provide food and protection, the muscle larvae are essentially hidden from the immune system and thus, can survive in many different species.

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Within the nurse cells, larvae also develop the early stages of a male or female reproductive system. Thus, when the larvae leave the nurse cell, they can be fully mature within 36 hours! This rapid development also allows the worms to avoid the immune response that builds slowly and is most intense when the new larvae are long gone out of the intestine and are already in the muscles. The short life span of adult worms also allows them to survive almost unnoticed in a wide range of animal species.

Species of *Trichinella* that live in arctic regions can survive in frozen carcasses for years. Not a bad idea if you want to stay alive in arctic ecosystems! In contrast, species that live in the vicinity of the equator survive well in rotting meat. Thus, whether the environmental conditions are cold and dry or hot and humid, even if it takes some time for a predator to finish eating all of the meat or for a scavenger to find a carcass, the *Trichinella* larvae will still be alive! No wonder these worms are found almost anywhere in the world.

Distribution in Alberta

Trichinella larvae are common in cougar and grizzly bear in Alberta and also have been seen in black bear, wolves, red fox, coyote, and lynx. There are some interesting patterns in the data. Cougar and grizzly bear in southern Alberta are twice as likely to be infected as those in the north. Larvae were absent in black bears in the north (Peace River and Ft. McMurray); yet they occur in some black bears in southwest Alberta. In contrast, we have not found larvae in wolves in the south; yet they are in wolves (and coyotes) around Ft. McMurray. It is apparent that *Trichinella* is widespread in Alberta but seems to have different ecologic patterns. We have little information on precise transmission but we assume that predation, cannibalism, and scavenging all play a role to differing degrees in different species.

Prevalence of *Trichinella* larvae north and south of the Bow River, 1983 - 1993.

Species	Total	North		South	
		%	*n	%	n
Cougar	79	36	25	72	54
Grizzly Bear	80	28	61	67	19
Black Bear	39	0	35	50	4
Wolves	217	39	31	0	186

*n = number tested



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Importance for Wildlife Management

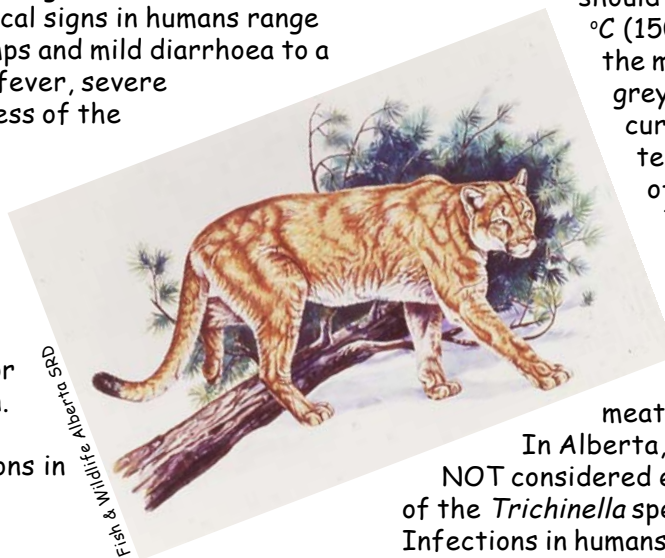
Trichinella is not known to cause clinical disease in wildlife hosts. However, there is some interesting evidence that even light infections may result in behavioural changes leading to decreased mobility, increased predation, and decreased reproductive activity in free-ranging wildlife. Wildlife managers should be aware of the presence or absence of *Trichinella* spp. in local wildlife populations in order to make appropriate information available to those who eat wild carnivores. The summary of big game regulations in Alberta contains a warning to those who hunt cougar and bears.

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Public Significance

In North America, the chance of eating *Trichinella* in pork has diminished over time; however, occasionally people are infected by eating poorly cooked meat of infected wildlife. Most often this involves eating smoked sausage or undercooked meat of bears, cougar, or wild boar. The severity of the disease in people is associated with the migration and location of muscle larvae. Clinical signs in humans range from stomach cramps and mild diarrhoea to a rapidly developing fever, severe muscle pain, stiffness of the neck, and swelling around the eyes. Fatal infections can occur if the number of larvae is large or if they interfere with the heart, diaphragm, or linings of the brain. Fortunately, *Trichinella* infections in people are rare in Canada.



Prevention/Control

Control of *Trichinella* in natural ecosystems is unnecessary and impossible to do. *Trichinella* larvae, like the animals in which they live, are part of the diversity of our natural ecosystems.

On the other hand, all potentially infected meat for human consumption should be thoroughly cooked. All parts of cooked meat should reach a temperature of 66 °C (150 °F) or be cooked until the meat changes from pink to grey throughout. Smoking, curing, and freezing techniques MAY kill larvae of some strains of *Trichinella*. However, this must be done with specific knowledge of the technique needed to kill larvae. Low-temperature smoking of meat will not kill muscle larvae.

In Alberta, prolonged freezing is NOT considered effective at killing some of the *Trichinella* species that occur here. Infections in humans can be treated. Appropriate husbandry of domestic species can prevent infection-livestock should never be fed meat or offal of wildlife.

Summary

Cougar and grizzly bear provide the best habitat for the muscle larvae in Alberta. It has not been determined whether the worms have any significant impact on wildlife populations, but they may contribute to individual behavioural changes or mortality. Meat from wild carnivores should be thoroughly cooked in order to avoid human infections.

Additional Information

Parasitic Diseases of Wild Mammals, Second Edition. Edited by William M. Samuel, Margo J. Pybus and A. Alan Kocan. 2001. Chapter 15 - *Trichinella* spp. and Trichinellosis.

Northwest Territories Resources, Wildlife and Economic Development: <http://www.nwtwildlife.rwed.gov.nt.ca/Publications/diseasepamphletweb/trichinosis.htm>

Merck Veterinary Manual-Online: http://www.merck.com/mrkshared/mmanual_home2/sec17/ch196/ch196n.jsp

University of Northern British Columbia: http://www.unbc.ca/nlui/wildlife_diseases_bc/trichinellosis.htm

US Dept of Agriculture: <http://www.nal.usda.gov/fsrio/research/fsheets/fsheet04.htm>

Centers for Disease Control and Prevention: http://www.cdc.gov/ncidod/dpd/parasites/trichinosis/factsht_trichinosis.htm