



## Salmon Poisoning

### What is salmon poisoning?

Despite sounding like a toxicity, salmon poisoning is actually an infection. Salmon poisoning is caused by a rickettsial organism (a very small type of bacteria) that can be found within flukes (parasitic flatworms) infecting the tissues of wild fish found in coastal streams of the Pacific Northwest. This condition is most commonly seen in dogs that eat raw fish in areas such as Washington, Oregon, northern California, and southern Vancouver Island (Canada).

Dogs and other canid species (wolves and foxes) are the only animals susceptible to this infection.



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### How is salmon poisoning transmitted?

In order for a dog to develop salmon poisoning, three steps must occur:

1. The dog must consume raw fish. Most commonly, this condition is caused by dogs eating raw salmon (hence the name 'salmon poisoning'), though there are other related species of fish, such as trout, that can transmit the disease. Wild salamanders have also been implicated in some cases of the infection.
2. The raw fish must contain a fluke, called *Nanophyetus salmincola*. This fluke, which is around 1/8" (or 2–4 mm) long at adulthood, spends a part of its life cycle inside salmonid fish. If a dog eats a fish infected with *Nanophyetus salmincola*, these flukes can attach to the dog's intestines and begin feeding on the dog. The flukes may cause diarrhea or gastrointestinal signs, but do not cause systemic illness.
3. Systemic illness in the dog occurs if the fluke is infected with a rickettsial organism, *Neorickettsia helminthoeca*. When an infected fluke feeds on a dog's intestines, these organisms are released from the fluke's mouthparts into the dog's bloodstream. Organisms are carried throughout the circulatory system, to the liver, lungs, brain, and lymphoid tissue, infecting these tissues and causing inflammation.

If a dog ingests raw fish containing the flukes that are infected with the rickettsial organism, salmon poisoning will occur. Clinical signs of salmon poisoning are typically seen within one week of ingesting raw fish, although longer delays have been reported.

## What are the clinical signs of salmon poisoning?

In the early stages of infection, clinical signs of salmon poisoning typically include decreased appetite, lethargy, weight loss, vomiting, and diarrhea. Diarrhea will typically worsen in severity as the disease progresses, becoming bloody in the later stages of disease.

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On physical exam, your veterinarian may note that your dog has a fever, enlarged lymph nodes, abdominal pain, discharge from the eyes and nostrils, and evidence of dehydration. Some dogs will also develop neurologic signs, including seizures and muscle twitching.

Dogs that do not receive appropriate treatment will deteriorate rapidly. Within seven to ten days, approximately 90% of untreated dogs will die of salmon poisoning. Fortunately, the prognosis with appropriate treatment is much better.

## How is salmon poisoning diagnosed?

A diagnosis of salmon poisoning is often made by observing the eggs of the fluke on a fecal examination. Your veterinarian will take a small sample of your dog's feces and examine it under the microscope for the presence of fluke eggs. In approximately 90% of cases, these eggs can be found on a fecal exam and lead to a presumptive diagnosis. Although the fluke itself does not cause disease, the presence of the fluke in a dog showing signs of salmon poisoning suggests a likely infection with *Neorickettsia helminthoeca*.

If fluke eggs are not found on your dog's fecal examination, further diagnostics may be needed in order to arrive at a diagnosis. Bloodwork may be performed to examine your dog's cell counts and organ function; in many cases, characteristic bloodwork abnormalities may direct your veterinarian towards a diagnosis of salmon poisoning. In some cases, your veterinarian may use a needle to aspirate (pull cells out of) your dog's enlarged lymph nodes. These samples are sent off to a laboratory for analysis, and the pathologist may be able to visualize the presence of the rickettsial organism within the lymphoid cells.

## How is salmon poisoning treated?

Treatment of salmon poisoning involves two components.

**1. Treatment of the rickettsial infection.** The organism that is causing the poisoning, *Neorickettsia helminthoeca*, is treated with antibiotics. The most commonly used antibiotic is doxycycline, though other tetracycline drugs may be used. These antibiotics can be given orally, although severely ill dogs with vomiting may require hospitalization for intravenous antibiotic therapy. Most dogs respond well to antibiotics, showing improvement in their clinical signs within one to three days. Antibiotics are continued for one to two weeks, to ensure elimination of the infection.

**2. Treatment of the fluke.** Remaining flukes in the gastrointestinal tract could reinfect your dog; therefore, it is important that these flukes be treated as the infection is treated. Your veterinarian will prescribe a dewormer which will clear the flukes, decrease diarrhea, and decrease the shedding of fluke eggs in the feces.

## What is the prognosis for salmon poisoning?

With appropriate treatment, most dogs will recover completely from this disease. Studies show that 85–90% of dogs affected by salmon poisoning will recover with appropriate care and antibiotic treatment. Early diagnosis is key to successful treatment, so contact your veterinarian at the first sign of illness if you are concerned about the possibility of salmon poisoning.

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## How can I prevent salmon poisoning?

If you live in areas affected by salmon poisoning, the most effective means of prevention is to keep your dog away from raw fish and salamanders. If your dog goes on fishing trips with you, ensure that all fish that you catch are secured in an area that your dog is unable to access. When around bodies of water, monitor your dog closely to ensure that he does not find and eat fish or salamanders. Finally, keep your dog away from trash cans and other areas where raw fish may be encountered.

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