

## Ehrlichia Infection in Dogs

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Revised: June 26, 2025

Published: August 15, 2005

### What is *Ehrlichia*?

*Ehrlichia*, named after Dr. Paul Ehrlich, who first described them, are a type of bacteria that infects and lives within the white blood cells of their hosts. Different types of *Ehrlichia* live within different types of white blood cells. Hosts can be humans, pets, or wild animals. *Ehrlichia* are spread from host to host by tick bites, and their intracellular location makes them difficult to remove, as most antibiotics do not penetrate into the inside of cells.

**The two *Ehrlichia* of concern are *Ehrlichia canis* and *Ehrlichia ewingii***

### The Crazy *Ehrlichia* Name Game (Making Sure You're on the Right Page)

*Ehrlichia* were originally grouped according to the type of white blood cell they attacked. By finding *Ehrlichia* inside certain types of white blood cells, one could get a better idea of which type of *Ehrlichia* one was seeing. Or so it was thought.

Previously thought:

- *Ehrlichia equi* - lives in what are called granulocytes (a type of white cell).

- *Ehrlichia lewinii* - lives in granulocytes as well.
- *Ehrlichia canis* - lives in what are called monocytes (a different type of white blood cell).
- *Ehrlichia risticii* was an *Ehrlichia* like the rest, but genetic testing shows it is actually a *Neorickettsia*, which is a whole other thing.
- *Ehrlichia platys* was an *Ehrlichia* like the rest but turned out to be an *Anaplasma* which is a whole other thing and is now *Anaplasma platys*.
- *Ehrlichia equi*, *Ehrlichia phagocytophila*, and Human Granulocytic Ehrlichial Agent were all separate organisms, but genetic testing shows they are all different versions of *Anaplasma phagocytophila*.

Your veterinarian may be using older names, depending on which system they were trained with.

If your dog has been diagnosed with [Anaplasmosis](#), read that article instead of this one.

### ***Ehrlichia canis* Infection (also Called Canine Monocytic Ehrlichiosis)**

*Ehrlichia canis* infection is a worldwide disease. In the U.S., it is spread by the bite of the brown dog tick (*Rhipicephalus sanguineus*). It is unknown how long the tick needs to remain attached in order to transmit the *Ehrlichia* organism, but the previously accepted idea of 48 hours is probably outdated, and a much shorter time is more likely. It is important to realize that this tick can transmit other tick-borne infections ([Babesiosis](#) and [Rocky Mountain Spotted Fever](#)), so



Brown dog tick. Photo courtesy of CDC.

infection with multiple organisms is not unusual. It can be difficult to separate which symptoms go with which tick-borne infection.

*Ehrlichia canis* was not well scrutinized until the Vietnam War, when military German Shepherd dogs in the war zone began dying in large numbers from an infection that appeared to wipe out all their blood cells. This condition, called "Tropical Canine Pancytopenia," was studied and found not to be limited to Southeast Asia. In fact, it had been in the good old U.S.A. all along. It turned out that German Shepherd dogs get a much more severe form of the disease, so it wasn't until large numbers of German Shepherd dogs were infected together that the disease could be defined.

In the 1980s, it became clear that people could also be infected by *Ehrlichia*, though not the same *Ehrlichia* as for dogs. When the human disease was recognized, research intensified.

For information on the human disease, visit: <https://www.cdc.gov/ehrlichiosis/index.html>

### **When Dogs Get Sick: *Ehrlichia* Symptoms**

There are three phases of illness with ehrlichiosis: acute, subclinical, and chronic.

#### ***Acute Phase***

This phase occurs one to three weeks after the host is bitten by the tick. The *Ehrlichia* organism is replicating in this time period and attaching to white blood cell membranes. During the acute infection, the platelet count will drop, and immune-mediated platelet destruction will occur. The dog will be listless, off food, and may have enlarged lymph nodes and/or spleen. There may be fever and even neurologic symptoms as well, but although the dog may seem pretty sick, this phase of infection is rarely life-threatening. Most dogs clear the organism if they are treated in this stage, but those that do not receive adequate treatment will go on to the next phase after 1 to 4 weeks.

### ***Subclinical Phase***

In this phase, the dog appears normal. The organism has sequestered in the spleen and is essentially hiding out there. Dogs can stay in this phase for months or even years. The only hints that *Ehrlichia* might be hiding are a somewhat reduced platelet count and/or elevated blood globulin level (the protein portion that includes miscellaneous antibodies). Long-term stimulation of the immune system will elevate globulins, sometimes dramatically. Not all dogs ever progress to the chronic stage, but when they do, the prognosis is worse.

### ***Chronic Phase***

In this phase, the dog gets sick again. Up to 60% of dogs infected chronically with *Ehrlichia canis* will have abnormal bleeding due to reduced platelet numbers. Deep inflammation in the eyes, called uveitis, may occur as a result of long-term immune stimulation. Neurological effects may also be seen. A type of kidney disease called glomerulonephritis, resulting in serious urinary protein loss, can also result. Increased globulin levels are almost always seen in this stage; albumin is often low. Most dogs in the U.S. do not show full pancytopenia (literally, a reduction in all blood cell lines), but severe cell deficiencies are associated with high mortality rates.

### ***Ehrlichia ewingii* Infection (also called Canine Granulocytic Ehrlichiosis)**

*Ehrlichia ewingii* is a different species of the *Ehrlichia* genus. It infects the white blood cells known as granulocytes and is not generally as serious as *Ehrlichia canis*.

Dogs are usually only mildly ill or may appear uninfected, but classically, symptoms include swollen, stiff joints, arthritis, and fever.

*Ehrlichia ewingii* is spread by the bite of the lone star tick (*Amblyomma americanum*).

### How the Diagnosis is Made

There are two main tests for *Ehrlichia*: PCR testing for *Ehrlichia* DNA or blood testing for *Ehrlichia* antibodies. Antibody testing has been the main diagnostic for many years, but the recent availability of PCR testing has changed the approach.

Of course, if lucky, the organisms will be seen on a blood smear, which clinches the diagnosis.



Lone star tick. Photo by CDC.

### Antibody Testing

Traditionally, when ehrlichiosis is suspected, a blood test for antibodies against *Ehrlichia* organisms can be ordered or performed in minutes using an in-house test kit. There are some limitations to antibody testing. A positive test indicates that the dog has been exposed to *Ehrlichia* but does not necessarily imply an active current infection. A negative titer does not fully rule out *Ehrlichia*, either, as a very sick patient may be too ill to produce antibodies, and an early case may not yet have started to produce them. Antibody titers can be measured in the laboratory, which makes it much easier to track progression; the in-house test kits are simply either positive or negative, and a numeric value is not provided.

It takes six to nine months after infection for antibody levels to drop. Antibodies against *Ehrlichia canis* and *Ehrlichia ewingii* will cross-react, so it is not easy to determine which organism a dog has been exposed to.

### PCR Testing

Recently, PCR testing for the presence of *Ehrlichia* DNA has become available. A laboratory commonly offers a tick panel, which uses PCR testing to screen for a group of classic tick-borne diseases. PCR testing

remains positive for several weeks after the infection has cleared, as it does not distinguish between live and dead organisms. It takes time to clear dead organisms from the body.

These two forms of testing are complementary, which means an antibody test can be used to screen dogs to identify those that have been infected. Treatment can be prescribed, and after the treatment has been completed and a couple of weeks have passed, the PCR test can be used to check if the infection has cleared by testing for any residual *Ehrlichia* DNA.

## Treatment

[Doxycycline](#) is probably the most effective against *Ehrlichia* (and any other intracellular blood parasite, for that matter). Expect at least a month of treatment to be needed. The response is initially rapid (improvement is notable in the first few days). Dogs in the acute or subclinical stage at the time of treatment can expect to be cured. A common protocol involves 28 days on doxycycline and a PCR test 2 weeks post-treatment. If the test is negative, another final PCR test is done in two months. If the post-treatment test is positive, another 28 days of doxycycline is used, and a two-week post-treatment PCR is repeated as before. If this second post-treatment PCR test is still positive, another medication (such as [chloramphenicol](#) or imidocarb) should be used.

If immune-mediated secondary reactions to *Ehrlichia* are a problem (such as immune-mediated arthritis or immune-mediated platelet loss), corticosteroids such as [prednisone](#) can be used to palliate the situation while the antibiotics are starting to work.

Dogs in the chronic stage are more difficult to treat as they are sicker and more debilitated. A blood transfusion may be needed, and the mortality rate is much higher.

Surviving dogs can become re-infected as *Ehrlichia* immunity is not lifelong.

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