

How Many *Bartonella* Species Are There?

Bartonella quintana was the first species isolated by researchers. Because of its close relation to other bacteria, it was originally named *Rickettsia quintana* and then *Rochalimae quintana*. During the 1990s, research on HIV/AIDS revealed that *B. henselae* was the cause of severe atypical symptoms, like bacillary angiomatosis.

Over 40 species have been discovered in various mammalian hosts and arthropod vectors. At least 20 of these have been linked to disease in humans and animals.

Species	Vector	Reservoir
<i>B. alsatica</i>	Rabbit flea	Rabbit
<i>B. clarridgeiae</i>	Cat flea	Cat
<i>B. elizabethae</i>	Oriental rat flea	Rat
<i>B. grahamii</i>	Rodent fleas	Wild mice
<i>B. koehlerae</i>	Cat flea	Cat
<i>B. melophagi</i>	Sheep ked	Sheep
<i>B. rochalimae</i>	Fleas	Canids
<i>B. tamiae</i>	Unknown (mites?)	Unknown (rats?)
<i>B. vinsonii arupensis</i>	Unknown (fleas?)	White-footed mouse
<i>B. vinsonii berkhoffii</i>	Unknown (ticks?)	Coyote, dogs
<i>B. washoensis</i>	Fleas	Californian ground squirrel

Prevention Is Key

Bartonellosis can cause severe symptoms in humans and companion animals. The good news is that infections are both treatable and preventable.

- ▶ Know the risks of *Bartonella* species transmission and symptoms.
- ▶ Protect your family and pets by using flea and tick prevention.
- ▶ Avoid animal bites and scratches. Clean any injuries promptly with soap and warm water.

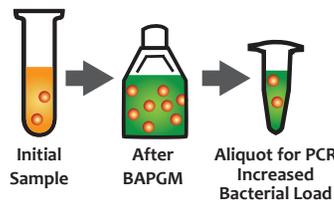
Healthy Pets, Healthy Families™

Advanced Testing

Individuals with bartonellosis can be tested for either DNA or antibodies. Diagnostically, patients are often antibody positive or DNA positive, **but rarely both**. Experts recommend testing for both DNA and antibodies in symptomatic patients.

Bartonella ePCR™ uses a patented medium (BAPGM™) to enrich patient specimens by growing *Bartonella* organisms up to levels detectable by PCR.

With BAPGM™ Enrichment Culture



Greater sensitivity and more **TRUE POSITIVES** verified by DNA sequencing

Bartonella IFA Serology, IgG uses immunofluorescence to detect antibodies created by the host immune system in response to *B. henselae* and/or *B. quintana* infections.

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From Cat Scratch Disease to Bartonellosis



Bartonella henselae, the causative agent of cat scratch disease, is one of over **20 Bartonella species** that can cause disease in animals and people and are spread by fleas, lice, ticks, and other biting arthropods.

The term, **bartonellosis**, encompasses the broad range of disease manifestations, from acute to chronic, that can result from infection with these stealth bacterial pathogens.



Best in Bartonella Testing

Chronic Bartonellosis:

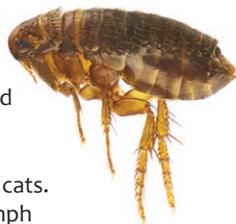
A stealth infection that causes multi-system disease in humans and animals.

Acute Presentations

Cat Scratch Disease (CSD)

(*Bartonella henselae*)

A common *Bartonella* infection diagnosed in humans and animals across the world. *B. henselae* infection is often diagnosed following contact with domestic or stray cats. Symptoms include persistent swollen lymph nodes and fever 1-3 weeks after infection occurs.



Primary Reservoir: Cats

Primary Vector: Cat fleas (*Ctenophalides felis*)

Trench Fever

(*Bartonella quintana*)

Famously known for causing relapsing fever, headache, and leg pain in over 1 million soldiers living in poor sanitary conditions during World War I. Today, trench fever is common in urban homeless populations due to poor hygiene, lice, and fleas.

Primary Reservoir: Humans

Primary Vector: Human body lice (*Pediculus humanus*)

Carrion's Disease

(*Bartonella bacilliformis*)

A dangerous infection acquired primarily by South American residents or travelers to Peru, Chile, and Ecuador. *B. bacilliformis* infection has two stages: the acute stage (Oroya fever) often involves headaches and abdominal pain while the latent stage can cause skin lesions called verruga peruana (Peruvian warts).

Primary Reservoir: Humans

Primary Vector: Sandfly (*Lutzomia verrucarum*)

Published case studies and research reports increasingly describe the role of *Bartonella* species infections (bartonellosis) in complex chronic illnesses that often mimic other diseases and autoimmune disorders.

Bartonella species can cause a persistent, intravascular blood infection, infecting red blood cells and the cells that line the blood vessels. Systemic infection not only inhibits the immune system from mounting an appropriate response, but may result in relapsing, non-specific symptoms that can progress to very serious conditions affecting the heart, joints, eyes, and nervous system.

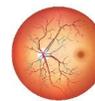
Infectious Endocarditis (IE)

IE is an infection of the inner lining of the heart and/or the heart valve that can lead to severe cardiac complications. *B. henselae* and *B. quintana* have been implicated in upwards of 5% of all cases with 90% of these cases requiring surgical intervention.*



Neuroretinitis

Neuroretinitis is defined as inflammation of the optic nerve and retina resulting in visual field changes. It is estimated that neuroretinitis occurs in 5-10% of CSD cases.*



*Sources available upon request

A Broad Spectrum of Symptoms

Non-specific/ General

Fever of unknown origin, granulomatous inflammation, fatigue, weight loss, irritability, headaches

Cardiovascular/ Hematologic

Endocarditis, myocarditis, anemia, arrhythmias, hypertension

Neurological

Hallucinations, vision loss, neuropathy, seizures, numbness, encephalopathy

Ocular

Uveitis, retinal vasculitis, neuroretinitis, intraocular inflammation

Rheumatologic

Arthritis, arthralgia, chronic fatigue, myalgia, bone pain, osteomyelitis

Vascular

Bacillary angiomatosis, peliosis hepatis, aneurysm, vasculitis, thromboembolism

Risk Factors

- ▶ Exposure to fleas, ticks, lice, biting flies, and other suspected vectors
- ▶ Working or living with pets and other animals
- ▶ Individuals with naturally weaker immune systems (young children, aging adults, pregnant women)
- ▶ Immunocompromised individuals (HIV/AIDS, cancer, transplant recipients, immune-mediated conditions and drugs)

Veterinary Occupational Risk

Animal workers are at a higher risk because of...

- ▶ Exposure to vectors that carry and transmit *Bartonella* species
- ▶ Animal scratches and bites
- ▶ Workplace hazards like needlestick injuries

A study from Duke University and NCSU found that 28% of symptomatic veterinarians tested positive for *Bartonella* species (Lantos, 2014)

The National Association of State Public Health Veterinarians (NASPHV) provides guidelines for reducing zoonotic disease transmission in the workplace. Bartonellosis is listed as one of many infections of concern for animal workers.