

## Bartonellosis: An Emerging Infectious Disease of Zoonotic Importance to Animals and Humans

Over the past three decades, substantial scientific evidence has begun to elucidate the emerging biomedical importance of the genus *Bartonella* and the disease bartonellosis. Our team of comparative infectious disease researchers at the North Carolina State University Intracellular Pathogens Research Laboratory has generated scientific publications related to bartonellosis in cats, cows, dogs, dolphins, horses, human beings, river otters, sea turtles, sheep, whales, and other wildlife species. The evolving research findings from around the world have left me with the following question:

Is Bartonellosis a modern-day hidden epidemic?

If so, how could a disease of epidemic proportions involving both animals and human patients be missed or remain hidden from diagnosticians, other scientists, physicians, and veterinarians for more than 100 years or perhaps an even a much longer period of medical history?

How much pain and suffering could have been avoided if the “hidden epidemic” called bartonellosis had been discovered sooner?

What has been the emotional, medical, occupational, and financial impact of historically undiscovered *Bartonella* species (now 38 named or candidatus species have been characterized) infections among patients with bartonellosis throughout the world?

## How can an epidemic be hidden?

Hiding an epidemic caused by a genus of bacteria may be easier than one might think. First you would start with a bacterial genus that was essentially not known to exist prior to the 1990s (with the exception of two historically important *Bartonella* species, *Bartonella bacilliformis* and *Bartonella quintana*, the cause of Carrion's Disease and Trench Fever, respectively). Next, the bacteria in question would have evolved effective mechanisms to avoid immune recognition and thereby behave as a stealth pathogen (i.e., bacteria that can fly under the radar like a stealth bomber).

In addition, Mother Nature might "design" this stealth bacterium with inherent attributes that facilitate effective maintenance of a persistent but relapsing intravascular infection (an infection involving erythrocytes, the immune cells that circulate within the blood, and the cells called endothelium that line the blood vessels), as well as long-standing dermal infections that facilitate transmission to new blood-seeking vectors.

Over time (perhaps tens of thousands of years), these stealth bacteria would differentiate genetically to selectively evolve and preferentially infect a large number of very specific animal reservoir hosts in nature.

Importantly, during evolution, these stealth bacteria would use a broad variety of insects and arthropods to facilitate transmission among the various animal populations.

Opportunistically, those arthropods (flea, sand fly, and tick bites, as examples) would

periodically transmit the bacteria directly to humans and other non-reservoir-adapted animals. Finally, to progress from periodic and infrequent infections to an epidemic, you would modify human behaviors to facilitate closer contact among the vector, the reservoir hosts, and human beings. As this epidemic has likely been ongoing throughout the history of mankind, minimal changes in human behaviors were needed to facilitate epidemic numbers of unrecognized infections with various *Bartonella* species.

From a microbiological perspective, the ideal stealth organism would have very specialized growth requirements and a very long dividing time (slow bacterial replication), which would greatly contribute to a historical inability to isolate these bacteria in microbiology laboratories throughout the world, especially when using well-established and standardized diagnostic isolation techniques. Finally, these stealth bacteria would not induce a consistent or predictable pattern of illness in animals or human patients, thereby avoiding discovery because doctors would not appreciate a defined disease pattern indicative of infection with a specific disease-causing agent. By the very nature and derivation of the word, epidemics are generally recognized when a substantial number of individuals within a defined population develop a similar disease pattern.

In many instances, the onset of illness occurs within a relatively short period after acquiring the infectious agent (for example, influenza), thereby facilitating rapid recognition of a definable disease pattern. **One way to miss an epidemic is to have the offending infectious agent induce variable disease symptomatology months to years after transmission, which would interfere with a clinician's ability to use pattern recognition** (as is typically done by infectious disease physicians and veterinarians) in an effort to correlate disease symptoms with a specific infectious agent.

Most pathogenic organisms (estimates include 60-75% of all known or emerging pathogens) are zoonotic, meaning the same organism can infect or induce disease in an animal and a human being. In some instances, the animal serves as a reservoir (a healthy animal that carries the organism in the blood, intestinal tract, skin, or urinary system, often for extended periods of time) for human infection, but, in many instances, the pathogen is opportunistic (i.e., takes advantage of low immune defenses) and induces disease of similar severity in animals and people. As a reservoir host for vector-borne organisms, animals maintain organisms primarily within the blood and the dermis (skin), and in most instances these organisms, which can be very prevalent in nature, do not induce disease in the animal reservoir host.

These same organisms (bacteria, protozoa, rickettsiae, viruses) can be mildly to highly pathogenic when introduced into a non-reservoir host.

Examples include children whose immune systems have not completely developed, the elderly who experience immune senescence (a natural progressive deterioration of immune function with advanced age), or other individuals within modern-day society who are immunocompromised due to HIV, alcoholism, or therapeutically to treat an immune-mediated disease (e.g., systemic lupus erythematosus, multiple sclerosis, rheumatoid arthritis). Thus, stealth organisms of low pathogenicity (low disease-causing potential) can induce chronic and insidious, or acute, serious and potentially fatal illnesses.

Because of improved science and diagnostic testing modalities, bartonellosis is now being documented in transplant recipients and in people and animals historically treated for autoimmune conditions with immunosuppressive drugs. Previously, these conditions were not accurately diagnosed as an infectious disease, as bacterial members of the genus *Bartonella* were not known to exist throughout North America and much of the world prior to the AIDS epidemic in 1990, another epidemic that was also not initially recognized or acknowledged as such. In conclusion, *Bartonella* species have evolved a stealth pathogen strategy over thousands of years, which may well have given rise to a hidden epidemic.

To learn more about *Bartonella*:

- [Understanding Bartonella medical webinar](#)  
(FREE)

- [Bartonellosis, One Health Perspectives for an Emerging Infectious Disease](#)
- Wolf, L.A., Cherry, N.A., Maggi, R.G., and Breitschwerdt, E.B., 2014. In pursuit of a stealth pathogen: Laboratory diagnosis of Bartonellosis. Clinical Microbiology Newsletter, 36(5), pp.33-39.

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Editor's note: Any medical information included is based on a personal experience. For questions or concerns regarding health, please consult a doctor or medical professional.