



TICKBORNE DISEASES

Sherry Cagan

There are over 20 Tick-borne diseases, more are continually being discovered.

Lyme disease is the most commonly reported tick-borne infection in the United States, however a single tick can transmit multiple pathogens, referred to as co-infections, including rickettsia and other types of bacteria, viruses, and protozoa, compounding the difficulty in diagnosis and treatment.

Several of these co-infections can be fatal. Many do not have diagnostic tests or treatments available

Bacterial

Lyme Disease-a cousin of syphilis. It's called "the Great Imitator," because many people who are diagnosed with fibromyalgia, chronic fatigue syndrome, MS, early Alzheimer's, early Dementia or Parkinson's disease can actually have Lyme disease. It is caused by the *Borrelia burgdorferi* spirochete, a screw-shaped bacterium. Symptoms include fever, arthritis, acute neurological problems, loss of ability to move one or both sides of the face, joint pains, severe headaches with neck stiffness, heart palpitations, memory problems, shooting pains or tingling in the arms and legs, a bulls eye rash, meningitis, sensitivity to light, carditis, fatigue, and flu-like illness, among others. Mild encephalitis may lead to memory loss, sleep disturbances, or mood changes. After several months, untreated or inadequately treated people may go on to develop severe and chronic symptoms that affect many parts of the body, including the brain, nerves, eyes, joints and heart. Many disabling symptoms can occur, including permanent impairment of motor or sensory function of the lower extremities in extreme cases. Chronic encephalomyelitis, which may be progressive, can involve cognitive impairment, brain fog, migraines, balance issues, weakness in the legs, an awkward gait, facial palsy, bladder problems, vertigo, and back pain. Panic attacks and anxiety can occur, as well as depersonalization, where patients feel detached from themselves or from reality. Lyme disease can also be fatal.

Tick-Borne Relapsing Fever-comes from a certain species of *Borrelia* spirochetes. It is characterized by recurring episodes of high fever (e.g., 103 degrees F.), headache, muscle and joint aches, and nausea. Symptoms can reoccur, producing a telltale pattern of fever lasting roughly three days, followed by seven days without fever, followed by another three days of fever. Without

antibiotic treatment, this process can repeat several times. The tick bites are quick and painless, so most people do not know they have been bitten.

Borrelia Miyamotoi Disease-caused by a spiral-shaped bacteria that is closely related to the bacteria that causes tick-borne relapsing fever and is distantly related to the bacteria that causes Lyme disease. Patients are most likely to show fever, chills, headache, body and joint pain, and fatigue. A rash is very uncommon, unlike in Lyme disease.

Anaplasmosis-can cause fever, muscle aches, chills, nausea, vomiting, and loss of appetite. It is caused by a rickettsia-like bacterium. Signs and symptoms usually begin within 1-2 weeks after the bite of an infected tick. People with weakened immune systems (such as those receiving cancer treatments, individuals with HIV infections, prior organ transplants, or people taking some medications) are at risk for severe illness. A crusted, ulcerated papule/scab with a red halo resembling a cigarette burn usually forms at the site of the tick bite.

Ehrlichiosis- also caused by a rickettsia bacterium. It can be life threatening or even fatal for elderly patients and others with compromised immune systems . It can cause mild fever, headache, chills, nausea, vomiting, confusion, rash, cough, loss of appetite, fatigue, muscle aches, and joint pain. Untreated ehrlichiosis with persistent symptoms can result in an illness serious enough to require hospitalization.

SPOTTED FEVER GROUP RICKETTSIOSES

- **Rocky Mountain Spotted Fever (RMSF)**-can be deadly or cause serious damage or failure to the kidney and heart if not treated within the first five days of symptoms with the right antibiotic. It can also cause inflammation of the brain, which can cause confusion, seizures, and delirium. Symptoms can include high fever, chills, severe headache, muscle aches, nausea, and vomiting. It is caused by an infection from the Rickettsia organism. Rocky Mountain Spotted Fever damages the lining of your smallest blood vessels, causing the vessels to leak or form clots, which can lead to serious infection and possibly amputation of fingers and toes, because they may develop gangrene. Untreated, RMSF has a death rate as high as 80 percent.
- **Rickettsia Parkeri Rickettsiosis**-closely related to the causative agent of RMSF, with similar signs and symptoms, except Rickettsia parkeri usually creates a crusted, ulcerated papule/scab with a red halo resembling a cigarette burn that forms at the site of the tick bite. It is characteristically less severe than RMSF. It can be difficult to distinguish it from RMSF and other spotted fevers, especially during the early stages of these diseases.

- **Pacific Coast Tick Fever**-typically causes fever, headache and an ulcerated papule/scab. More than half of the reported cases have been pediatric, and some patients have required hospitalization. Multiple infections can be transmitted from the bite of the same tick.
- **Rickettsialpox**-also causes a scab to form at the site of the tick bite. Some people may experience fever, muscle aches, swollen lymph glands and a generalized rash that may last for several days to a week.
- **Rickettsia Helvetica**-was first recognized in Switzerland. It can cause non-specific fever, muscle pain, headache and respiratory problems. The bulls eye rash are described as red spots, much smaller in size than in Lyme disease, but sometimes there are no spots at all.

Bartonellosis-a group of infectious diseases caused by the Bartonella genus. Bartonella can cause Cat-Scratch Disease, endocarditis, and chronic infection. Patients exhibit similar symptoms to the other tick-borne diseases but typically report more neurological symptoms, such as blurred vision, numbness in the extremities, memory loss, balance problems, ataxia (unsteady gait), and tremors. It can sometimes trigger psychiatric manifestations.

Mycoplasma-the most common Lyme coinfection and the smallest of all bacteria: 4,000 of them can fit inside one red blood cell (only 10-15 of average-sized bacteria would fit.) Since they have no cell wall, they can change their shape and fit into areas where other bacteria cannot go. Without a cell wall, they are completely resistant to many types of antibiotics. There are more than 200 species known—29 can infect humans, and of these, 23 can cause disease. Most everyone has been exposed to some form of mycoplasma, and it is closely linked to many chronic degenerative diseases.

STARI (Southern tick-associated rash illness)-also known as **Masters Disease**; early STARI symptoms are similar to symptoms of early Lyme disease. A skin lesion, or rash, that looks like a Lyme disease bulls eye appears at the site of the tick bite. The most common symptom reported by patients with skin lesions is fatigue.

Tularemia-also called Rabbit Fever or Deer Fly Fever that typically attacks the skin, eyes, lymph nodes, and lungs. Occasionally a form that results in pneumonia or throat infections may occur, and it can be life threatening. All forms are accompanied by fever, which can be as high as 104 degrees F.

Viral

Bourbon Virus Disease-symptoms are similar to those of other tick-borne illnesses. There are no tests available that would help a doctor diagnose this infection, so diagnoses are made based on symptoms alone. And because there is no medicine to treat Bourbon Virus Disease, doctors can only treat the symptoms. For example, some patients may need to be hospitalized and given intravenous fluids and treatment for pain and fever. People that are diagnosed have low blood counts for cells that fight infection and prevent bleeding. Antibiotics are not effective against viruses, including Bourbon Virus.

Tick-Borne Encephalitis (TBE)-a viral infectious disease involving the central nervous system. Symptoms may include fever, malaise, anorexia, headache, nausea and/or vomiting. After about eight days of remission, a second phase of the disease occurs in 20% to 30% of patients. These patients may also experience a clinical illness that involves symptoms of meningitis (e.g., fever, headache, and a stiff neck), encephalitis (e.g., drowsiness, confusion, sensory disturbances, and/ or motor abnormalities, such as paralysis), or meningoencephalitis. The convalescent period can be long, and sequelae can occur in 30-60% of cases, with long-term or permanent neurologic symptoms. Neuropsychiatric sequelae have been reported in 10-20% of patients.

Powassan Virus/Deer Tick Virus Disease-people with severe Powassan virus disease often need to be hospitalized to receive support with breathing and swelling around the brain. There are no vaccines to prevent or medicines to treat Powassan Virus Disease.

Heartland Virus Disease-most patients report a tick bite in the two weeks prior to illness. The symptoms of infection are similar to ehrlichiosis and anaplasmosis infections and include weakness, headaches, muscle pain, loss of appetite, nausea, diarrhea, weight loss, joint pain, low white blood cell count, and easy bruising due to a low platelet count. There are no vaccines to prevent or medications to treat Heartland Virus infections.

Colorado Tick Fever-symptoms include a fever of up to 105 degrees F., chills, severe headache, light sensitivity, muscle aches, nausea, skin tenderness, loss of appetite, abdominal pain, weakness, fatigue, and a faint rash. It can affect the liver, so impaired liver function may also be a sign of the disease. There is no medication to treat Colorado Tick Fever.

Crimean-Congo Hemorrhagic Fever-symptoms may include fever, muscle pains, headache, vomiting, diarrhea, mood instability, agitation, mental confusion and bleeding into the skin. Onset of symptoms is less than two weeks following exposure. Complications may include liver failure, acute kidney failure, shock, and sometimes acute respiratory distress syndrome. In those who survive, recovery usually occurs around two weeks after onset. The virus can be spread between people via body fluids as well. A vaccine is not commercially available.

It occurs in Africa, the Balkans, the Middle East and Asia and often occurs in outbreaks. The risk of death among those affected is between 10 and 40%, and up to 30% of infected people die by the end of the second week of illness.

Protozoan

Babesiosis-a malaria-like illness that primarily infects red blood cells. The infection can be fatal in patients with a compromised immune system, individuals without a spleen, or people with concomitant Lyme disease. In certain situations, it can also cause severe acute illness; severe, acute Babesia infections should be managed appropriately and aggressively.

Cytauxzoonosis-transmitted to domestic cats by tick bites. It poses no risk of transmission to humans. Most infected cats have been healthy before a very sudden onset of severe disease. The course of symptoms is often swift, with signs of lethargy, decreases appetite, dehydration, jaundice, enlarged liver and spleen, pale mucous membranes, respiratory distress, tachycardia or bradycardia. Until recently, it was believed that after being infected with Cytauxzoonosis, pet cats almost always died within a few days. With increased awareness, it has been found that treatment is not always futile-new treatments offer as much as 60% survival rate.

Toxin

Tick Paralysis-it is the only tick-borne disease that is not caused by an infectious organism. The illness is caused by a neurotoxin produced in the tick's salivary gland. After prolonged attachment, the engorged tick transmits the toxin to its host. The toxin causes symptoms within 2-7 days, beginning with weakness in both legs that progresses to paralysis. The paralysis ascends to the trunk, arms, and head within hours and may lead to respiratory failure or distress, similar to anaphylaxis and death before anyone becomes aware of a tick's presence. Patients may report minor sensory symptoms, such as local numbness. Since tick paralysis is chemically induced by the tick, it usually only continues in its presence. Once the tick is removed, the symptoms usually diminish rapidly.

Allergies

Alpha-gal Allergy-also known as meat allergy or mammalian meat allergy (MMA). Bites from certain ticks, which can transfer this carbohydrate to a victim,

have been implicated in the development of this delayed allergic response to consumption of mammalian meat products. Since doctors are not required to report the number of patients with alpha-gal allergy, the true number of affected individuals is unknown. While no cure is known, symptoms may recede over time. Symptoms include severe whole-body itching, hives, angioedema, gastrointestinal upset, and possible anaphylaxis. In 70% of cases, the reaction is accompanied by respiratory distress and is especially harmful to those suffering from asthma.