

Each illness is caused by a bacterium

[Science](#), [Biology](#)



A 27-year old white female presented at the walking clinic of her local physician on August 15. On physical exam, the patient had a fever of 38.5°C. She appeared fatigued, had tender joints, and complained of a headache, a stiff neck and a backache. The physician noticed a circular "rash" about 5 inches in diameter, with a bright red leading edge and a dim center in the form of a "bull's eye". The physician noted an irregular heartbeat. The patient complained of lack of ability to concentrate. The patient gave the following history: She is a graduate student in the wildlife program at the university in town. She was in the field for three weeks in Wisconsin during the months of May and June. She tracks small mammals in the field and studies their behavior. It had been a warm, wet spring and she complained of a large number of biting flies, mosquitoes and ticks in the area. She felt well until about 2 weeks after returning to her home. Since that time, many of her symptoms had progressed. She finally found that she could take it no more.

1. What microorganism causes this disease? The case presented a high-risk for contracting the microorganism called *Borrelia burgdorferi* (*B. burgdorferi*) because of the frequent contact with large number of biting flies, mosquitoes, and ticks in the wildlife areas ("Lyme Disease" 2011). *B. burgdorferi* is a spirochete categorized under the genus *Borrelia*. It has three additional geno-species, namely: *Borrelia burgdorferi sensu stricto* (the most common in the US), *Borrelia garinii*, and *Borrelia afzelii*. These strains vary with restriction fragment length polymorphism (RFLP), multi-locus enzyme electrophoresis (MLEE), and ssRNA sequences (Todar 1). In addition, the bacteria are not classified as either Gram-positive or Gram-negative. They are present abundantly in the intestinal tracts of *Ixodes scapularis* and *I.*

pacificus ticks (Bacon et al. 1). 2. What is your best diagnosis of this case? With the given clinical signs and symptoms, as well as the relative risk factors presented in the scenario, the client is most probably affected with Lyme disease. This condition is caused by the *B. burgdorferi* infection from vector organisms such as biting flies, mosquitoes, and ticks (Todar 1). While non-specific symptoms like joint pains, headache, backache, and fever also occur with most types of infections, history reveals important information about the presence of ticks and small mammals in the patient's location. 3. What features are critical to your diagnosis? The diagnosis of Lyme disease is difficult to establish in its early stages ("Lyme Disease" 2011). General signs and symptoms like body malaise, fever, and joint pains can be clinically appreciated in other infectious processes aside from Lyme disease. Meanwhile, major features that suggest the presence of the condition are present in this case, which includes the presence of ticks that can transmit the microorganisms, and mammals which serve as reservoir (Todar 3). Furthermore, the clinical manifestations of irregular heartbeat and difficulty of concentration already indicate the involvement of other body systems, which is typical with the dissemination of the infection (Bacon et al. 3). 4. What further steps should be taken to clear up the problem? Lyme disease is managed with several antibiotics (Kowalski et al. 519). Presently, doxycycline is the drug of choice for this condition (Halperin et al. 91). Because major complications are already manifested in this patient, serological tests such as antibody test, ELISA, and western blot specific for Lyme disease would strengthen the validity of the diagnosis. On the other hand, electrocardiogram and echocardiogram are needed to detect heart

involvement, and spinal tap and MRI should be performed to determine any pathologic changes occurring in the central nervous system. While additional antibiotic therapy may be needed to treat the secondary complications, recovery can still be expected except for the permanent damages (Todar 6).

5. How is this disease transmitted? Lyme disease is originally a disease of wildlife animals, especially deer and mice. Blacklegged ticks acquire the microbial pathogen when they feed on the blood of infected animals. The blood-meal is an important part of the life-cycle of the tick. In turn, animals and humans become infected with Lyme disease after a direct contact with infected ticks (Todar 3).

6. What symptoms might the patient develop if the disease is not treated? What is the prognosis with treatment? Ideally, Lyme disease should be detected as early as possible. Antibiotics are the frontline treatment for the early stages of the disease. If left untreated, the disease gradually progresses to affect the entire body systems, especially the cardiovascular, musculoskeletal and nervous systems. Fortunately, recent developments in the medical research have provided effective therapeutic regimen even in complicated cases of the disease (Halperin et al. 92). In rare cases, some people who have recovered fully from the disease still experience troublesome symptoms that interfere with their full functioning (Todar 6).

Works Cited Bacon, Rendi Murphree, Kiersten J. Kugeler, Paul S. Mead. " Surveillance for Lyme Disease- United States, 1992- 2006." MMWR Surveillance Summaries. Washington, DC: U. S. Government Printing Office, 2008. Print. The authors are affiliated with the Center for Disease Control and Surveillance of the United States. This is a government's initiative to determine the actual number of the incidence rate and distribution of the

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accuracy of information. Todar, Kenneth. "Borrelia burgdorferi and Lyme Disease." *Todar's Online Textbook of Bacteriology*. 2011. Web. 15 Nov. 2011.

Dr. Kenneth Todar is a renowned microbiologist from the University of Wisconsin in Madison. He produced a web-based textbook to increase information usage by the students from high school and college levels. Basic foundations of microbiology and extensive discussions of diseases caused by bacteria are included in this online textbook. Colored photos and diagrams are also interesting features present in the text, as in any other published books and journals.