



## Tick-Borne Pulmonary Involvement

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Ticks or *Babesia microti* and *Babesia* species, obligate blood-sucking arthropods can transmit rickettsiae, spirochetes, protozoa, viruses and bacteria and cause tick-borne diseases, such as babesiosis, Lyme disease and ehrlichiosis, the fatal illnesses. The general signs and symptoms include fever, chills, sweats, malaise, fatigue, myalgia, arthralgia, headache, gastrointestinal symptoms (anorexia, nausea, vomiting, abdominal pain), dark urine, cough, sore throat, emotional lability, depression, photophobia, conjunctival injection, mild splenomegaly, mild hepatomegaly or jaundice. A pulmonary complication caused by a tick-borne disease should be considered in the differential diagnosis in a patient presenting with respiratory symptoms and giving a history of a recent tick bite. This disorder can be fatal if left untreated. Rodents and small mammals that inhabit gardens, parklands, and wooded areas are the large reservoirs of ticks. The diagnosis of a tick-borne disease is frequently based on a history of outdoor pursuits, tick bites, skin rash, and clinical features. Pulmonary complications in Lyme disease that is caused by *Babesia burgdorferi* are cough, acute respiratory distress syndrome (ARDS) and respiratory failure, whereas ehrlichiosis that caused by *E. chaffeensis* are pharyngitis, ARDS and respiratory failure. Babesiosis that is caused by *B. microti* can present cough and ARDS, whereas tularemia that is caused by *F. tularensis* can present cough, pleural effusion, and pneumonia. Rocky Mountain spotted fever (RMSF) that is caused by *R. rickettsii* can present pharyngitis, pleurisy, and pleural effusion, whereas tick paralysis that is caused by its neurotoxin can present respiratory failure. The incubation period begins from one week to nine weeks or longer. The general laboratory findings include decreased he-

matocrit due to hemolytic anemia, thrombocytopenia, elevated serum creatinine and blood urea nitrogen (BUN) levels and mildly elevated hepatic transaminase levels. The definite laboratory diagnoses include identification of intraerythrocytic *Babesia* parasites by light-microscopic examination of a peripheral blood smear or positive *Babesia*/or *B. microti* polymerase chain reaction (PCR) analysis or isolation of *Babesia* parasites from a whole blood specimen by animal inoculation (in a reference laboratory). Oral tetracycline antibiotics are the treatments of choice for all stages of Lyme disease. A previous controlled study of disseminated Lyme disease, intravenous ceftriaxone of 2g daily for 2 weeks and oral doxycycline of 100 mg twice daily for 3 weeks demonstrated similar clinical cure rate of 85% and 88%, respectively at 9 months. Currently, intravenous ceftriaxone is recommended for patients with encephalopathy or meningitis. For RMSF, doxycycline 200 mg for 10 days or chloramphenicol 2.4g for 10 days (until afebrile for 2 - 3 days) is recommended. For ehrlichiosis, doxycycline 200 mg for 14 days is recommended. For Tularemia, gentamicin 3 - 5 mg/kg for 14 days is recommended. For babesiosis, quinine 2.6 gm for 7 - 10 days and clindamycin 2.4g for 7 - 10 days are recommended, whereas for tick paralysis, tick removal is recommended. In severely ill patients with babesiosis, atovaquone (750 mg orally every 12 hours, the maximum dose per day is not available) plus azithromycin (on the first day, give a total dose in the range of 500 - 1,000 mg orally; on subsequent days, give a total daily dose in the range of 250 - 1,000 mg, maximum dose is 1,000 mg per day) for 7 - 10 days. The alternative treatment regimen for severely ill patients with babesiosis is clindamycin (300 - 600 mg, intravenously administered every 6

hours or 600 mg orally every 8 hours, the maximum dose per day is not available) plus quinine (650 mg orally every 6 - 8 hours, the maximum dose per day is not available) for 7 - 10 days.

In conclusion, for patients with histories of tick bites and respiratory complaints, it is critical to consider a diagnosis of tick-borne pulmonary involvement or disease due to greatly improved treatment outcome by current effective-antimicrobial therapeutic interventions.

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