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Tularemia Takes a Tropical Turn: A Rare Case of Typhoidal Tularemia in Florida

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Statistical Analysis C
Data Interpretation D
Manuscript Preparation E
Literature Search F
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Patient: Male, 36-year-old
Final Diagnosis: Tularemia
Symptoms: Fever of unknown origin, malaise, unintentional weight loss
Clinical Procedure: —
Specialty: Infectious Diseases

Objective: Unknown etiology

Background: Florida is not a common area for tularemia infection; in fact, only 4 cases have been reported over the past 10 years. Here, we present the case of a 36-year-old man with no significant past medical history and no recent travel who presented with 6 months of vague symptoms including fatigue, night sweats, and unintentional weight loss who was found to have tularemia.

Case Report: A 36-year-old man with no significant past medical history presented to his primary care physician with a 6-month course of fevers, malaise, rigors, night sweats, and a 30-pound unintentional weight loss. On questioning, the patient was discovered to hunt deer and wild turkey, which prompted testing for tularemia. *Francisella tularensis* IgM testing was positive, confirming the diagnosis of tularemia suspected to have been borne by a tick vector. Our patient was started on levofloxacin 750 mg daily for 14 days. His febrile episodes resolved within 7 days of initiating antibiotics.

Conclusions: In this patient's case, tularemia was not considered initially in his evaluation as cases are rare in Florida, and his typhoidal presentation had such a broad differential of infectious, rheumatologic and malignant processes. With climate patterns changing, to which insect vectors are particularly sensitive, re-emergence of otherwise rare infectious disease pathogens can be seen and should be explored in otherwise difficult-to-diagnose cases.

Keywords: Case Reports • *Francisella tularensis* • Infectious Diseases • Tularemia

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Introduction

Tularemia is a rare and reportable disease in the United States, with only about 150-300 cases reported annually over the past 10 years. In the United States, tularemia is most commonly seen in the south-central region, with Arkansas, Kansas, Missouri, and Oklahoma comprising over half of all cases from 2011-2023. The geographic distribution of reported U.S. cases in 2023 is shown in **Figure 1** [1]. Florida has not been a common area for cases of tularemia; in fact, only 4 cases in total have been reported over the past 10 years in the state. Annual reported tularemia cases in Florida from 2005-2024 are shown in **Figure 2**. [2]. There are earlier case reports of tularemia in Florida, one dating back to 1928, in which the patient had transmission via an infected rabbit [3] and 2 additional cases in 1975 implicating the marsh rabbit as well [4]. According to a Florida Department of Health 2014 article, tularemia cases were more regular in Florida until the 1960s and dropped significantly throughout the 1980s with a decline in rabbit hunting. The sporadic cases seen in recent years have mostly been attributable to travel and exposure in more endemic regions of the country [5].

Here, we present the case of a 36-year-old man with no significant past medical history and no recent travel out of the state of Florida, who presented with 6 months of vague systemic symptoms including fatigue, night sweats, and unintentional weight loss, and was found to be infected with *Francisella tularensis,* suspected to have been transmitted by a tick vector.

Case Report

This patient was a 36-year-old man with no significant past medical history who presented initially to his primary care physician with a 6-month course of fevers, malaise, rigors, night sweats, and a 30-pound unintentional weight loss. At that time, he was sent for lab evaluation and a computed tomography (CT) scan of his chest/abdomen and pelvis. He was noted to have leukopenia and splenomegaly but was given no definitive diagnosis or plan according to the patient. He followed up in our emergency department shortly thereafter with progressively worsening symptoms; noting fatigue so profound that he was missing work twice a week as he felt he was unable to get out of bed. Fevers and night sweats remained intermittent over the prior 6-8 month duration. He reported intermittent hematuria and epistaxis, last occurring a few months prior to this visit. Emergency room evaluation was notable for mild thrombocytopenia, mild normocytic anemia, and elevated inflammatory markers including sedimentation rate and C-reactive protein. He also had mild derangements of his leukocyte lineages. Chest X-ray was negative for an acute process, and syphilis IgG and mono rapid testing were negative. He was referred for urgent follow up in the outpatient infectious disease clinic.

He was seen 5 days later via telehealth by a clinician in the infectious disease clinic. On closer review of exposures in his history, he reported that he works as a machinist making aircraft parts. He denied having pets or contact with animals. He had no contact with tuberculosis or exposure to homeless shelters or prisons. He had no travel outside of the United States. He had a remote history of IV drug abuse more than 10 years ago, but the only current drug use was smoking cannabis on occasion. He did vape and had been drinking a few alcoholic drinks per month. The differential diagnosis at this visit was broad, including infectious, malignant, and rheumatologic etiologies.

He had an extensive work-up ordered, including the following: human immunodeficiency virus (HIV) testing; rapid plasma reagin to screen for syphilis; erythrocyte sedimentation rate and C-reactive protein as markers of systemic inflammation; complete blood count with differential and peripheral blood smear to evaluate hematologic abnormalities; procalcitonin as a marker of bacterial infection/sepsis; ferritin as an acute-phase reactant and marker of inflammatory or hemophagocytic processes; antinuclear antibody to screen for autoimmune/connective tissue disease; rheumatoid factor to screen for rheumatoid arthritis and other autoimmune conditions; 3 blood cultures to evaluate for bacteremia; QuantiFERON-TB Gold assay to screen for latent or active *Mycobacterium tuberculosis* infection; CT of the abdomen and pelvis, and CT of the chest for anatomic evaluation and to assess for occult infection, malignancy, or lymphadenopathy; urinalysis with reflex culture to evaluate for urinary tract infection; and serologies for *Coxiella burnetii* (Q fever), cytomegalovirus, Epstein-Barr virus, *Bartonella* species, and *Brucella* species to evaluate for zoonotic and atypical infectious etiologies. Additionally, he was referred to the hematology/oncology clinic for further evaluation.

The patient delayed getting this evaluation completed for the next 3 weeks and presented again to the emergency department with a fever back up to 103 degrees, sleeping all day, diffuse body aches, headache, shortness of breath, and difficulty for a family member to arouse him. Emergency room evaluation was notable for new mild transaminitis, a marked leukocytosis with bandemia, significantly elevated procalcitonin, and elevated inflammatory markers. He was recommended for admission to the hospital for further infectious and malignant work-up. **Table 1** highlights his admission labs.

Given his night sweats, weight loss, and hematologic derangements, there was additional concern for hematologic malignancy. He was evaluated by both the infectious disease team and oncology. He underwent CT imaging of his chest, abdomen, and

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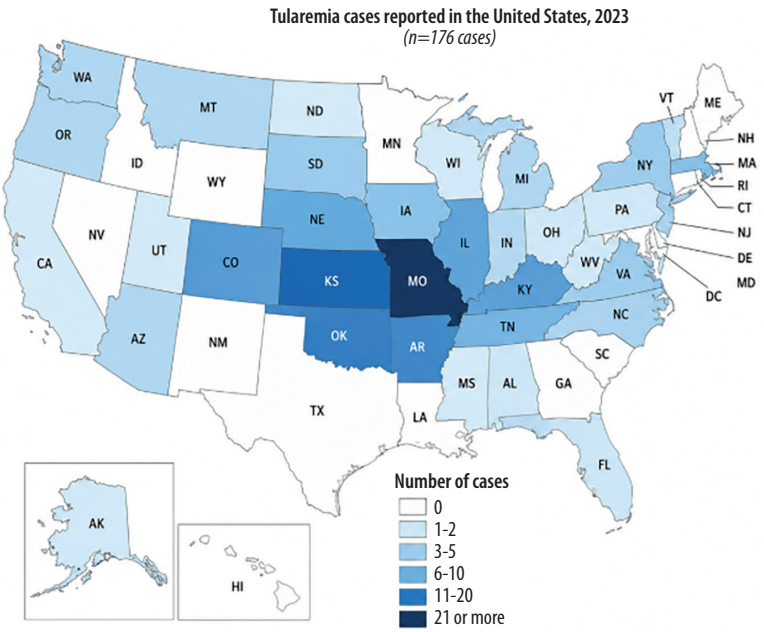

State	Cases	State	Cases
Alabama	1	Montana	2
Alaska	1	Nebraska	12
Arizona	2	Nevada	0
Arkansas	12	New Hempshire	0
California	1	New Jersey	2
Colorado	11	New Mexico	0
Connecticut	0	New York	5
Delaware	0	North Carolina	8
Disctrict of Columbia	0	North Dakota	1
Florida	1	Ohio	1
Georgia	0	Oklahoma	13
Hawaii	0	Oregon	5
Idaho	0	Pennsylvania	2
Illinois	9	Rhode Island	1
Indiana	4	South Carolina	0
Iowa	7	South Dakota	8
Kansas	20	Tennessee	8
Kentucky	10	Texas	0
Luisiana	0	Utah	1
Maine	0	Vermont	2
Maryland	0	Virginia	4
Massachusetts	6	Washington	4
Michigan	4	West Virginia	1
Minnesota	0	Wisconsin	2
Mississippi	1	Wyoming	0
Missouri	24		

Source: Centers for Disease Control and Prevention (National Notifible Diseases Surveillance System)

Figure 1. Graphic Heatmap of reported cases of tularemia in the United States 2023. Centers for Disease Control and Prevention. Tularemia Data and Statistics. National Center for Emerging and Zoonotic Infectious Diseases. Updated March 12, 2025. https://www.cdc.gov/tularemia/data-research/index.html

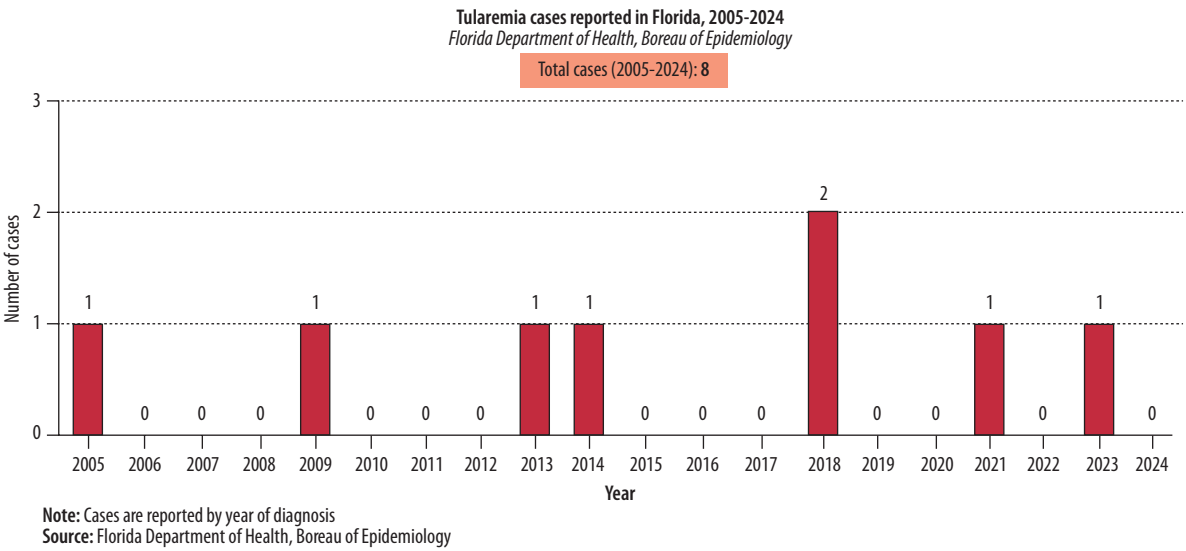

Figure 2. Number of cases of tularemia reported in Florida 2005-2024. Source: Florida Department of Health. Florida Health CHARTS: Tularemia — Ten Year Report. Florida Department of Health, Division of Public Health Statistics and Performance Management. https://www.flhealthcharts.gov/ChartsDashboards/rdPage.aspx?rdReport=NonVitalIndNoGrpCounts.TenYrsRpt&cid=185

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Table 1. Laboratory findings on admission.

Test	Result	Reference Range
Hematology		
Leukocyte count (×10⁹/L)	**21.7**	**3.4-9.6**
Absolute neutrophil count (×10⁹/L)	**20.13**	**1.56-6.45**
Hemoglobin (g/dL)	12.3	13.2-16.6
Platelet count (×10⁹/L)	159	135-317
Chemistry		
Sodium (mmol/L)	138	135-145
Potassium (mmol/L)	3.7	3.6-5.2
Creatinine (mg/dL)	0.95	0.74-1.35
Estimated GFR (mL/min/1.73 m²)	> 90	≥60
Glucose (mg/dL)	120	70-140
Lactate (mmol/L)	1.3	0.5-2.2
Inflammatory markers		
C-reactive protein (mg/L)	**234.6**	**< 5.0**
Erythrocyte sedimentation rate (mm/hr)	**46**	**0-22**
Procalcitonin (ng/mL)	**44.31**	**0.00-0.24**
Ferritin (ng/mL)	179	31-409
Liver function tests		
ALT (U/L)	**71**	**7-55**
AST (U/L)	**58**	**8-48**
Alkaline phosphatase (U/L)	**141**	**40-129**
Total bilirubin (mg/dL)	0.3	0.0-1.2
Albumin (g/dL)	3.4	3.5-5.0

GFR, glomerular filtration rate; ALT, alanine aminotransferase; AST, aspartate aminotransferase.

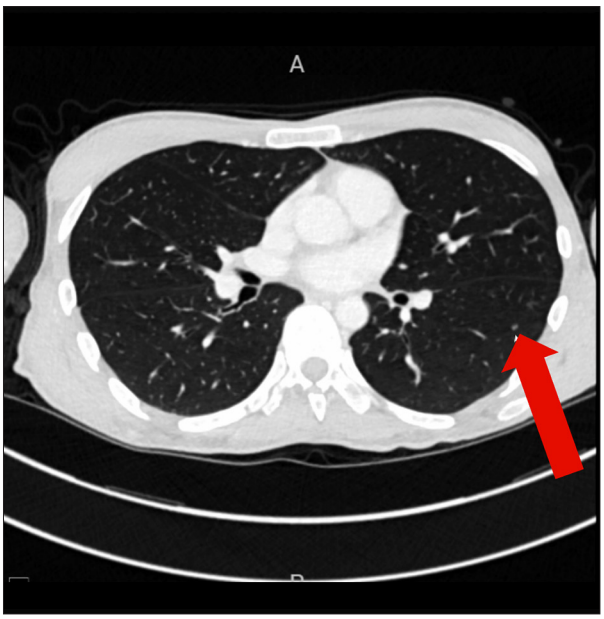

Figure 3. Chest computed tomography showing pulmonary nodule, axial view. One of the only minimal findings on imaging.

pelvis that did not show lymphadenopathy or any acute infectious process other than a small pulmonary nodule. However, splenomegaly was confirmed at 15.3 cm. **Figure 3** shows the CT scan of his chest is mostly benign except for these small pulmonary nodules. He underwent a peripheral smear, flow cytometry and a bone marrow biopsy, which were all negative for malignancy. Additionally, an MRI of the brain was negative for metastatic disease.

All infectious and rheumatologic work-up assays listed above were negative. On further questioning, the patient was discovered to hunt deer and wild turkey, which prompted testing for tularemia. Tularemia IgM testing did return positive. **Table 2** reflects the results of the infectious disease work-up. Further screening questions noted that he fully cooked all his meat.

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Table 2. Infectious disease diagnostic evaluation.

Test	Result
Tularemia testing	
Francisella tularensis IgM ELISA	Positive
Francisella tularensis IgG ELISA	Negative
Tick-borne and zoonotic infections	
Bartonella antibody panel (IgG/IgM)	Negative
Borrelia burgdorferi PCR	Negative
Borrelia garinii/B. afzelii PCR	Negative
Borrelia mayonii PCR	Negative
Brucella IgG/IgM ELISA	Negative
Q fever serology (IgG/IgM)	Negative
Viral studies	
CMV DNA PCR	Undetected
EBV DNA PCR	Undetected
Parvovirus B19 IgG	Positive
Parvovirus B19 IgM	Negative
Infectious mononucleosis screen	Negative
SARS-CoV-2 PCR	Negative
Influenza A PCR	Negative
Influenza B PCR	Negative
HIV-1/2 antigen/antibody screen	Negative
Fungal and mycobacterial studies	
Histoplasma/Blastomyces PCR	Negative
Fungal blood culture	No growth after 30 days
Acid-fast smear, bone marrow	Negative
Mycobacterial culture, bone marrow	No growth after 42 days
Bacterial cultures	
Aerobic blood culture	No growth after 5 days
Blood culture (bacterial/fungal)	*Paenibacillus xylanisolvens* isolated (time to detection 59 hours)*
Syphilis IgG with reflex testing	Negative

* *Paenibacillus xylanisolvens* was isolated from a single blood culture at 59 hours of incubation and was considered clinically insignificant. IgM, immunoglobulin M; IgG, immunoglobulin G; ELISA, enzyme-linked immunosorbent assay; PCR, polymerase chain reaction; CMV, cytomegalovirus; EBV, Epstein-Barr virus.

He had no exposure to rabbits or history of eating/handling rabbit meat and denied rodent exposures as well. He did have a tick bite noted 2-3 months prior to the onset of his disease symptoms and has had numerous mosquito and insect bites, particularly while hunting. Although he had no travel outside of the United States, he did travel to Tennessee, where there is a low incidence of tularemia, but more annual cases reported than in Florida [1]. His travel occurred within 6 months prior to his disease symptomatology. He does have a well at home for his drinking water that has never been checked. Contaminated well water has been implicated in at least one outbreak of tularemia, although not in the state of Florida [6].

Our patient was started on levofloxacin 750 mg daily for 14 days. His febrile episodes resolved within 7 days of initiating antibiotics. By 1 month post-treatment, he reported improvement in his appetite and was working to increase his dietary intake gradually. He continued to experience a lack of energy

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but had no ongoing episodes of extreme fatigue and was able to adequately resume activities of daily living. His symptoms are expected to continue to improve gradually over time.

Discussion

Tularemia infections are caused by the bacterium *F. tularensis,* a highly infectious anaerobic gram-negative coccobacillus [7]. Human transmission can occur through a number of exposures. Mosquitoes, deer flies, and ticks, particularly the dog tick *Dermacentor variabilis*, the wood tick *Dermacentor andersoni,* and the lone star tick *Amblyomma americanum,* are the most common vectors in the United States. Additionally, direct transmission can occur through the skin when handling or eating undercooked meat of infected animals, most commonly small mammals such as rabbits, muskrats, prairie dogs, and other rodents. There are reports of domestic cat and dog transmission and outbreaks from hamsters purchased at the pet store. Less commonly in North American cases, but more commonly in European cases, inhalation of dust or aerosols contaminated with *F. tularensis* and transmission through untreated contaminated water supply can progress to human disease. Hunters, farmers, butchers, and veterinarians are at higher overall risk for disease from tularemia [1,7].

There are about 120 notifiable diseases that the Centers for Disease Control (CDC) tracks through the National Notifiable Diseases Surveillance System (NNDSS) [8]. Tularemia has been a notifiable disease since 1927 [9]. The data collected by the state health departments and ultimately the CDC allow for monitoring and preventing disease outbreaks [8].

Additionally, as of 2017, *F. tularensis* is one of 66 select agents classified as a potential threat to public health and safety, and its use must be approved by the CDC and/or the USDA according to the Public Health Security and Bioterrorism Preparedness and Response Act of 2002 [10]. *F. tularensis* is categorized at Tier 1 of these select agents, which is reserved for those substances that pose the greatest threat for misuse as an agent for bioterrorism [11].

Symptoms related to tularemia vary depending on the type of infection. There are currently 4 subtypes of the bacteria *F. tularensis,* with type A being the most common in the United States and generally causing the most severe form of the disease [12]. There are 6 known clinical forms: ulceroglandular, glandular, oculoglandular, oropharyngeal, pneumonic, and typhoidal. The form of clinical presentation is generally determined by the transmission vector and can range from mild disease to life threatening. The ulceroglandular form is the most common presentation, in which a skin ulcer appears at the site of inoculation and is accompanied by localized lymphadenopathy. The glandular form is similar in presentation but lacks the ulcer. The oculoglandular form presents with conjunctivitis and regional lymphadenopathy, the oropharyngeal form with exudative pharyngitis or tonsillitis, again with regional lymphadenopathy, and the pneumonic form presents with cough, pleuritic chest pain, and severe pneumonia. Typhoidal disease presents with systemic symptoms, generally without localized lymphadenopathy. Presentation can range widely from septic shock to chronic daily fevers; commonly with anorexia, headache, myalgias, sore throat, chest discomfort, and abdominal pain. Hepatomegaly and splenomegaly are common in typhoidal presentation [1,12]. Symptoms of tularemia typically appear within 3-5 days after exposure, but the incubation period can range from one to 14 days, sometimes up to 21 days [1].

Our patient's presentation was consistent with typhoidal disease, presenting with fever, night sweats, malaise, and unintentional weight loss. He had a non-focal physical exam without prominent localizing signs or lymphadenopathy on exam or imaging. Typhoidal tularemia carries the highest risk of mortality if untreated [13]. Given his generally vague symptoms and exam findings, he underwent extensive work-up for infectious, rheumatologic, and malignant diagnoses.

Aminoglycosides have classically been the gold standard of treatment. However, in the updated 2025 CDC guidelines for treatment, fluoroquinolones are now designated as a first line treatment for tularemia, including typhoidal forms, with efficacy noted to be comparable to aminoglycosides and superior to doxycycline, among other practical advantages [14].

With climate patterns changing, to which insect vectors are particularly sensitive, re-emergence of otherwise rare infectious disease pathogens can be seen and should be explored in otherwise difficult-to-diagnose cases such as this [15,16]. Vectors such as ticks, mosquitoes, midges, black flies, sand flies, and triatomine bugs are cold-blooded and sensitive to temperature fluctuations in the environment [17]. Additionally, the majority of a tick's lifespan is spent away from its host, so it is greatly affected by changes in its environment [18]. Most of the research regarding the effects of climate change on vector-borne illnesses has been dedicated to mosquito-borne illnesses. However, the consensus is that climate change will expand the area in which a number of vectors can survive and infections are predicted to spread beyond previously outlined endemic regions [18)]. For example, in the last 130 years, *A. americanum,* the lone star tick, has spread from the southeastern United States to the northern border of the country. This expansion is suspected to be a result of temperature increases, resulting in improved environmental suitability in the northern states. Models predict continued expansion of these vectors with warming temperatures [18]. Additionally, as many re-emerging infectious disease outbreaks specifically in Florida

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are secondary to travel, a thorough travel history is imperative. For example, both locally acquired cases and travel related cases of malaria and dengue fever have been isolated in Florida in the past several years [19,20].

Conclusions

This case highlights the importance of obtaining a thorough exposure history and maintaining a broad differential when presented with a chronic febrile illness. In our patient's case, tularemia was not considered initially in his evaluation as cases are so rare in Florida, and because his typhoidal presentation created such a broad differential of infectious, rheumatologic, and malignant processes. Although Florida has only reported 4 cases of tularemia in total over the past 10 years [1], attention should be given to emerging and re-emerging infectious diseases such as this with climate change patterns and subsequent changes in vector populations.

Institution Where Work Was Done

Mayo Clinic, Jacksonville, FL, USA.

Patient Permission/Consent

Patient consent was provided.

Declaration of Figures' Authenticity

All figures submitted have been created by the authors who confirm that the images are original with no duplication and have not been previously published in whole or in part.

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