Tularemia: Deer Fly Fever, Rabbit Fever, Pahvant Valley Fever

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Tularemia

- Initially described in the 19th century when Japanese physician Homma Soken
    - A febrile illness associated with adenopathy in individuals who ate hare meat.
- Rare zoonosis caused by *Francisella tularensis*
    - Reservoir small mammals such as rodents and rabbits, and arthropods, such as ticks.
    - **AKA Deerfly fever, rabbit fever**
- Small intracellular Gram-negative bacterium
- Three subspecies, two of which are of clinical importance.
    - ***F. tularensis*** subspecies ***tularensis*** occur only in North America.
    - ***F. tularensis*** subsp. ***holarctica*** occurs in North America, most of the countries in Europe and in Asia, from Russia to China Japan, and is generally associated with a less aggressive disease than the subspecies ***tularensis***

Tularemia

- Worldwide in Northern Latitudes
- 200/cases a year in US
- Higher rate of infection in Scandinavia
- Cats and dogs can become infected, and bites and scratches may transmit infection
- Viable in flies for weeks, ticks for years

Edward Francis at the lab bench 1920s

TULAREMIA

Dr. Edward Francis and His First 23 Isolates of *Francisella tularensis*

WILLIAM L. JELLISON *

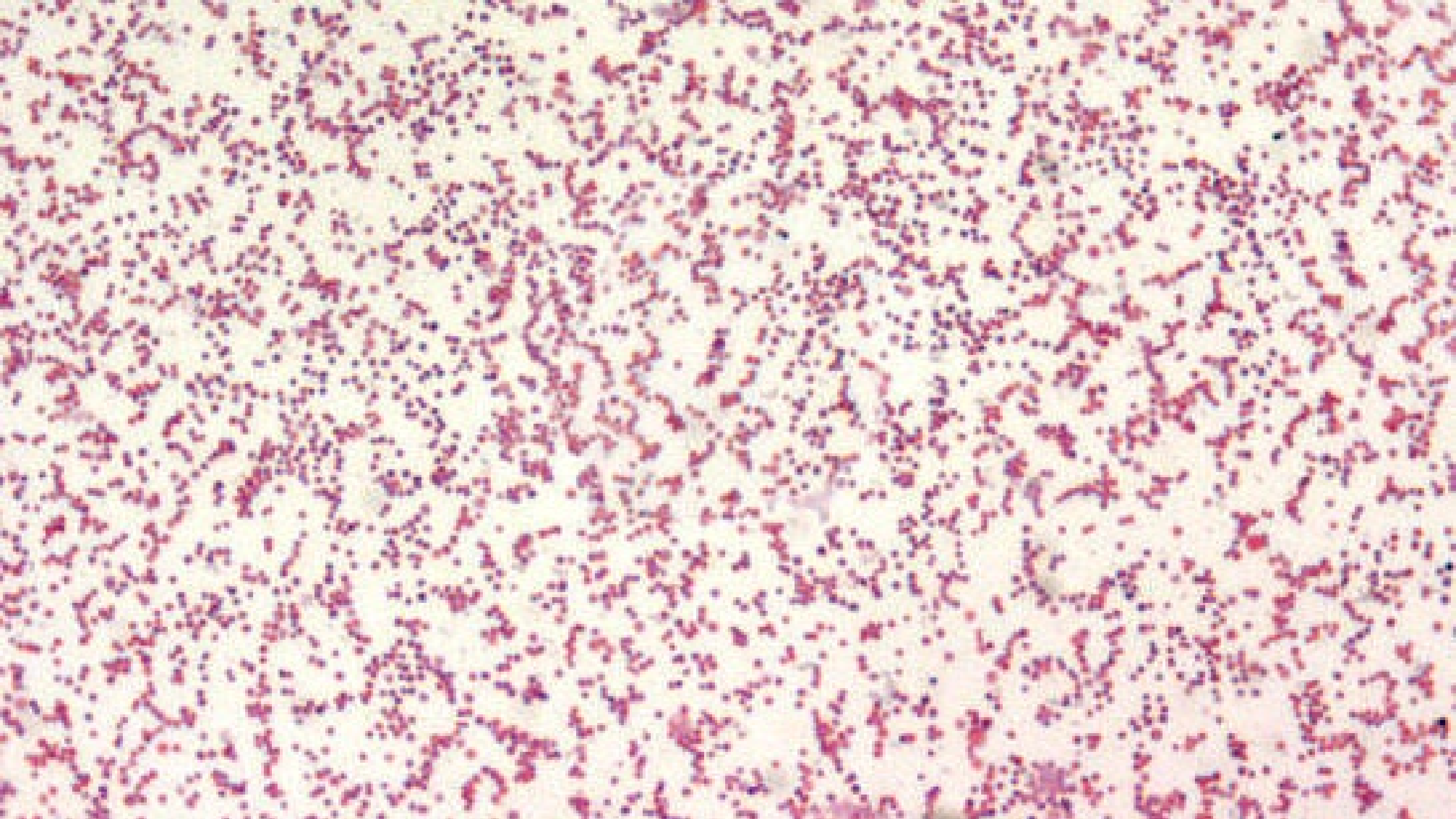
A spectacular glamour attached itself to the discovery of tularemia. It is a new disease, being recognized as such only since 1921. Its identity and complete description were worked out entirely by the collaboration of American investigators, the only such incident in history. As the problem of yellow fever was solved by members of the United States Army, so tularemia was the result of observations and research made by members of the United States Public Health Service. Also, as yellow fever took toll of that intrepid band of soldiers in Cuba, so has tularemia laid low those who sought to conquer it. It is a curious fact that all six members of the force connected with tularemia investigations in 1919 to 1921 contracted the disease; even the most elaborate precautions failed to prevent infection (Hull, 1930).

The one man more responsible for unraveling the intricacies and many manifestations of tularemia than any and all others combined was Dr. Edward Francis.

His first field assignment on this disease, as yet unnamed, was to study "deer-fly fever" in Utah. This is only one of the several epidemiological types of tularemia and had been described by Dr. Pearse of Utah in 1911. This was the first published description in the English language of what 10 years later was named tularemia.

While on his first trip to Utah, Dr. Francis immediately contracted the disease and was so completely naive regarding the insidious character of the infection that he did not suspect the cause of his own illness until a year later. Not only Francis but a dozen or so other laboratory workers were soon to learn more about this *tularense* organism from personal experience. Perhaps he was more concerned in getting his precious experimental animals back to Washington than in his own well-being or diagnosis. He stopped briefly in Chicago to transfer the infection to fresh animals but when he arrived in Washington he was quickly separated from them; the guinea-pigs went to the Hygienic Laboratory and Francis to the hospital. He recovered after a serious illness and in this

* Read at the 44th annual meeting of the American Association for the History of Medicine, Colorado Springs, Col., May 1, 1971.



Chrysops discalis

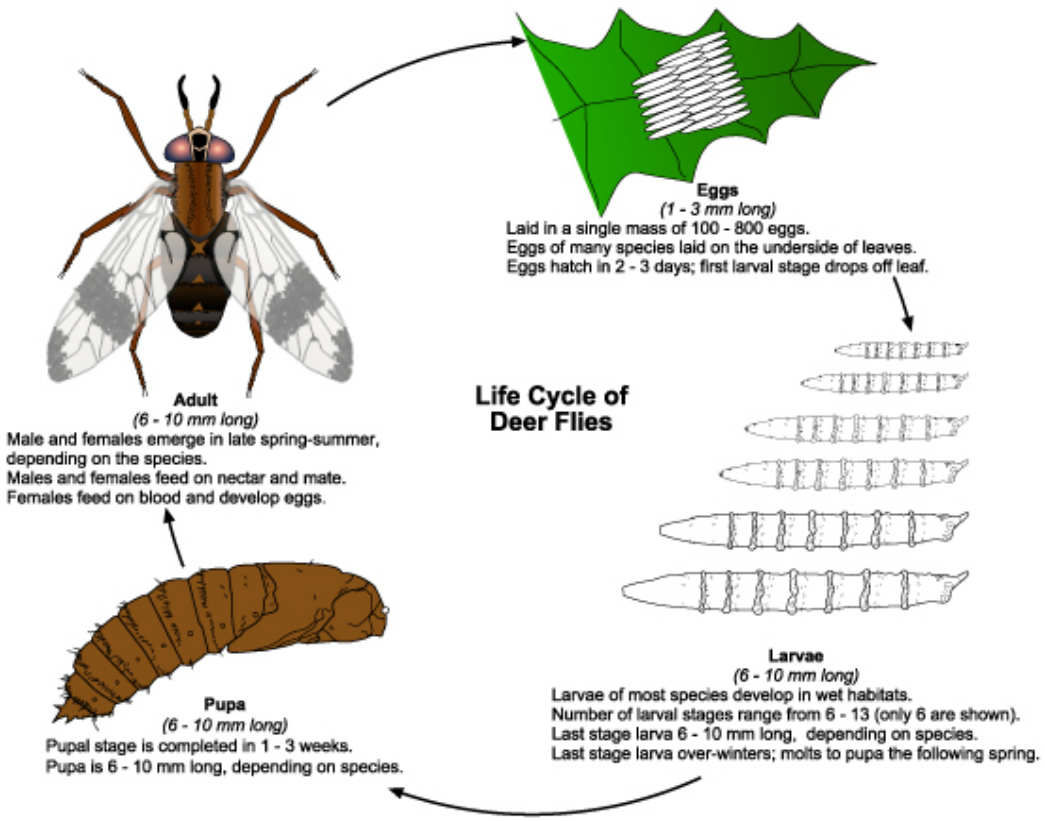
Male

Female

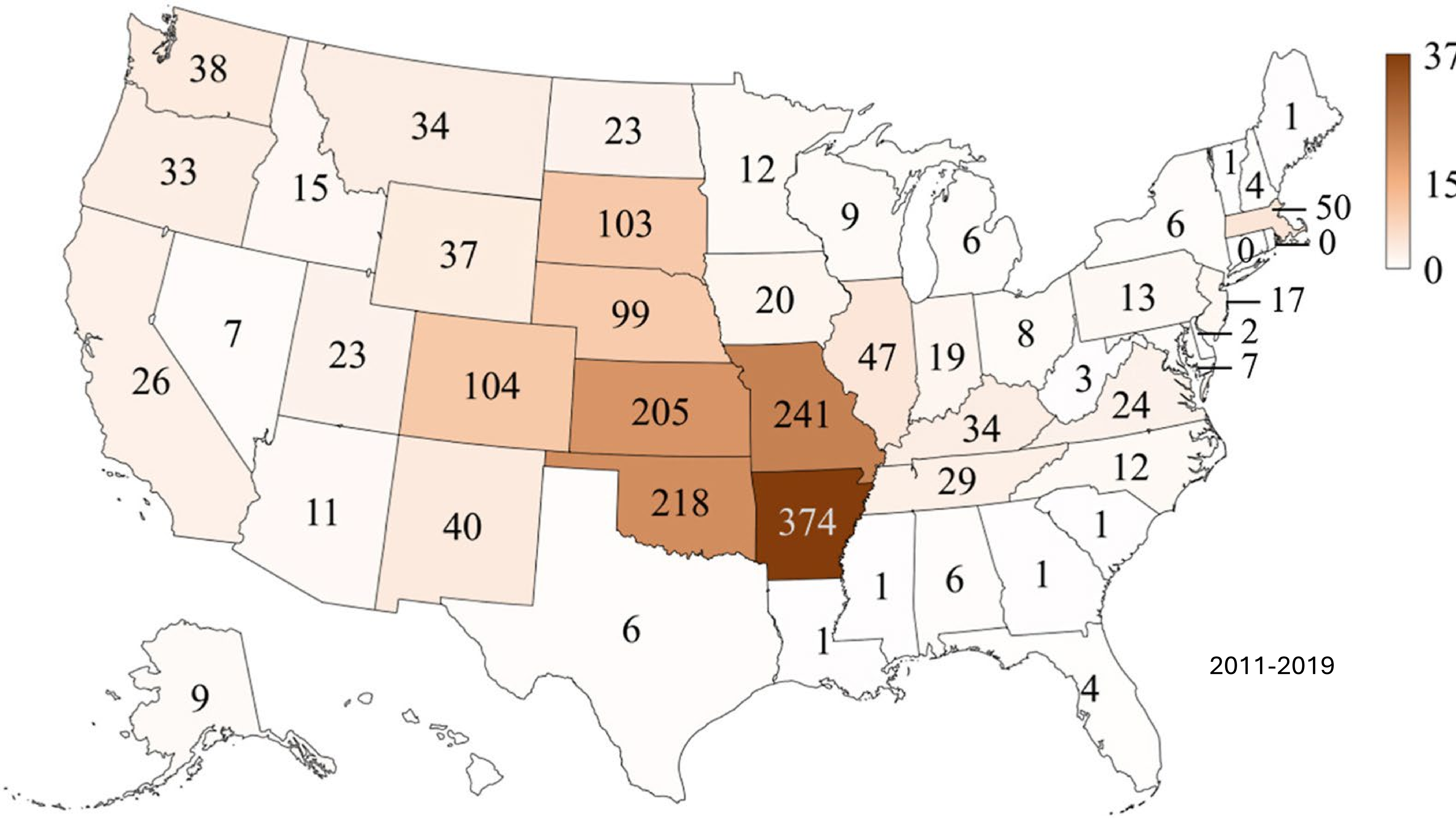
This was the vector of Pahvant Valley Fever; caused infection in kayakers on Colorado River in Arizona

One Vector: Deer Fly (*Chrysops discalis*)

Life Cycle



- Can you think of another disease vectored by *Chrysops* flies in West Africa?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Francisella tularensis

Modes of Acquisition of Tularemia

Transmission is multifarious

- Tick or biting fly bite
  - Dog tick (Dermacentor variabilis)
  - Wood tick (Dermacentor andersoni)
  - Lone star tick (Amblyomma americanum)
  - Deer flies (Chrysops spp.)
- Handling of an infected animal (rabbits, muskrats, prairie dogs and other rodents)
  - Also: domesticated cats, hamster
- Inhalation or ingestion of the bacterium
- People have not been known to transmit the infection to others.
- Incubation period: 3–5 days (range 1–21 days)

Clinical Presentation

- Enters the macrophage leading to:
- Fever
- Pulse-temperature dissociation
- Splenomegaly
- Normal or marginally elevated WBC

Tularemia as a bioterrorism weapon

- Two serovars: North America and Central Europe and Soviet Republics
- Easy to aerosolize
- Use in Manchuria
- Soviet-German front
- 50 kg—city of 5 million—250,000 cases—19,000 deaths

Diagnosis

Difficult to diagnose this rare disease; high index of suspicion based on epidemiological exposure

Laboratory Diagnosis

- Confirmatory: Isolation of F. tularensis from a clinical specimen
  - BCx: Often negative
  - Alert lab: cultures incubated for extended periods (fastidious, slow-growing)
- Supportive: clinical specimen by DFA, IHS staining, sequence-based technologies, or PCR
  - Ab responses can take 14+ days
  - A negative serologic test soon after illness onset does not exclude the diagnosis of tularemia.
  - A second test obtained several weeks later is needed to confirm or exclude the diagnosis.

Tularemia Treatment/Prophylaxis

- Gentamicin
- Doxycycline
- Ciprofloxacin

- Streptomycin