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# ENCEPHALITIS CAUSED BY BABESIA DUNCANI: UNRAVELING THE INTRICACIES



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## BACKGROUND

- Babesiosis, caused by apicomplexan parasites from the Babesia genus, is primarily transmitted by Ixodes scapularis ticks and occasionally through blood transfusion, organ transplantation, and congenital means.
- While over 100 species have been identified, including Babesia (B.) microti, B. divergens, B. duncani, and the yet unnamed MO-1 strain, B. duncani is primarily found on the West Coast.
- However, its presence in the northeastern US is now emerging<sup>1,2</sup>.
- Most cases occur during spring and summer, presenting with flu-like symptoms.

## CASE SUMMARY

- A 22-year-old male presented with fever and joint pains, having recently traveled to Israel and stayed in rural Pennsylvania. He did not recall a tick or mosquito bite.
- Labs were remarkable for WBC 3.1, low absolute neutrophil count (1.5 with 2 blast forms), elevated LDH 393, and elevated ALT/AST levels in 200s.
- Initially, he was treated for suspected Lyme disease with doxycycline, however he developed a headache which was suspected to be due to Doxycycline and was switched to Amoxicillin and Rifampin.
- Brain MRI showed findings of subarachnoid space infection.
- Serology and CSF studies for CMV, EBV, VZV, HSV, Anaplasma, Rickettsia, West Nile, cryptococcus, and parvovirus were negative.
- CSF studies were unremarkable with normal glucose, a slightly elevated protein with a white count of 44, with 99% monocyte predominance.
- Serology testing (WA1 IgG AB FTA) for B. duncani returned positive (> or = 1:256 Antibody). He was treated with azithromycin and atovaquone for 7 days. Eventually, his symptoms improved in 2-3 days.

## DISCUSSION

- Babesiosis occurrences were thought to be rare in Pennsylvania, and B. duncani cases even rarer<sup>3</sup>.
- This case report underscores the significance of B. duncani testing for suspected tick-borne illnesses and highlights its emergence in the eastern US.
- The unique presentation involves a traveler with unexplained neutropenia, thrombocytopenia, and hemolytic anemia unresponsive to doxycycline.
- Evidence suggests potential antibiotic resistance of B. duncani, complicating treatment with standard agents like atovaquone and azithromycin<sup>4</sup>.
- As per a study conducted by Renard I, et, al. the drugs Atovaquone, Azithromycin, Clindamycin, and Quinine have questionable efficacy in achieving parasite elimination.
- They believe that Quinolone when combined with Atovaquone is a promising treatment with better potency and efficiency to eliminate infection<sup>5</sup>.

## REFERENCES

- <https://www.cdc.gov/dpdx/babesiosis/index.html>
  4. Abraham A, Brasov I, Thekkiniath J, Kilian N, et. al. J Biol Chem. 2018 Dec 28;293(52):19974-19981. doi: 10.1074/jbc.AC118.005771. Epub 2018 Nov 21. PMID: 30463941; PMCID: PMC6311517.
  - <https://www.cdc.gov/parasites/babesiosis/epi.html>
  5. Renard I, Ben Mamoun C. Pathogens. 2021 Sep 1;10(9):1120. doi: 10.3390/pathogens10091120. PMID: 34578153; PMCID: PMC8469882.
- Figure 1 credit: Krause PJ. Int J Parasitol. 2019 Feb;49(2):165-174. doi: 10.1016/j.ijpara.2018.11.007. Epub 2019 Jan 26. PMID: 30690090.

## ABBREVIATIONS

LDH: Lactate dehydrogenase, AST: Aspartate transaminase, ALT: Alanine transaminase, CSF: cerebrospinal fluid, CMV: cytomegalovirus, EBV: Epstein-Barr virus, VZV: Varicella Zoster virus, HSV: Herpes simplex virus.

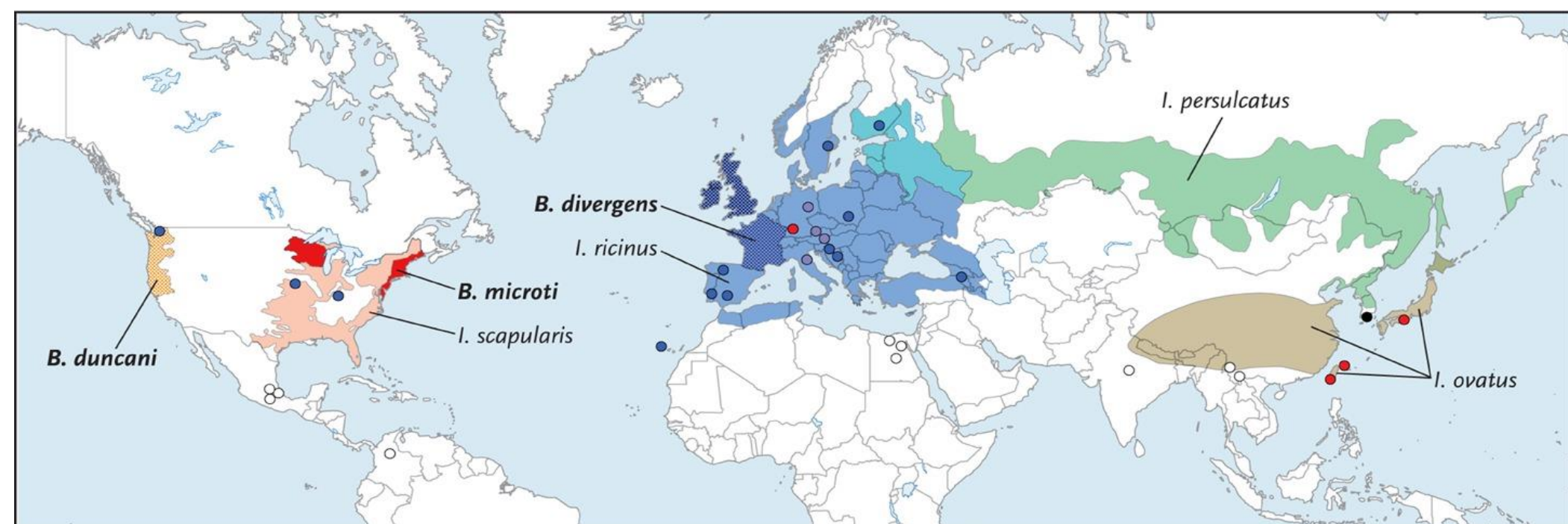


Figure 1: Geographic Areas Where Human Babesiosis and Ixodes Tick Vectors Are Endemic.

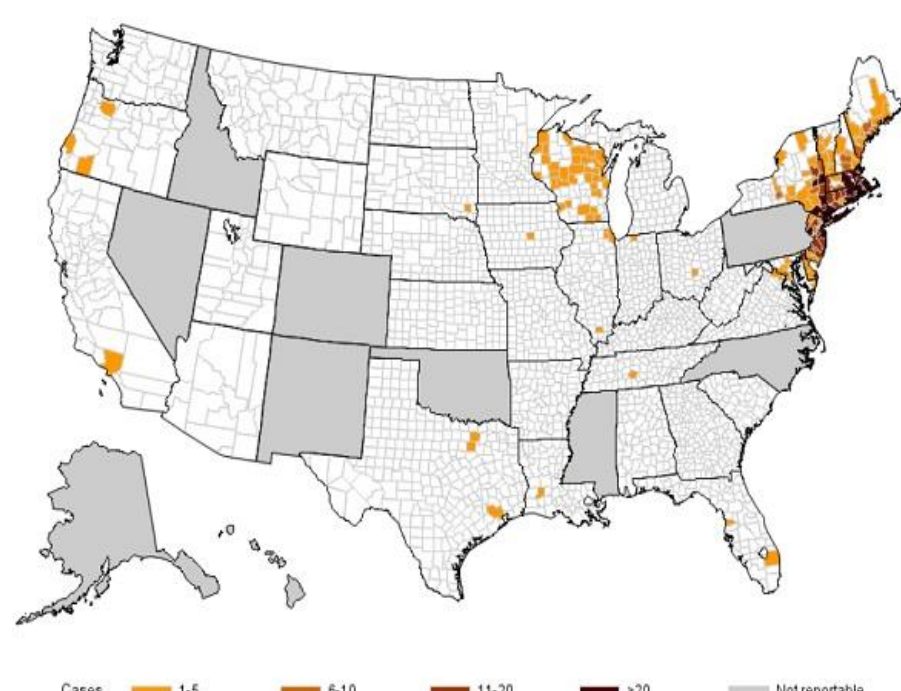


Figure 2; Number of reported cases of babesiosis, by county of residence — 40 states, 2020 -CDC

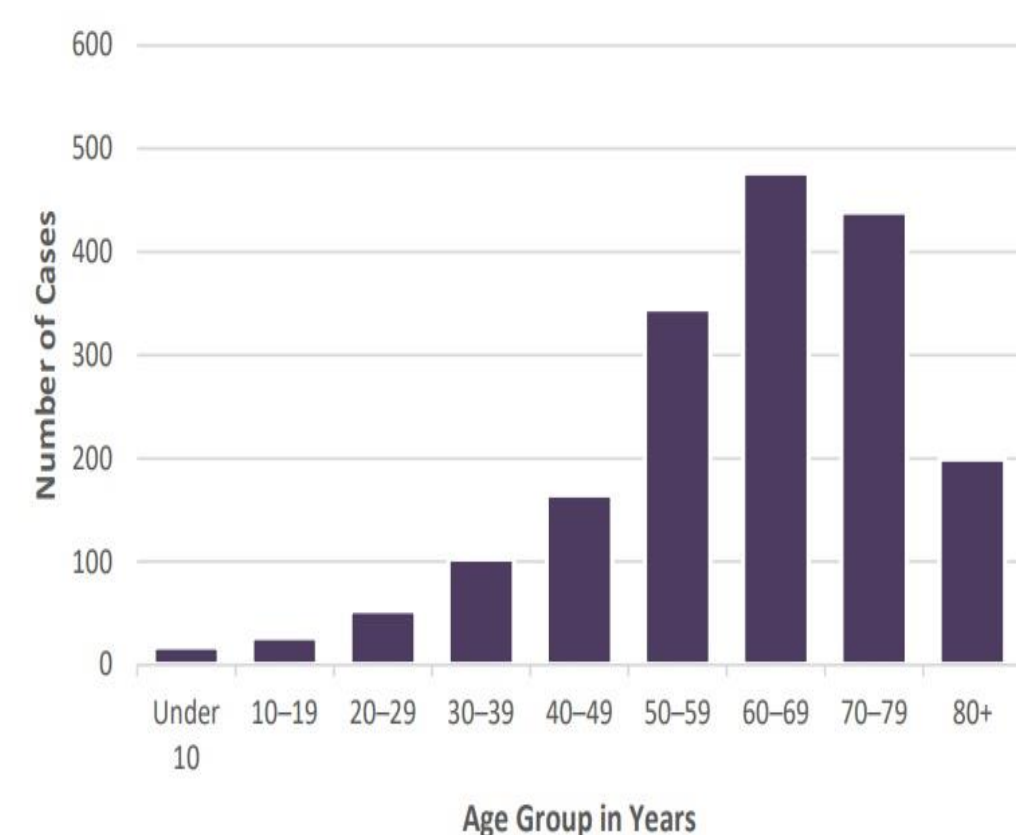


Figure 3: Number of reported cases of babesiosis, by age group in years, 2020 -CDC

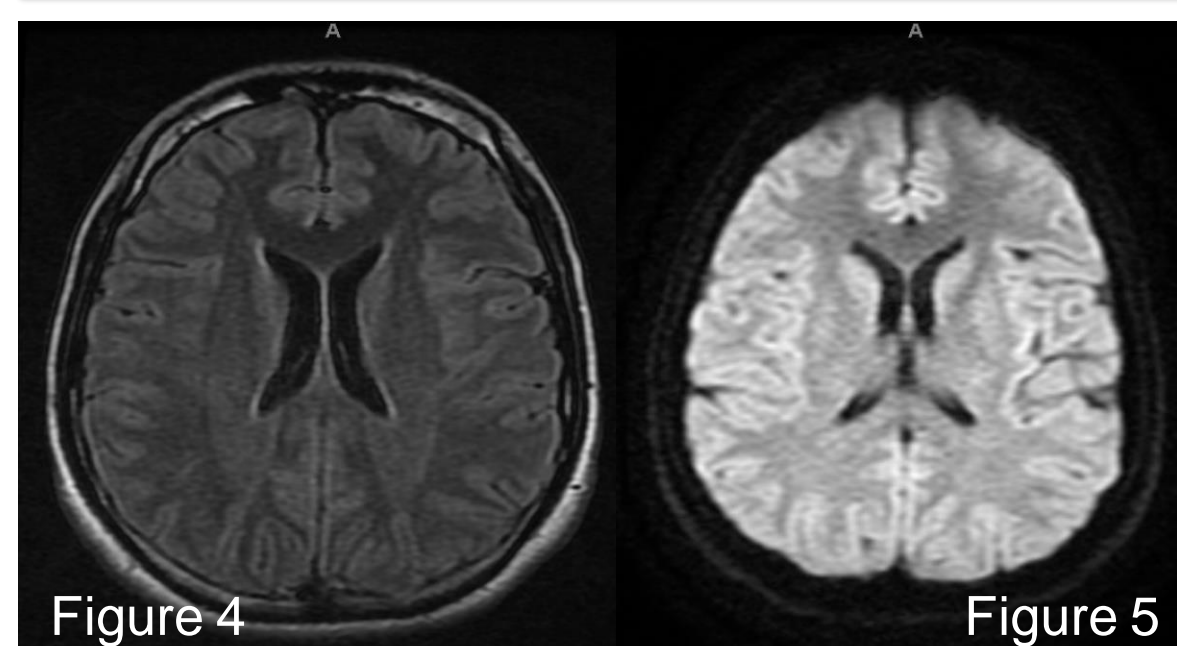


Figure 4

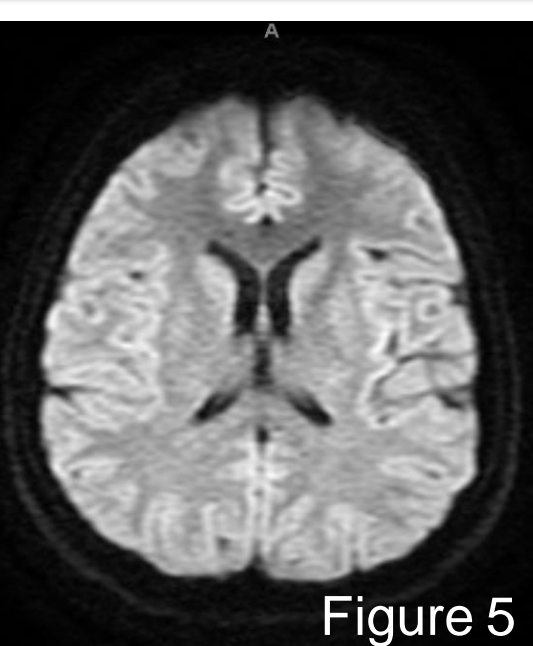


Figure 5

Figures 4 & 5: MRI showed findings of subarachnoid space infection; subtly increased conspicuity of gray white differentiation of cortical gyri and basal ganglia seen on both DWI and FLAIR sequences.



Figure 6

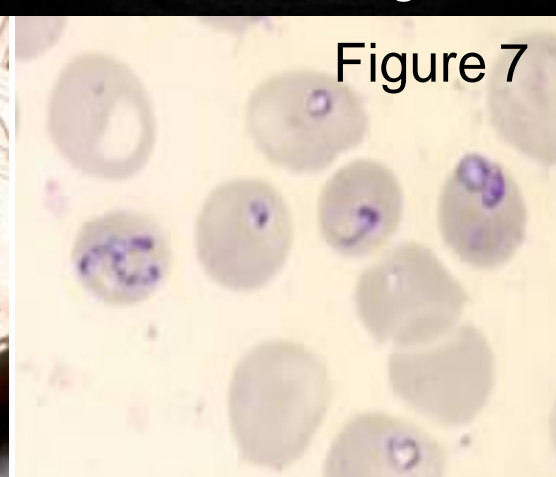


Figure 7

Figure 6: A nymphal stage Ixodes scapularis tick (about the size of a poppy seed) is shown here on the back of a penny. Credit: G. Hickling, University of Tennessee.

Figure 7: Babesia parasites in red blood cells on a stained blood smear. (CDC Photo)