

# Lyme disease protein tricks immune system, ignites arthritis

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Lyme disease patients often struggle with ongoing symptoms including arthritis. Findings from this latest study are a “testament to how unique this bacterium is — and how we need to keep working to understand more about what is going on behind the scenes in order to develop future diagnostics and treatments,” states Mari Davis, [lead author on the paper](#).

[In earlier studies](#), Brandon Jutras, a Virginia Tech biochemist, discovered that as the “Lyme-causing bacteria *Borrelia burgdorferi* multiplies, it sheds a cellular component called peptidoglycan that elicits a unique inflammatory response in the body.”<sup>1</sup>

Peptidoglycan, he reported, contributes to inflammation and Lyme arthritis.

Peptidoglycan is an essential component of bacterial cell walls. It was still present in Lyme disease patients weeks to months after the initial infection, inciting inflammation and arthritis, Jutras reported.

## NapA protein tricks immune system

[But most recently](#), scientists at the Jutras lab (lead by Brandon Jutras) identified a type of peptidoglycan-associated protein, called Neutrophil Attracting Protein A (NapA) in *Borrelia burgdorferi* bacterium.

“Using microfluidics, we demonstrate that NapA acts as a molecular beacon—exacerbating the pathogenic properties of *B. burgdorferi* [peptidoglycan].”<sup>2</sup>

NapA is an “immunomodulatory molecule that is able to recruit immune cells, called neutrophils, toward the inflammatory peptidoglycan,” the author explains.

“NapA is another piece to an ever-evolving puzzle; it seems to play a basic role in everyday bacterial life by helping the overall protective properties of peptidoglycan,” explains Jutras, “but it moonlights as a devious protein capable of tricking our immune system.”

## NapA has two devious sides

“Early in infection, when bacteria are dying and releasing NapA and peptidoglycan, it acts as a decoy to attract immune cells, which allows the viable bacteria to escape and cause disease,” Jutras explains.

“In later stages of disease, it may act to attract immune cells to peptidoglycan, a molecule capable of causing inflammation and arthritis.”

## Authors' Conclusion

The combination of peptidoglycan and NapA could serve as a novel target for prevention and diagnostics developments.

“One thing that we know for sure is that this finding furthers our understanding of how peptidoglycan can drive Lyme arthritis patient symptomology.”

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**References:**

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2. Marisela M. Davis, Aaron M. Brock, Tanner G. DeHart, Brittany P. Boribong, Katherine Lee, Mecaila E. McClune, Yunjie Chang, Nicholas Cramer, Jun Liu, Caroline N. Jones, Brandon L. Jutras. The peptidoglycan-associated protein NapA plays an important role in the envelope integrity and in the pathogenesis of the Lyme disease spirochete. *PLOS Pathogens*, 2021; 17 (5): e1009546 DOI: 10.1371/journal.ppat.1009546

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