Late stage Lyme disease treatment might include azlocillin in the future.

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https://danielcameronmd.com/late-stage-lyme-disease-treatment-azlocillin/

Researchers identified azlocillin after screening nearly 8,000 drug compounds. They found that in the test tube and in mice, azlocillin was effective against drug-tolerant *Borrelia burgdorferi s.s.*, the pathogen causing Lyme disease. But will late stage Lyme disease treatment soon include azlocillin, an FDA-approved drug that is often used to treat infections such as Pseudomonas aeruginosa and Escherichia coli? Stanford researchers say that is what they are working towards.

"This compound is just amazing," says Rajadas, senior author of the study. "It clears the infection without a lot of side effects. We are hoping to repurpose it as an oral treatment for Lyme disease."

Chronic Lyme disease

Unfortunately, treatment fails for too many patients with late stage Lyme disease. Multiple studies have shown that as many as 34% to 62% of patients have Lyme disease symptoms that persist long term despite treatment.

In fact, one study found that at their six-month follow-up visit, "36% of patients reported new-onset fatigue, 20% widespread pain, and 45% neurocognitive difficulties."

When late stage Lyme disease treatment fails, chronic symptoms may be due, in part, to what scientists call 'persisters,' bacterial cells that are resistant to antibiotics.

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"These studies reveal that a small subpopulation of dormant *B. burgdorferi* persisters still survives with current Lyme therapy antibiotics," says Pothineni and colleagues in the article, "Azlocillin can be the potential drug candidate against drug-tolerant *Borrelia burgdorferi sensu stricto*." [1]

"The probable mechanisms as evidenced by scientific literature are the persister formation, evading the immune system by hiding in the privileged sites, surface lipoproteins modifications to avoid antigenic responses, biofilm formation, and immunomodulation," explains Pothineni.

Azlocillin in mice

The authors inoculated mice with high doses of *Borrelia burgdorferi* (*Bb*) to test the effectiveness of each of the antibiotics. Doxycycline cleared the infection on Day 7 but did not clear the *Borrelia* bacteria at Days 14 and 21. Cefotaxime alone failed to eradicate the *B. burgdorferi* infection completely in mice who had been infected for 7 and 14 days.

Meanwhile, azlocillin completely cleared the infection in all mice but some *B. burgdorferi* DNA remained.

“Though the azlocillin eliminated *B. burgdorferi* infection completely in all the mice infected for 21 days, still 2 of 8 mice infected for 14 days had some *B. burgdorferi* DNA in ear tissues,” says Pothineni.

The authors points out, “the drug combinations of 40 ?g/ml azlocillin and 80 ?g/ml cefotaxime is much more effective in killing persisters than using azlocillin alone.”

Treatment for patients

Unfortunately, treatments that are successful in the test tube and in mice, may not work in humans.

Azlocillin is a semisynthetic ?-lactam drug that cannot be used in patients who are allergic to penicillin. Currently, it is only available intravenously and the dosage, duration, efficacy, and side effects in *B. burgdorferi*-infected patients has not been studied.

For now, there are a number of antibiotics that are better understood including oral doxycycline, amoxicillin, cefuroxime, cefdinir, azithromycin, and clarithromycin, as well as intravenous ceftriaxone and cefotaxime. And specific drugs are available to target tick-borne co-infections, such as atovaquone and azithromycin for the treatment of *Babesia*.

Lastly, medications, which have recently been studied in the laboratory or in mice are now being considered as late-stage Lyme disease treatment options. These include dapsone [2], a combination of daptomycin, ceftriaxone, and doxycycline [3-5], and disulfiram. [6]

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