

What is antibiotic resistance?

Antibiotic resistance is the ability of bacteria to resist the effects of an antibiotic. Every time a person takes antibiotics, sensitive bacteria are killed but the resistant ones can keep multiplying.

Examples of antibiotic-resistant infections

CRE (carbapenem resistant Enterobacteriaceae)

CRE infections are caused by a family of bacteria that are a normal part of a person's digestive system. These germs can cause infections when they get into the bladder, blood, or other usually sterile areas. Some of these germs have become resistant to all or almost all antibiotics, including last-resort drugs called carbapenems. Almost all CRE infections occur in patients receiving medical care. CRE infections are hard to treat, and in some cases, untreatable. When patients get CRE in their blood, up to half of them die as a result.

C. difficile (*C. diff*)

The *C. difficile* bacterium causes watery diarrhea, fever, loss of appetite, nausea and abdominal pain. Nationally, it is linked to 14,000 deaths each year. Long-term use of antibiotics is the strongest risk factor for developing *C. diff*.

MRSA (Methicillin-resistant *Staphylococcus Aureus*)

MRSA causes potentially life-threatening infections, such as bloodstream infections, surgical site infections or pneumonia. It can also cause skin infections that may appear as pustules or boils that often are red, swollen, painful, or have pus or other drainage. They can first look like spider bites.



Photo Credit: Gregory Moran, M.D.

Why should we be concerned?

Antibiotic resistance is one of the world's most pressing public health problems. Almost every type of bacteria has become stronger and less responsive to antibiotic treatment. Antibiotic-resistant bacteria can spread to family members, schoolmates, and co-workers – threatening the entire community with a strain of disease that is more difficult to cure.

What about long-term antibiotic treatment for Lyme disease?

Lyme disease treatment guidelines based on the available scientific evidence, such as those developed by the Infectious Disease Society of America (IDSA),^[1] do not recommend open-ended long-term antibiotics. Randomized, placebo-controlled trials published in the scientific literature^{[2][3][4]} do not support the use of long-term antibiotic therapy. There are at least two published accounts of death due to long-term antibiotic use, both in patients with no objective evidence of Lyme disease^{[5][6]}. A study conducted by the New Jersey Department of Health identified 25 patients on long-term antibiotics for Lyme disease who were hospitalized for catheter infections and colicystitis^[7]. Over half of these patients required abdominal surgery for gallstones caused by the prolonged antibiotic therapy. Because they may not all be reported, the true public health burden of these events is not known.

[1] Wormser GP, Dattwyler RJ, Shapiro ED, Halperin JJ, Steere AC, Klemmner MS, Krause PJ, Bakken JS, Strle F, Stanek G, Bockenstedt L, Fish D, Dumler JS, Nadelman RB. The clinical assessment, treatment, and prevention of Lyme disease, human granulocytic anaplasmosis, and babesiosis: clinical practice guidelines by the Infectious Diseases Society of America. *Clin Infect Dis*. 2006 Nov 1;43(9):1089-134. Erratum in: *Clin Infect Dis*. 2007 Oct 1;45(7):941.

[2] Klemmner et al. 2001. "Two Controlled Trials of Antibiotic Treatment in Patients with Persistent Symptoms and a History of Lyme Disease." *New Eng J Med* 345:85-92.

[3] Krupp LB, Hyman LG, Grimson R, Coyle PK, Melville P, Ahnn S, Dattwyler R, Chandler B. "Study and treatment of post Lyme disease (STOP-LD)." *Neurology* 2003;60:1923-1930.

[4] Fallon, BA et al. 2008.

[5] Patel R, Grogg KL, Edwards WD, Wright AJ, Schwenk NM. Death from inappropriate therapy for Lyme disease. *Clin Infect Dis*. 2000 Oct;31(4):1107-9.

[6] Holzbauer, S, Kemperman, M, and Lynfield, R. 2010 Death due to Community-Associated *Clostridium difficile* in a Woman Receiving Prolonged Antibiotic Therapy for Suspected Lyme Disease. *Clin Infect Dis*. 51:369-370

[7] CDC. Ceftriaxone-Associated Biliary Complications of Treatment of Suspected Disseminated Lyme Disease — New Jersey, 1990-1992. *MMWR* 1993;42(02):39-42.