

Prolonged transmission of a resistant bacterial strain in a Northern California hospital

June 24 2019

Researchers have used whole genome sequencing (WGS) to demonstrate transmission of a single bacterial strain that possessed a carbapenem-resistance gene in a northern California hospital. The gene armed the bacteria with resistance to carbapenems, a type of antimicrobial drug reserved as a last-line treatment for serious infections. The research is presented on Sunday, June 23rd at ASM Microbe, the annual meeting of the American Society for Microbiology.

Epidemiologists from the local public health department and the California Department of Public Health (CDPH) collaborated with laboratory scientists from the CDPH Microbial Diseases Laboratory (MDL) to characterize the strain and identify potential transmission pathways in combination with epidemiologic information.

The [bacterial strain](#) persisted in the hospital for over 3 years, potentially due to transmission from patient to patient combined with lengthy stays in the hospital [intensive care unit](#) (ICU). "Our investigation highlights the importance of regular epidemiological and microbiological monitoring of resistant [strains](#) in hospitals and the use of the advanced molecular technologies to track their spread," said Varvara Kozyreva, Ph.D. Genotyping Unit Chief, Microbial Diseases Laboratory Program, California Department of Public Health.

Between 2013 and 2015, the hospital identified eight patients who were

positive for a strain of *Klebsiella pneumoniae* [bacteria](#) that produced an enzyme conferring resistance to carbapenems. The initial four patients identified with the resistant strain had overlapping stays in the ICU over a one-month period. One of these initial patients remained in the ICU for two years, during which time an additional four patients with the resistant bacterial strain were found in the facility. WGS analyses of the bacteria from the eight different patients demonstrated they were all highly related genetically.

"WGS allowed us to understand and demonstrate connections among the [patients](#) over a multiple year time period, which would not have been possible using epidemiologic information alone," said Dr. Kozyreva. WGS also showed that this particular bacterial strain's carbapenem-resistance gene appeared to be located on the chromosome. Normally, such resistance genes are located on additional "mobile" DNA pieces called plasmids, that can be transferred between different strains (and even [different species](#)) of bacteria.

"Since this particular strain had less means to efficiently share its carbapenem-resistance genes with other bacteria in the hospital environment, it is all the more likely that this one antibiotic-resistant clone of bacteria persisted in the [hospital](#) over multiple years," said Dr. Kozyreva. Using WGS to track resistant bacterial strains can help hospitals and public health officials target infection control interventions to halt transmission sooner.

Provided by American Society for Microbiology

Citation: Prolonged transmission of a resistant bacterial strain in a Northern California hospital (2019, June 24) retrieved 11 May 2024 from <https://medicalxpress.com/news/2019-06-prolonged-transmission-resistant-bacterial-strain.html>

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