The Path to High Drug Resistance for Staph Infections

Antibiotic-resistant pathogens pose a severe public health threat with difficult to treat infections often requiring multiple drug combinations.

Now, in the advanced online edition of Molecular Biology and Evolution, authors Mari de Evgrafov et al. (2015) examined how several strains of Staphylococcus aureus evolved resistance to five different antibiotic drugs and three different combinations (including the increasingly threat of methicillin-resistant S. aureus, or MRSA). In all, 24 different bacterial lineages (15 single drug and 9 combinations) were followed during their adaptation experiments.

Alarmingly, the study showed that high-level exposure to single antibiotics specifically selects for resistant strains, increasing the ability to adapt and survive with each exposure. The resistance after five exposures was 100 to 1,000 times greater than normal. In contrast, drug combinations were found to be effective at limiting resistance evolution. DNA sequencing revealed that the resistance patterns are reflected by mutational differences in the evolved S. aureus strains.

“In this study, we show that collateral effects of drug resistance evolution can be exploited in the selection of drug combinations to limit the evolution of antibiotic resistance in S. aureus,” said corresponding author Morten Sommer.

They conclude that resistance toward drug combinations is largely mediated by the same mutations that confer resistance toward the drugs individually. Additionally, they find that collateral effects of resistance evolution play a key role in modulating resistance evolution for drug combinations. These results could aid in the selection of novel treatments of S. aureus with limited resistance potential.

Reference

Joseph Caspermeyer* 1
1 MBE Press Office
*Corresponding author: E-mail: MBEpress@gmail.com.
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