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Antibiotic resistance in bacteria

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Antibiotic resistance is a key medical concern, with antibiotic use likely being an important cause. However, here an alternative route to clinically-relevant antibiotic resistance that occurs solely due to competitive interactions between bacterial cells and in the absence of any antibiotic treatment is described. It is consistently observed that isolates of Methicillin-resistant *Staphylococcus aureus* diversify spontaneously into two distinct, sequentially arising strains. The first evolved strain outgrows the parent strain via secretion of surfactants and a toxic bacteriocin. The second is resistant to the bacteriocin. Importantly, this second strain is also resistant to intermediate levels of vancomycin. This so-called VISA (vancomycin-intermediate *S. aureus*) phenotype is seen in many hard-to-treat clinical isolates. This strain diversification also occurs during *in vivo* infection in a mouse model, consistent with the fact that both coevolved phenotypes resemble strains commonly found in clinic. The study shows how competition between coevolving bacterial strains can generate antibiotic resistance and recapitulate key clinical phenotypes.

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