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**Bacterial cheating limits the evolution of antibiotic resistance** HUI XIAO CHAO, MANOSHI DATTA, EUGENE YURTSEV, JEFF GORE, Department of Physics, Massachusetts Institute of Technology — The widespread use of antibiotics has led to the evolution of resistance in bacteria. Bacteria can gain resistance to the antibiotic ampicillin by acquiring a plasmid carrying the gene beta-lactamase, which inactivates the antibiotic. This inactivation may represent a cooperative behavior, as the entire bacterial population benefits from removing the antibiotic. The cooperative nature of this growth suggests that a cheater strain–which does not contribute to breaking down the antibiotic–may be able to take advantage of cells cooperatively inactivating the antibiotic. Here we experimentally find that a "sensitive" bacterial strain lacking the plasmid conferring resistance can invade a population of resistant bacteria, even in antibiotic concentrations that should kill the sensitive strain. We observe stable coexistence between the two strains and find that a simple model successfully explains the behavior as a function of antibiotic concentration and cell density. We anticipate that our results will provide insight into the evolutionary origin of phenotypic diversity and cooperative behaviors found in nature.

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