Dynamics, Noise, and Antibiotic Resistance in Single Cells

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The majority of our understanding on antimicrobial drug resistance comes from studies on the genetic changes that cause it, however bacteria can also transiently survive antibiotic exposure even without permanent genetic changes. Using a combination of time-lapse microscopy experiments and stochastic modeling I will show how *E. coli* bacteria use feedback to generate dynamics and noise in expression of a key regulatory protein, providing transient antibiotic resistance at the single-cell level. In addition, I will discuss how expression of resistance genes can predispose cells towards mutation. Our findings show that even in the absence of antibiotic exposure, cells that are transiently resistant are more mutation prone, suggesting that these transient mechanisms may act as a stepping stone towards higher levels of drug resistance. These results are significant because they reveal important dynamic information about the period over which transient resistance develops and ultimately how it can lead to permanent genetic changes encoding multidrug resistance.

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