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A Stochastic Cooperative Agent Model of Band-Pass Antibiotic Resistance[1] LOUIS NEMZER, ROBERT SMITH, Nova Southeastern University — The recently described phenomenon of band-pass antibiotic resistance occurs when bacteria exposed to a periodic environment of oscillating antibiotic concentration grow fastest at intermediate period lengths. Previously, it has been shown that such behavior can arise from a non-linearity in individual fitness as a function of the initial colony density, called the "Allee effect," as well as a fixed-point catastrophe that depends very strongly on the antibiotic concentration. Here, we present a new agent-based, *in silico* stochastic model of cooperative antibiotic resistance. This model attempts to capture the behavior of "cooperative" bacteria that, for example, expend resources to produce enzymes that break down β-lactam antibiotic molecules, but are subject to the problem of freeloading by non-secretors that benefit but do not contribute. Colony survival can be threatened when exposed to a periodic antibiotic challenge. By creating a simulation in which the bacteria are modeled as stochastic agents, the effect of antibiotic concentration, period of antibiotic oscillation, and degree of cooperativity can be evaluated.

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