Exploiting temporal gradients of antibiotic concentration against the emergence of resistance MARIANNE BAUER, Ludwig-Maximilians-Universitt Munich, VUDTIWAT NGAMPRUETIKORN[1], Okinawa Institute of Science and Technology, ERWIN FREY, Ludwig-Maximilians-Universitt Munich, GREG STEPHENS, Vrije Universiteit Amsterdam and Okinawa Institute of Science and Technology — A very simple model for antibiotic resistance - involving one normal and one more resistant species interacting indirectly through a carrying capacity - shows that the temporal variation of the antibiotic can affect the effect of the antibiotic. For a single antibiotic pulse, we find that for different minimal inhibitory concentrations of the two species an optimal pulse shape may exist, which increases the likelihood of bacterial extinction. For a long series of pulses, efficiency does not vary monotonically with the length of the gap between two individual pulses, but instead, the gap length can be optimised by exploiting the competition between the two species. Finally, a series of pulses is not always more efficient than a single pulse. Shorter pulses may be more efficient in an initial time window without risking population level resistance. We elucidate this behaviour with a phase diagram, and discuss the meaning of this work for current experiments.

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