Cologne Evolution Colloquium

CRC 1310 Predictability in Evolution

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Multi-phage resistance evolution

Antibiotic resistance is on the rise and bacterium-infecting viruses (phages) are increasingly used as a last-resort therapeutic for patients suffering from antibiotic-resistant infections. However, the emergence of phage-resistant mutants is a major problem during treatment: after an initial relief of bacterial load, patients often suffer from relapses. Multidrug cocktails have proven themselves as a resistance-proof approach against a range of diseases, such as HIV/AIDS, tuberculosis, influenza, malaria, and many forms of cancer. Therefore, multi-phage cocktails are increasingly used with the hope of preventing resistance. However, in stark contrast to other multidrug treatments, resistance against all components of a multi-phage cocktail is frequently observed during therapy. Why?

By combining theory and experiments, we show how phage replication dynamics and bacterial evolutionary dynamics uniquely intertwine, creating a perfect storm where bacteria can sequentially acquire multi-phage resistance with near-certainty. These results explain why even multi-phage resistance is so frequently observed during treatment. Our work also shows the existence of a regime where multi-phage resistance is virtually impossible and therefore provides actionable insights toward resistance-proof therapy.

If time permits, I will also talk about phages which can infect and eradicate metabolically inactive bacteria.

Monday, 17 February 2025, 14:00
Institute for Biological Physics, Zülpicher Str. 77a
Seminar Room S0.02
Hosted by Tobias Bollenbach