

Understanding Drug Resistance: Experimental Evolution in a One Health Context

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Antimicrobial resistance poses a serious threat to public health. Drug resistance is a pervasive problem in the treatment of infectious diseases regardless of the nature of pathogens and parasites. Current strategies to tackle drug resistance are almost entirely focused on drug development and prudent use of drugs. While important, we argue that these strategies are not sufficient. They need to be augmented by approaches that explicitly acknowledge and study the dynamics of drug resistance evolution to allow the prediction of drug resistance evolution. Such predictions would shift the treatment of drug-resistance from a post hoc to a predictive approach that could potentially prevent the evolution of drug resistance a priori. This is the main goal of this proposal. As drug resistance is a pervasive one-health challenge, we combine the expertise of researchers from human and veterinary medicine, theoretical biology and evolutionary biology. Four empirical projects, two on viruses, one on bacteria and one on parasitic nematodes, will use experimental evolution approaches to study resistance evolution across different organisms and treatment approaches. Central to these efforts is a theoretical project that will closely interact with all empirical research to identify generalizable principles of resistance evolution. The main goal is develop a framework for predicting drug resistance evolution across several pathogens and drugs and hence to foster sustainable drug usage. Moreover, the postdoctoral researchers on this project will be trained as a new generation of researchers in evolutionary translational medicine.

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