

NanoBiotechnology and Synthetic Biology Design Approaches towards the Development of Smart Therapeutics Against Infectious Diseases

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Introduction

There is a growing need to enhance our antibacterial arsenal given the rising incidence of antibiotic resistance, the emergence of novel virulent pathogens, and the almost 40-year innovation gap between introductions of new molecular classes of antibiotics. In the face of newly infectious organisms and the global crisis in antibiotic resistance, there is a need to invigorate the basic science and technology of antimicrobial development. This talk, focuses on the different engineering approaches to resolve some of the challenges in antibiotic development. The first approach involves exploring potentiation of current antibiotics using novel and naturally existing therapeutic adjuvants (such as silver and supplementary metallic micronutrients) based on a better understanding of the mechanisms of infectious disease, a comprehension of microbe-therapeutic biochemical interactions as well as the microbial genetic responses to therapeutics. The second approach includes some of the work in progress to develop novel drug delivery systems, using the interface of Nanotechnology and Synthetic Biology, to design intelligent and endogenous antimicrobial therapeutics. The third approach addresses the commitment to discover novel antimicrobial molecules and therapies. Finally as a fourth approach, this talk describes an innovative mechanism to discover antimicrobial molecules through the identification of fruitful competitive biochemical interactions between a set of microorganisms in synthetic and natural ecologies.