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The pros and cons of being a parasite: Obligate parasites produce myriads of protein isoforms from each gene

Sergey Melnikov
Yale University, USA

I study the phenomenon of genome decay in obligate intracellular parasites – organisms that exploit living cells of other species as a nutrient-rich shelter in which to grow, reproduce, and evade the host immune response. As intracellular parasites evolve under conditions with alleviated natural selection, they suffer from irreversible accumulation of deleterious mutations and progressive genome decay. Through biochemistry, genetics, structural biology and bioinformatics, I investigate how the genome decay affects structure and activity of molecular machineries of a parasite cell. Because the genome decay problem is universal, I move back and forth between bacterial and eukaryotic pathogens (Microsporidia, Wolbachia, Mycoplasma). These studies are important because they are uncovering fundamental principles and predictable routes of pathogen evolution and because they may lead to new effective therapies to eliminate diseases caused by intracellular parasites.

The talk will present my recent findings that the genome decay in intracellular parasites eradicates one of the most fundamental properties of a cell – its ability to accurately translate the genetic code into correct protein sequences. For instance, in Microsporidia – emerging pathogens of animals, including humans, mosquitos and honey bees – protein synthesis is accompanied with statistical errors in protein sequence leading to expression of myriads of protein isoforms from each gene. In my talk I will highlight our current efforts to understand the impact of error-prone protein synthesis on parasites' fitness and parasite-host interaction. Also, I will present our progress in using the error-prone protein synthesis as a target to treat parasite infections.

e: serguey.v.melnikov@gmail.com

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