

## Seminar in Microbiology

Monday, January 9, 2017

Salle de séminaire E07.3347.a, CMU

**11:30 – 12:30**

**Médéric Diard**

Institut of Microbiology, ETH Zürich



### Experimental micro-evolution of virulence and cooperative behaviors in pathogenic bacteria

As exemplified by the current antibiotic crisis, the rapid evolution of bacterial pathogens makes them a constantly renewed threat for public health worldwide. Nevertheless, our general understanding of the evolutionary dynamics of virulence remains limited and further insights could inspire alternative strategies to rationally manage pathogen spread. The intestine of humans and farm animals hosts very large populations of bacteria, some of them being potentially pathogenic. Understanding the forces that drive bacterial evolution in the intestine is therefore critical in preventing the emergence of virulence.

I am focusing on *Salmonella* Typhimurium, an archetypal entero-pathogen of considerable economic and medical importance. Using experimental evolution, we have recently revealed that avirulent mutants (i.e., defectors) overwhelm populations of *S. Typhimurium* during within-host growth, impairing transmission to the next host. However, antibiotic treatment favors virulent clones of *S. Typhimurium* that survive as persisters within the intestinal mucosa. Upon clearance of the drug, these virulent clones can reseed the gut lumen to very high densities and reinitiate efficient transmission [1]. Thus, environmental conditions, as well as tight regulation of gene expression [2], exert strong influences on the evolution of *S. Typhimurium* virulence. The dynamics of horizontal gene transfers between strains of *S. typhimurium in vivo* will further elucidate the influence of gene flow and host physiology on virulence maintenance.

The rise of avirulent defectors is signature for cooperative virulence, a phenomenon recognized in a growing number of pathogens. Well-characterized and genetically tractable, *S. Typhimurium* represents a potent model to understand emergence, maintenance and evolvability of inherently unstable cooperative behaviors in pathogenic bacteria. This weak point in a pathogen's lifestyle has yet to be efficiently targeted and opens a novel field for alternative pathogen management strategies that intersects between evolutionary biology, ecology, infection biology, genetic and immunology.

[1] Diard et al. Current Biology 2014

[2] Diard et al. Nature 2013