

Micro201  
Rudner Class 5: Toxin-Antitoxin Systems  
March 26<sup>th</sup> 2019

Overview:

In this class we will discuss plasmid and chromosomally encoded Toxin-Antitoxin (TA) systems. The background readings include a comprehensive review on these interesting modules (Yamaguch, Park and Inouye 2011) and a more recent review that discusses the current view on the mechanisms underlying bacterial persistence (Fisher et al 2017). TA systems are thought to play an important role - although the jury is definitely still out. The required reading is a beautiful paper in which Aakre and colleagues identify and characterize a novel TA system in *Caulobacter crescentus*. In this case, the toxin targets DNA replication but unlike other TA systems, instead of inhibiting DNA gyrase it targets the beta clamp. I have never seen so many experiments work out as cleanly as they do in this paper. I hope it will be inspirational (and aspirational) rather than simply depressing. As always, think about whether the experiments are convincing and what you would do next. And consider why *C. crescentus* might encode such a TA system. What is the benefit of inhibiting replisome progression in this case? Can you come up with more “out of the box” explanations than they do?

The second required reading (Helaine et al 2014) suggests that studying the role of TA systems in persistence (and antibiotic tolerance) is best done in the context of infection. Read critically but don't sweat the details if you're unfamiliar with all the techniques used.

enjoy.  
David

**Primary Papers:**

Aakre, Phung, Huang, Laub (2013)  
Helaine et al (2014)

**Background Reading:**

Yamaguch, Park and Inouye (2011)  
Fisher et al (2017)