

Micro 201:
Bernhardt Lecture 7 - Phage vs Host
February 19, 2019

Overview:

For this class period our focus will be on the ongoing battle between bacteria and the viruses that prey on them. I will start off with a brief overview of the history of bacteriophage research. Following this, I will highlight a few different strategies used by bacteria to thwart phage infections and the countermeasures taken by phages to overcome them. For the paper discussion, we will explore the ever popular topic of CRISPR elements. These clustered regularly interspaced short palindromic repeats and their associated protein reading frames (Cas genes) are intriguing defense systems that generate short RNAs directed against invader nucleic acids. We will cover two papers investigating how phages overcome CRISPR systems or use them to subvert other bacterial defenses. Finally we will discuss how an anti-phage element in *Vibrio cholerae* is induced to target a phage.

Papers for discussion:

- 1) Joe Bondy-Denomy, April Pawluk, Karen L Maxwell, and Alan R Davidson. **Bacteriophage genes that inactivate the CRISPR/Cas bacterial immune system.** (2013) Nature 493:429-432.
- 2) Kimberly Seed, David Lazinski, Stephen Calderwood, and Andrew Camilli. **A bacteriophage encodes its own CRISPR/Cas adaptive response to evade host immunity.** (2013) Nature 494: 489-491
- 3) Amelia McKitterick and Kimberly Seed. **Anti-phage islands force their target phage to directly mediate island excision and spread.** Nature Communications 9:2348

General Reviews:

- 1) Luciano Marraffini. **CRISPR-Cas Immunity in prokaryotes.** (2015) Nature 526: 55-61
- 2) Simon J Labrie, Julie E Samson, and Sylvain Moineau. **Bacteriophage resistance mechanisms.** (2010) Nat Rev Microbiol 8: 317-322