

Pre-Class Assignment for “Becoming a Friend Instead of a Foe”

The following assignment is an individual effort. After you complete the “Pre-Class Reading,” answer the questions that follow the “Introduction” below and submit at the beginning of class. *All* sources must be documented, including any texts, fellow students, or online resources. If in doubt, annotate the source or ask your instructor. Use complete sentences for full credit.

Learning Objectives

1. Understand basic bacteria-insect symbiotic relationships.
2. Understand how to select organisms and design experiments symbiotic origin hypothesis.
3. Analyze and interpret collected data from a symbiotic designed experiment.

Pre-Class Reading

Read “Making of a Friendly Microbe” from the references below (Young, 2017) as an introduction into this material. After completing this reading, access “Quorum Sensing Attenuates Virulence in *Sodalis praecaptivus*” (Enomoto *et al.*, 2017). Within this source, read the summary, abstract, and introduction to understand the context and background of *Sodalis praecaptivus*. Read the “QS Controls a Weevil-Killing Phenotype” section within the Results and specifically review the results shown in Figure 4, parts A–C.

Introduction

As a new research student in the lab you are eager to learn more about bacteria and symbiosis, the primary focus of your principal investigator (PI). She recommends that you review some material (Young, 2017; Enomoto *et al.*, 2017) to prepare for your next research meeting. A post-doctoral student in the lab gives you a brief overview of the bacteria and how it was discovered:

An elderly man suffered a persistent, localized infection after impaling his hand with a crab apple tree branch. After antibiotic treatment failed to eliminate the infection, further medical screening, specifically genome sequencing, was used to identify the pathogen causing the infection. The sequencing resulted in the identification of a new, unknown bacterial species of the Sodalis genus, taxonomically categorized as Sodalis praecaptivus (Clayton et al., 2012). Our lab is particularly interested in the relationship between this species and host organisms.

You later reflect on this conversation and realize that you have some homework to do. After reviewing the material your PI recommended, you answer the following questions to prepare for your research meeting.

Questions

1. Define the following key terms:
 - a. Quorum sensing (QS):
 - b. Endosymbiont:
 - c. $\Delta ypeI$ A mutant:
 - d. $\Delta ypeR$ Mutant:

e. $\Delta yenR$ Mutant:

f. genome degeneration:

2. The *Sodalis* genera of bacteria are studied in this paper because _____.
 - a. the *Sodalis* genera are extremophiles.
 - b. the *Sodalis* genera represent bacterial phylotypes that are predisposed to mutualistic symbiotic relationships with insects.
 - c. the *Sodalis* genera are pathogenic and can rapidly kill the insect host that it infects.
 - d. the *Sodalis* genera will not infect insects, thus remaining free from symbiotic relationships.

3. Why did this study use a grain weevil to explore the impacts of *S. praecaptivus*? _____.
 - a. *S. praecaptivus* is an endosymbiont with several other insects.
 - b. *S. praecaptivus* is the endosymbiont of the grain weevil.
 - c. *S. praecaptivus* is related to several other *Sodalis*-allied insect endosymbionts.
 - d. Insects like the grain weevil generally do not have allied endosymbionts.

4. Aposymbiotic (no symbiont) weevils were infected with *S. praecaptivus* because _____.
 - a. results reflect the interaction between the weevil and *S. praecaptivus* only.
 - b. weevils generally don't have insect endosymbionts.
 - c. aposymbiotic weevils will react only to the wild type (WT) *S. praecaptivus* strain.
 - d. quorum sensing (QS) mutant strains of *S. praecaptivus* will not impact the grain weevil.

5. What happened to the grain weevils that were microinjected with the QS mutants? _____.
 - a. The QS mutants did not impact the grain weevils.
 - b. The QS mutants killed the grain weevil beginning at one-week post infection.
 - c. The QS mutants killed the grain weevil slowly over a five-week period.
 - d. There was no difference between the WT and the QS mutants.

6. The QS genes in *S. praecaptivus* have been lost in *Sodalis glossinidius* because of _____.
 - a. the lysogenic cycle
 - b. DNA replication
 - c. gene splicing
 - d. genome degeneration



References

- Clayton, A., K. Oakeson, M. Gutin, A. Pontes, D. Dunn, A. von Niederhausern, R. Weiss, M. Fisher, and C. Dale. 2012. A novel human-infection-derived bacterium provides insights into the evolutionary origins of mutualistic insect-bacterial symbioses. *PLoS Genetics* 8(11): e1002990. <<https://doi.org/10.1371/journal.pgen.1002990>>.
- Enomoto, S., A. Chari, A. Clayton, and C. Dale. 2017. Quorum sensing attenuates virulence in *Sodalis praecaptivus*. *Cell Host Microbe* 21(5): 629–636.e5. <<https://doi.org/10.1016/j.chom.2017.04.003>>.
- Yong, E. 2017. The making of a friendly microbe. *The Atlantic*. <<https://www.theatlantic.com/science/archive/2017/05/a-friendly-microbe/526152/>>.