Introduction

- Bacteria get sick too!
- Viruses that infect bacteria (phage) engage in complex interactions with their hosts where they can have two life cycles: lytic or lysogenic (1).
- Lysogeny is widespread, with > 50% of bacterial genomes showing evidence of prophage integration. However, mechanistic study of bacteria-phage interactions are limited to a few well-studied model systems (1-3).
- The paradigm is that host cell stress prompts prophage induction (i.e. switch from lysogeny to lytic state). However, low levels of induction occurs in the absence of stress. This phenomenon is known as spontaneous prophage induction (SPI) (3).
- We have developed roseobacter-roseophage system to better understand SPI in an environmentally relevant context.

Project Objective

Characterize the general growth dynamics, cellular features and metabolic response of two genetically similar bacterial-phage systems with different rates of SPI.

Results

- One host, two phages. Phages share 85.65% sequence identity.
- Previous research identified significant phenotypic differences between these two bacterial strains (cell size, biofilm formation, and growth dynamics).

- Depiction of phage differences between strains.
- Metabolite profiles for two strains (CB-ΦA) and (CB-ΦD)
- Data from flow cytometry reveals CB-D cells are larger, on average, compared to CB-A cells.
- PLS plot reveals separation of the strains throughout the growth cycle in terms of metabolites. The occurrence of SPI is higher in CB-A compared to CB-D.

Future Directions

- Future research will include repeated procedures for the two strains in cultures supplemented with 10mM acetate to further identify any differences in physiology depending upon culture conditions.
- Further studies will also look to determine viral burst size for both phages under basal media conditions as well as complex media conditions through a one-step growth curve.

Conclusion

- The metabolite profiles of CB-D and CB-A differ throughout growth curve.
- CB-D cells are larger than CB-A cells.
- Evidence suggests CB-A has a higher rate of spontaneous prophage induction than CB-D at different stages of growth.

Acknowledgments

This research was supported by NSF grant award #OCE-1736237. We thank Benjamin Calfee for flow cytometry expertise.

Citations