

Pest Life Cycles and Infection Mechanisms:

Genomics Tools and Challenges

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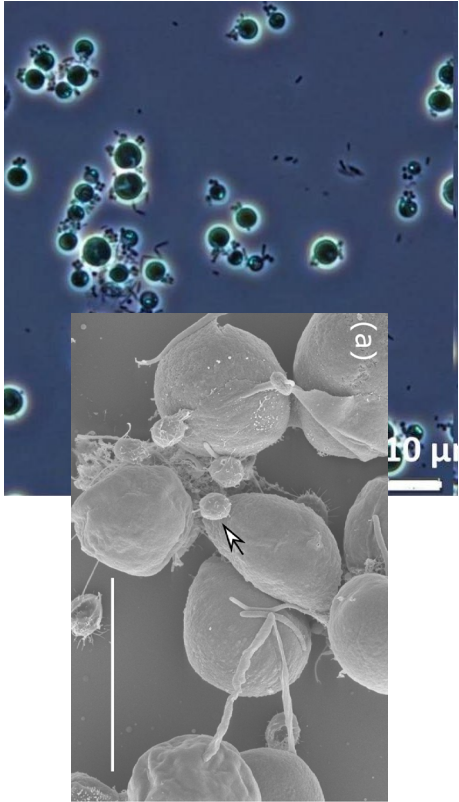
April 2021



Genomic Characterization informs Infection Mechanisms

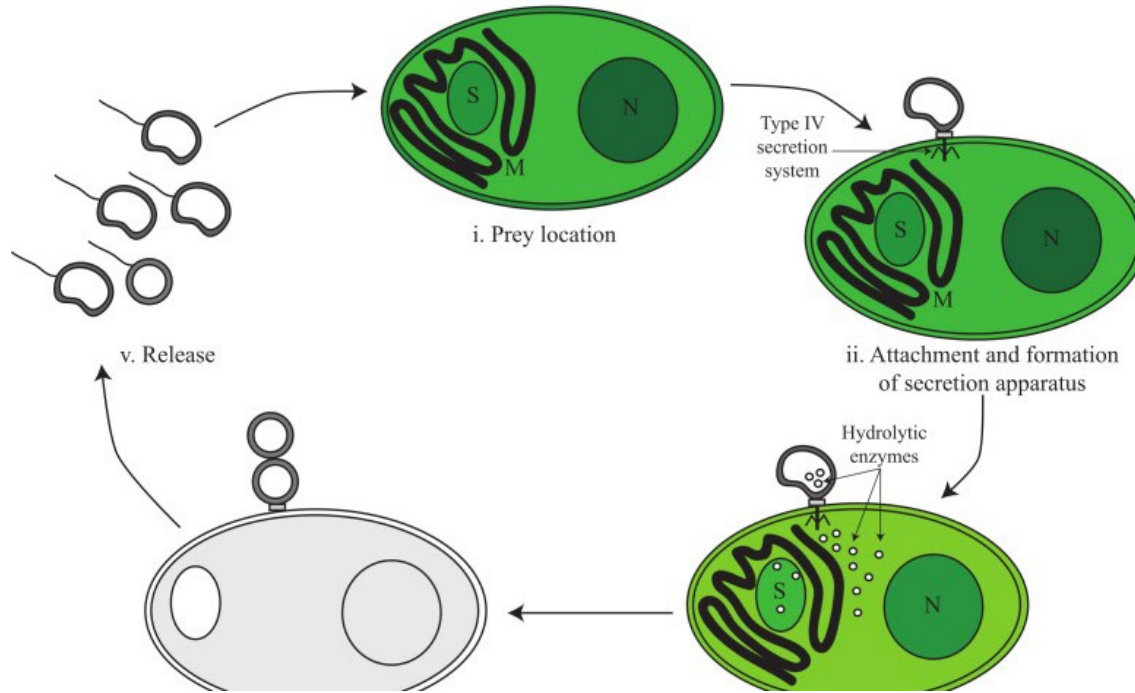
Vampirovibrio chlorellavorus

Pathogen of *Chlorella sp.*



Ganuja et al. Front Microbiol 2016
Stechein, et al. 2019

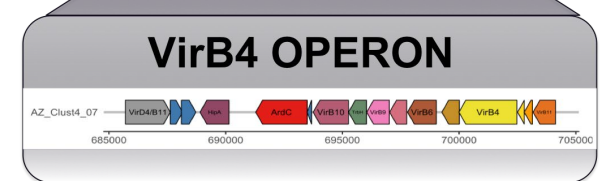
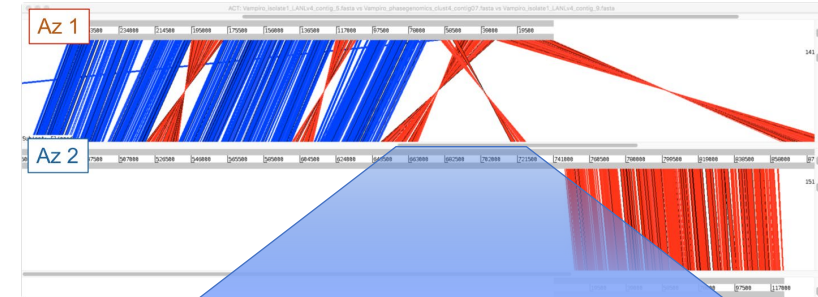
Identified Virulence Factor Genes:
Type IV Secretion System



Soo et. al. 2015

Genome and Virulence Gene Variability

| | Vc_AZ_1 vs Vc_AZ_2 | Vc_AZ_1 vs Vc_UKR | Vc_AZ_2 vs Vc_UKR |
|------------------------------|--------------------------|-------------------------|-------------------------|
| % Nucleotide Identity | 84.49 % | 83.86 % | 83.00 % |
| Genome 1 coverage | 60.07 % | 57.75 % | 55.78 % |
| Genome 2 coverage | 56.41 % | 53.29 % | 54.82 % |



Hovde, et al Phyc. Research 2019



J. Brown, S. Steichen, S. Starkenburg, B. Hovde



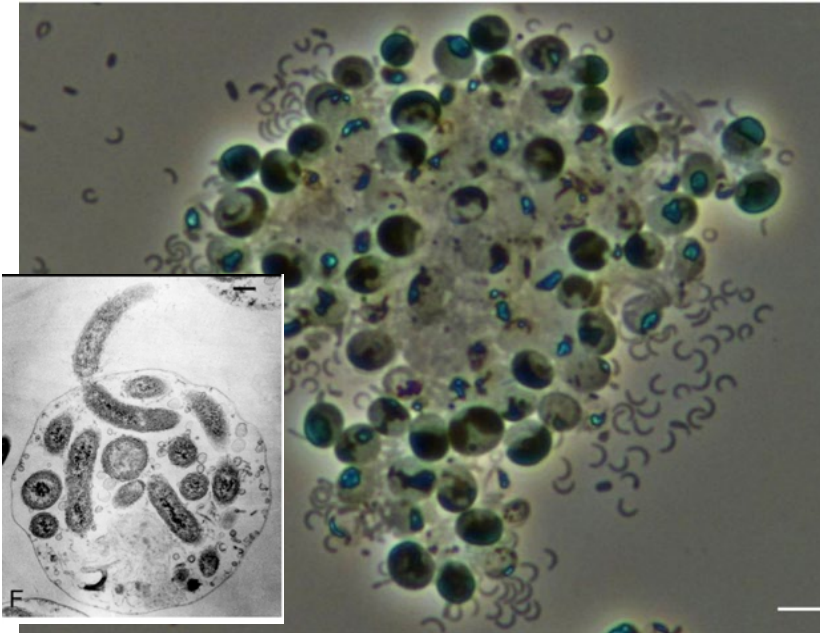


Molecular Diagnostics Tool Development

• “FD111”

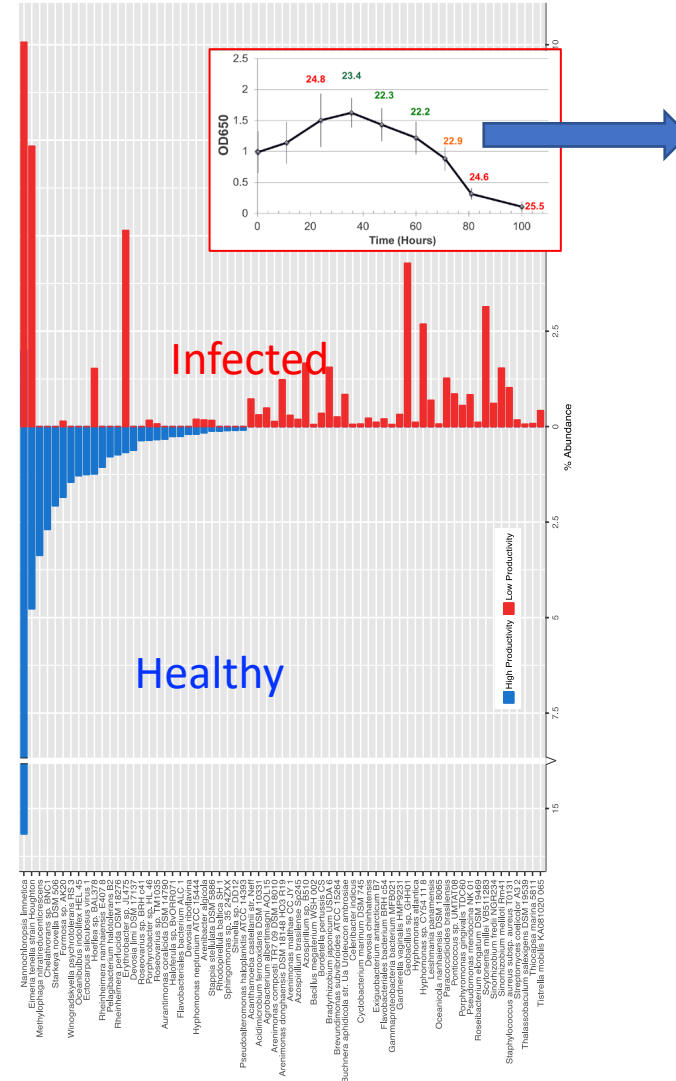


- Novel Bacterial Pathogen
- Infects *Nannochloropsis*

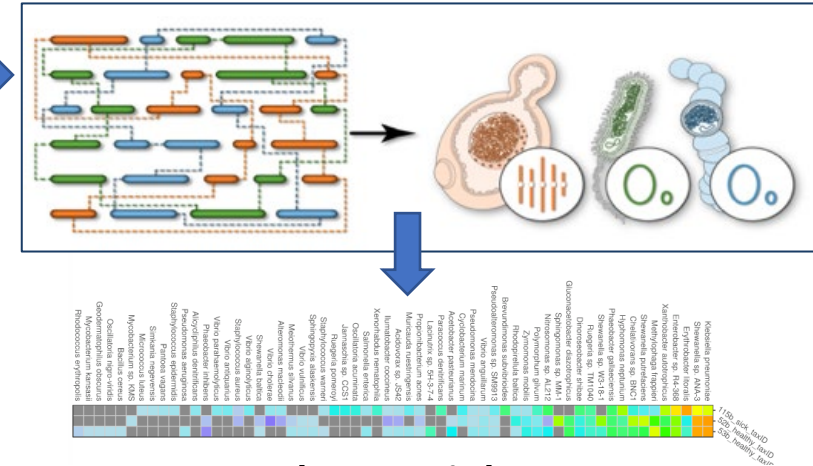


Lee, et al Algal Research 2018

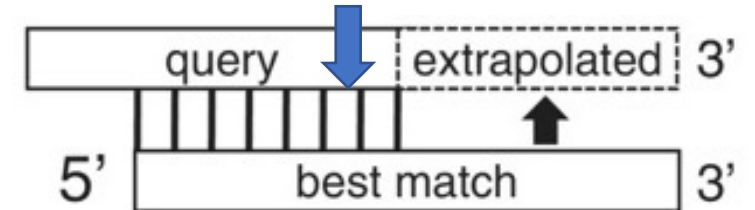
Pathogen Identification



Characterize Unique Genomic Signatures



qPCR probes with PROSIG



PI's: Hovde, Starkenburg, Lee, Corcoran, Nalley

Challenges/Needs

- **Narrow Host Ranges**
 - Limits extrapolation of knowledge to all production strains
 - Implications for type and quantity of “model systems”
- **Lack of Public Genomic Data/Repository for Pests and Pond Communities**
 - Needed to minimize redundancy and inform molecular tool development
- **Fieldable/Cheap Molecular Diagnostics Tools**
- **Employ/Deploy Functional Omics Assays to Characterize M.O.I.**
- **Unknowns**
 - **Extent of Diversity of Specific Pathogens**
 - Degradation and/or cross-reactivity of genetic probes
 - Abiotic and Ecological Drivers of Pathogenicity/Susceptibility
 - **Viral pathogens?**

