Chromera velia: Coral symbiont or parasite?

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INTRODUCTION

- ***Chromera velia*** is a newly discovered algal species found to be associated with corals
- *C. velia* is closely related to the **apicomplexan parasites**, but also related to the **photosynthetic dinoflagellates** including the coral **symbiont** *Symbiodinium*

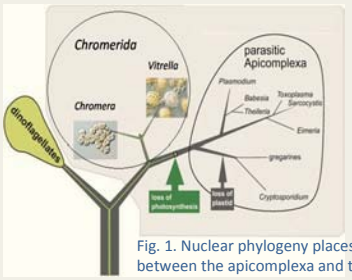

Fig. 1. Nuclear phylogeny places *Chromera velia* between the apicomplexa and the dinoflagellates

- *C. velia* has been detected in association with 3 different scleractinian corals

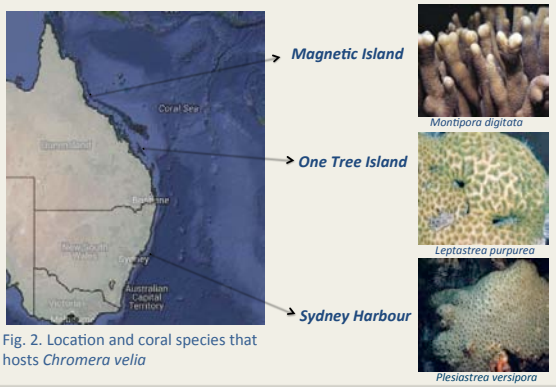

Fig. 2. Location and coral species that hosts *Chromera velia*

PROJECT AIM

- **Aim:** To establish the nature of the relationship between *C. velia* and corals
- In corals, stress and immune challenge have distinct transcriptomic signatures, as does the normal *Symbiodinium* infection process.

→ Analysis of the transcriptomic impact of *C. velia* infection should shed some light on the nature of the association of this organism with coral

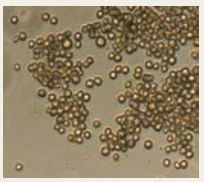

Fig. 3. *Chromera velia* cells

METHODOLOGY

Infection
Infect *Acropora digitifera* larvae with *C. velia* or *Symbiodinium* (+ve control)

Transcriptomics
Quantitative analysis of the coral transcriptomic response to *C. velia* infection using next-gen DNA sequencing technology

Differential gene expression
Comparing gene expression levels in coral larvae exposed to *C. velia* with larvae exposed to a compatible *Symbiodinium* strain

C. velia Infection Experiment

- Larvae exposed to two different *C. velia* cultures, a *Symbiodinium* clade B culture (as positive control), and no algae (as negative control)
- Larvae sampled at 4, 12 and 48h post algal exposure, and visualized under fluorescence microscope to detect the infection success
- 150 larvae from each treatment were collected, washed and frozen in liquid N_2
- Total RNA was extracted using TRIZOL method

Fig. 4. *A. digitifera* larvae

RESULTS

Fluorescence Microscope Observations

- Larvae exposed to *C. velia* cultures were successfully infected
- At 4h post infection, *C. velia* cells were penetrating the larval ectoderm
- At both 12h and 48h post infection, *C. velia* cells are found in both larval ectoderm and endoderm
- Larvae have a strong response (red fluorescence) to *C. velia* early in the infection process

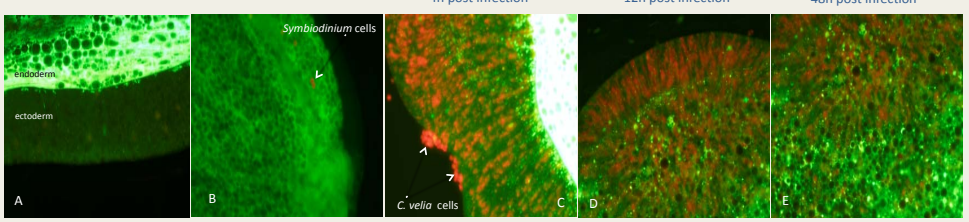

Fig. 5. *A. digitifera* larvae under fluorescence microscope. A) negative control larvae; B) uptake of *Symbiodinium* by larvae; C,D, and E) uptake of *C. velia* by larvae. Larval ectoderm fluoresce red in the presence of *C. velia*

CONCLUSION

- Coral larvae have a strong response to *C. velia* infection (red fluorescence of larval ectoderm/endoderm). This response is not seen in larvae exposed to *Symbiodinium,* or in the negative control (no algae).
- Transcriptomic analysis of the larval response to *C. velia* at different stages of the infection process will help to determine if *C. velia* is a parasite.

NEXT STEPS

- Total RNA → mRNA enrichment → cDNA library construction → **Illumina** high-throughput sequencing
- The sequencing reads will be trimmed and thinned in order to discard poor-quality bases
- The sequences will be **mapped** onto the *A. digitifera* reference transcriptome assembly
- **Differential gene expression** will be inferred based on these mapping counts using the edgeR package

Fig. 6. Next-generation DNA sequencing method PCR bridge amplification and Illumina GAIIx platform

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