

## Molecular exploration of virus-induced DMSP turnover by phytoplankton

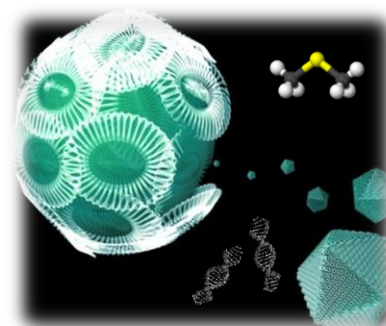
**Supervisors:** Dr Susan Kimmance; Dr. Frances Hopkins (Plymouth Marine Laboratory, PML), Dr. Jonathan Todd (University of East Anglia, UEA), Prof. Willie Wilson (Sir Alister Hardy Foundation for Ocean Science, SAHFOS)



### Why are viruses and DMSP important?

Throughout the world's oceans a constant battle is taking place, with algal viruses infecting and destroying their phytoplankton hosts. Viruses can cause the rapid demise of phytoplankton blooms, such as the globally important calcifying coccolithophore *Emiliana huxleyi* (Kimmance et al. 2014).

Coccolithophores form huge blooms in many regions of the world's oceans acting as giant sponges mopping up CO<sub>2</sub>. Furthermore, they impact global sulphur cycling because they can produce high concentrations of the osmolyte dimethylsulphoniopropionate (DMSP). DMSP is the major precursor of gaseous dimethylsulphide (DMS), which has key roles in signaling pathways, atmospheric chemistry potentially affecting climate, and sulphur transfer to terrestrial systems.



Viral lysis of phytoplankton is thought to be one of the key processes in the transformation of DMSP yielding DMS. Indeed, *E. huxleyi* viral infection has been shown to stimulate DMS production (Evans et al. 2007). However, the evidence for this is limited, and how this actually occurs within the cell is virtually unknown. Furthermore, whether this is a phenomenon typical of other coccolithophores, and additionally other phytoplankton species, is unclear.

### What is the main focus of the project?

With recent discovery of phytoplankton genes involved in both DMSP synthesis and its cleavage to DMS (Alcolombri et al. 2015; Curson et al. 2017), we are now in a great position to study viral-phytoplankton interactions and their role on DMSP/DMS production at a molecular level.

### This exciting PhD offers a highly interdisciplinary mixture of both laboratory and natural seawater sampling to address the following broad research questions:

- Does virus infection directly stimulate DMSP production and its conversion to DMS?
- Which genes are regulated during virus-induced DMS/P production?
- Upon infection, do all DMSP producers have the capacity to produce DMS?

### Interested?

We seek an enthusiastic, highly motivated, individual who has excellent attention to detail and a keen interest in marine virology/biogeochemistry. You will have access to state-of-the-art facilities and receive training in **molecular biology, analytical flow cytometry, trace gas analysis, phytoplankton/virus culturing, virology, marine biogeochemistry** and **natural seawater sampling**. You will join dynamic and friendly research groups at three institutes (PML, UEA and SAHFOS). Primarily based at PML, you will also spend up to 12 months at the University of East Anglia learning molecular microbiology with Dr Todd. Interested candidates are encouraged to contact the lead supervisor (sukim@pml.ac.uk) for further information.

**References:** (1) Kimmance et al. 2014 (<https://tinyurl.com/y9oc8etf>); (2) Evans et al. 2007 (<https://tinyurl.com/y9r4qp2z>); (3) Alcolombri et al. 2015 (<https://tinyurl.com/y76dua67>) (4) Curson et al. 2017 (<https://tinyurl.com/ya8mn7y8>).

