

Capsid assembly of two algal bloom-regulating viruses

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Small, planktonic diatoms of the *Chaetoceros* genus are important primary producers in marine ecosystems worldwide [1–3]. However, rapid *Chaetoceros* blooms can have severe negative effects on local wildlife and economy [4–6]. Thus, understanding the environmental conditions that shape the growth behaviour of diatoms is crucial to predicting the emergence and behaviour of these harmful algal blooms. Viruses play a particular role in regulating the cell densities of their specific host organisms.

Our project is based on two viruses, *Chaetoceros lorenzianus* DNA virus type I (ClorDNAV) [7] and *Chaetoceros tenuissimus* DNA virus type II (CtenDNAV-II) [8]. The structure of the mature CtenDNAV-II capsid has been solved recently [9], but the mechanisms of capsid assembly and genome packaging are still unclear. We are currently reconstructing the capsid structure of ClorDNAV based on single-particle cryo-electron microscopy (Fig. 1), to compare the capsid architecture between these closely related viruses. Previous work has also identified potential intermediate stages of CtenDNAV-II and ClorDNAV virion assembly [7, 8]. These rod-shaped structures appear in the host nuclei during early infection, and mature virions appear to associate with the distal ends. We will track the temporal progression of the rod-shaped particles over time, using thin-sectioning transmission electron microscopy to observe CtenDNAV-II infection inside the host nucleus. Then, we will proceed to cryo-electron tomography of infected cells to collect structural data on the rod-shaped particles. Investigating the assembly mechanism of the CtenDNAV-II capsid could be used to infer assembly mechanisms of other ssDNA viruses of the *Bacilladnaviridae* family, including ClorDNAV, and provide insights into the complex interactions between these viruses and their diatom hosts.

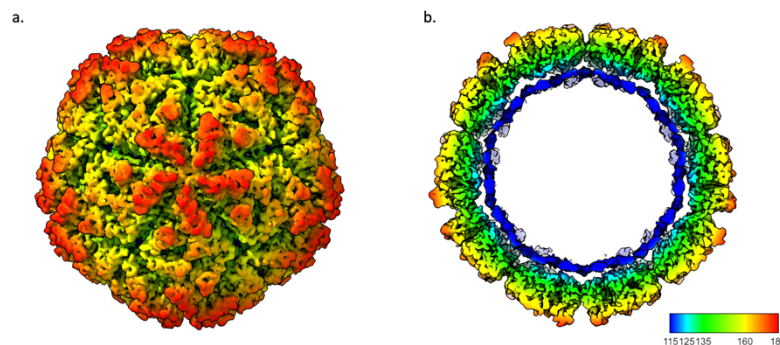


Fig 1. Preliminary reconstruction of ClorDNAV capsid, coloured by distance from center (Å). Surface representation (a) and equatorial slice (b) through the entire capsid.

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