Structural characterisation of a phage-like bacteriocin from Pseudomonas sp. by cryo-Electron Microscopy

Dr Eilis Bragginton[1], Miles Graham[1,2], Liam Mead[1], Dr Matthew Byrne[1], Dr Karen Davies[1]
[1]Electron Bio-Imaging Centre, Diamond Light Source, Harwell Science and Innovation Campus, Didcot, United Kingdom, [2]Division of Structural Biology, Wellcome Trust Centre for Human Genetics, University of Oxford, Oxford, United Kingdom

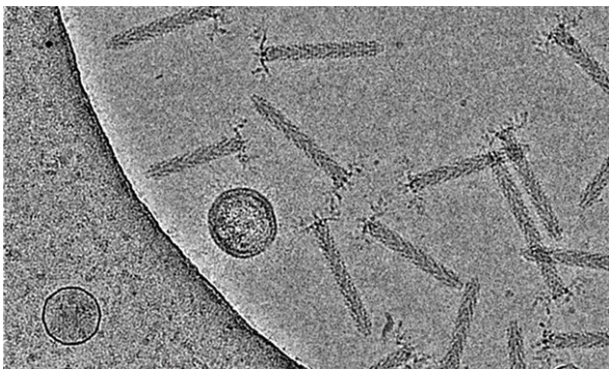
Background incl. aims
Antibiotic resistance is a global health crisis with the ever growing need to develop novel antibiotics and strategies to treat resistant infections. Bacteriophage therapy is often highlighted as an alternative approach due to its high specificity to kill a certain bacterial strain. However, bacteriophage propagate through a replication cycle within the target bacterium, with the potential to generate mutations with detrimental consequences. Strains of Pseudomonas sp. produce phage tail-like bacteriocins (PTLBs) which have evolved from bacteriophage. Although sharing many similarities, they differ from bacteriophage lacking a capsid and therefore the ability to replicate. These unique features highlight the potential of PTLBs as an alternative therapy to treat bacterial infections as they can be tittered to a specific dose. However, for PTLBs to be implemented as a bactericidal treatment, further information is needed regarding their structure, mechanism of action and how they recognise their target strains. We have isolated a contracting PTLB from an environmental strain of P. veronii and determined its structure by cryo-EM.

Methods
The PTLB was purified by ammonium sulphate precipitation and visualised by cryo-EM. The structure of the PTLB was determined using a combination approach of single particle and helical analysis.

Results
The structure was determined of a new clade of contracting PTLBs in both its uncontracted and contracted states. We also identified the lack of a 'ruler protein' for the purified PTLBs, observing varying lengths in the collected micrographs.

Conclusion
We solved the structure of a novel contracting PTLB and show that it shares structural similarities with the previously characterised contractile nanomachine from P. aeruginosa. We also observe that inconsistent lengths of PTLBs does not appear to affect the lethality of the PTLB to its target strain.

Graphic:



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Keywords:

Bacteriocin, filament, cryo-EM

Reference:

Carim, S. et al. ISME J 15, 2289–2305 (2021)