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Title of the M2 research internship:

Structure determination of Phage T5 immunity protein in complex with its receptor

Project summary:

Phage infection is triggered by host recognition thanks to the Receptor Binding Protein binding to its receptor at the surface of the cell: this interaction allows viral DNA to be delivered into the host cytoplasm. This first step of infection is followed by viral replication and eventually liberation of the new virions. During this vulnerable time, phages protect the new viral factory from over-infection. In coliphage T5, protection is mediated by a periplasmic lipoprotein, Llp, targeted to the inner leaflet of the outer-membrane, which binds the phage receptor FhuA. Llp biological function is probably also to prevent the inactivation of progeny phage by active receptors present in outer-membrane debris of lysed cells, thereby increasing their chances of infecting a new host. We aim to decipher the mechanisms of T5 host inhibition by Llp at the molecular level. We have determined the structure of Llp alone and now want to determine its structure in complex with FhuA.

Keywords:

Bacteriophages, Structural biology,

Relevant publications of the team:

Linares R, Arnaud CA, Degroux S, Schoehn G, Breyton C.* (2020) Structure, function and assembly of the long, flexible tail of siphophages. *Curr Opin Virol.* 45:34-42. doi: 10.1016/j.coviro.2020.06.010.

Alexander LT, Lepore R, Kryshtafovych A, Adamopoulos A, Alahuhta M, Arvin AM, Bomble YJ, Böttcher B, Breyton C, Chiarini V, Chinnam NB, Chiu W, Fidelis K, Grinter R, Gupta GD, Hartmann MD, Hayes CS, Heidebrecht T, Ilari A, Joachimiak A, Kim Y, Linares R, Lovering AL, Lunin VV, Lupas AN, Makbul C, Michalska K, Mout J, Mukherjee PK, Nutt WS, Oliver SL, Perrakis A, Stols L, Tainer JA, Topf M, Tsutakawa SE, Valdivia-Delgado M, Schwede T. (2021) Target highlights in CASP14: Analysis of models by structure providers. *Proteins.* doi: 10.1002/prot.26247.

Arnaud C-A, Effantin G, Vivès C, Engilberge S, Bacia M, Boulanger P, Girard E, Schoehn G and Breyton* C (2017) Bacteriophage T5 tail tube structure suggests a trigger mechanism for Siphoviridae DNA ejection *Nat Com*, 8, 1953 doi: 10.1038/s41467-017-02049-3

Fraga H, Arnaud CA, Gauto DF, Audin MJC, Kurauskas V, Macek P, Krichel C, Guan JY, Boisbouvier J, Sprangers R, Breyton C, Schanda P. (2017) Solid-State NMR H-N-(C)-H and H-N-C-C 3D/4D Correlation Experiments for Resonance Assignment of Large Proteins. *Chem. Phys. Chem.* doi: 10.1002/cphc.201700572.