Master 2 research internship in Integrated Structural & Cell Biology in Grenoble

Supervisor(s):
Marc Jamin, marc.jamin@ibs.fr
Jean-Marie Bourhis, jean-marie.bourhis@ibs.fr

Host laboratory:
Institut de Biologie Structurale
https://www.ibs.fr/spip.php?lang=en

Title of the M2 research internship:
Characterization of nucleocapsid binding by the rabies and Nipah virus phosphoproteins

Project summary:
Rabies virus (RABV) and Nipah virus (NiV) are among the deadliest zoonotic viruses infecting human. The negative-sense RNA genome of both viruses is encapsidated in a linear homopolymer of nucleoprotein, forming a helical nucleocapsid that serves as template for both transcription and replication by the viral polymerase. The phosphoprotein is another essential viral protein that connects the polymerase to ribonucleoprotein template, most likely acting as a processivity factor. During RNA synthesis the polymerase moves along its template and the presence of the phosphoprotein is required to ensures the proper elongation of the RNA molecule, but the molecular details by which the phosphoprotein moves is still debated.
Working with recombinant proteins from RABV and NiV for which protocols are established in the lab, the objectives of the project are (1) to set up assays based on different experimental methods (fluorescence anisotropy, biolayer interferometry, equilibrium dialysis) for measuring the binding of the phosphoprotein to the nucleocapsid, (2) to record high-quality data with these assays and (3) to build a model of the interaction that is in agreement with the data.
This project is will allow answering fundamental questions about the mechanism of action of the polymerase of these viruses, but could also unveil new therapeutic targets. The experimental work will involve protein expression in bacteria and eukaryotic cells, protein purification, biophysical characterization including SEC-MALLS,bio-layer interferometry, fluorescence anisotropy and SAXS.
Candidates should have a background in biochemistry and show an interest in biophysical and molecular modelling methods.

Keywords:
viral replication, negative-sense RNA viruses, protein-protein interactions

Relevant publications of the team:
Structural Description of the Nipah Virus Phosphoprotein and Its Interaction with STAT1.(2020) Jensen MR, Yabukarski F, Communie G, Condamine E, Mas C, Volchkova V, Tarbouriech N, Bourhis JM, Volchkov V, Blackledge M, Jamin M. Biophys J. 118:2470-2488. doi: 10.1016/j.bpj.2020.04.010.

Ensemble Structure of the Highly Flexible Complex Formed between Vesicular Stomatitis Virus Unassembled Nucleoprotein and its Phosphoprotein Chaperone. (2016)

Yabukarski F, Leyrat C, Martinez N, Communie G, Ivanov I, Ribeiro EA Jr, Buisson M, Gerard FC, Bourhis JM, Jensen MR, Bernadó P, Blackledge M, Jamin M. J Mol Biol. 428:2671-2694. doi: 10.1016/j.jmb.2016.04.010.

Structure of Nipah virus unassembled nucleoprotein in complex with its viral chaperone. (2014) Yabukarski F, Lawrence P, Tarbouriech N, Bourhis JM, Delaforge E, Jensen MR, Ruigrok RW, Blackledge M, Volchkov V, Jamin M. Nat Struct Mol Biol. 21:754-759. doi: 10.1038/nsmb.2868.