

**Supervisor(s):**

Allison Ballandras-Colas, [allison.ballandras-colas@ibs.fr](mailto:allison.ballandras-colas@ibs.fr)

Thibaut Crépin, [thibaut.crepin@ibs.fr](mailto:thibaut.crepin@ibs.fr)

**Host laboratory:**

IBS, VRM group

<https://www.ibs.fr/spip.php?lang=en>

**Title of the M2 research internship:**

Cryo-EM of the Influenza virus nuclear export machinery

**Project summary:**

Influenza viruses is a highly infectious pathogen that has continued to be a significant threat to the global public health by causing devastating avian epidemics and seasonal human flu epidemics. The segmented genome of influenza makes ribonucleoproteins (RNPs - genomic RNAs encapsidated by the nucleoprotein and bound to the viral RNA polymerase) and replicates in the nucleus of the infected cell. The newly replicated RNPs are then exported to the cytoplasm and, along with other viral proteins, assemble into progeny infectious virions.

Influenza viruses have developed several strategies to hijack the cellular machinery to achieve efficient replication, notably the nuclear export Crm1 pathway, utilized to escort the progeny RNPs from the nucleus to the cytoplasm. Previous studies have shown that two viral proteins are involved in this process: the Nuclear Export protein (NEP) and the Matrix 1 protein (M1). In the lab, we focus on elucidating the molecular mechanism of the RNPs nuclear export through Crm1 machinery. To support that goal and to visualize macromolecular complexes, we notably utilize cryo-electron microscopy (cryo-EM), a structural biology technique that evolved exponentially in the past decade and enables solving near atomic structures of dynamic assemblies.

The project will aim at characterizing NEP and M1 proteins interaction, as well as with the RNP and with Crm1. The candidate will employ multiple technics ranging from molecular biology, biochemistry (recombinant protein expression and purification, protein-protein interaction) to structural biology (cryo-EM and X-ray crystallography), and will have access to state-of-the-art equipment, platforms and experts. The candidate should therefore have a strong background in protein chemistry.

**Keywords:**

cryo-EM, Influenza virus replication, structural biology

**Relevant publications of the team:**

Labaronne A., et al, *Viruses*, 2016, PMID: 27649229

Reich S., et al, *Nature*, 2014, PMID: 25409151

Chevanas S., et al, *PloS Path*, 2013, PMID: 23555270

Akarsu H., et al, *EMBO J*, 2003, PMID: 12970177