M1-Molecular and Cellular Biology (MCB)
Internship Proposal Form
Chemistry-Biology Department

(Deadline Friday 12th December 2025)

Laboratory/Company Address and Affiliation:

Institut de Biologie Structurale, 71 avenue des Martyrs, UMR 5075 CEA-CNRS-UGA

Laboratory/Team Research/Company area (Keyword)

Institut de Biologie Structurale, Groupe Microscopie Électronique et Méthodes, Bunyavirus replication and transcription

Summary of the Proposed Internship Project (10 lines)

Title: Structural and functional analysis of a bunyavirus polymerase

The *Bunyaviricetes* class of segmented negative-strand RNA viruses (sNSV) includes over 500 species across fifteen families. Spread globally, bunyaviruses significantly threaten human health, with some classified by the WHO as priority pathogens due to epidemic potential. Among bunyaviruses infecting humans, Hantaan (HTNV) causes haemorrhagic fever, while La Crosse (LACV) causes encephalitis in children. Certain bunyaviruses also affect animals and plants, harming livestock and crops, like Rice Hoja Blanca virus (RHBV), which causes economic losses in rice crops. No treatments or vaccines against bunyaviruses are currently approved for human use. To address this neglected viral class, we are studying the replication and transcription of their viral genome that are two essential steps of the viral cycle. The main enzyme that performs replication is the polymerase, also called L protein.

During the proposed internship, the recruited M1 student will work on one bunyavirus polymerase, either LACV, HTNV or RHBV L, and attempt to analyze its interaction with RNA to visualize a step of defined step of replication or transcription (the exact question will be refined at the beginning of the internship depending on the exact state of the project).

Methodologies and/or Techniques to be used

The protein will be over-expressed in insect cells and purified. RNA-binding to the purified protein will be tested by fluorescence anisotropy and protein oligomerization will be analyzed by mass photometry. These methods will allow to choose the conditions suitable to answer a specific question concerning replication or transcription. The chosen protein-RNA complex will then be visualized by negative staining or cryo electron microscopy. Data collection will be performed, followed by image processing to obtain 2D classifications and, if possible, a preliminary 3D reconstruction.

Person to contact:

Name: Hélène MALET
E-mail: helene.malet@ibs.fr Phone: 04. 57. 42. 87. 77

Additional information

Bibliography:

1. Malet H, Williams HM, Cusack S, Rosenthal M. PLoS Pathogens. 2023 Jan 12;19(1):e1011060. doi: 10.1371/journal.ppat.1011060. The mechanism of genome replication and transcription in bunyaviruses.
2. Durieux Trouilleton Q, Housset D, Tarillon P, Arragain B*, Malet H*. Nature communications. 2024 Mar 13;15(1):2256. doi: 10.1038/s41467-024-46601-4. Structural characterization of the oligomerization of full-length Hantaan virus polymerase into symmetric dimers and hexamers
3. Durieux Trouilleton Q1, Barata-García S1, Arragain B1, Reguera J and Malet H Nature communications. 2023 May 23;14(1):2954. doi: 10.1038/s41467-023-38555-w. Structures of active Hantaan virus polymerase uncover the mechanisms of Hantaviridae genome replication

Proposal Form send as a PDF file to: sabrina.boulet@univ-grenoble-alpes.fr

File has to be named as: name-Internship-M1-MCB-2025-2026.pdf