

Supervisor(s):

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Host laboratory:

IBS www.ibs.fr

Host group/team:

CAID / CIRDis

Title of the M2 research internship:

Biophysical and interaction characterization of recombinant IgM against PyVBK virus

Project summary:

Although polyomaviruses such as PyVBK virus can cause mild to no symptoms, persistent infections and reactivation in immunosuppressed hosts provoke severe pathologies such as nephropathies, graft losses, leukoencephalopathies. Recently and thanks to new single cell sequencing, B-cell repertoires against PyVBK in such patients have been characterized, and humoral immune responses have been shown to be dominated by memory type-M immunoglobulins (IgM). Due to the peculiar structure of the virus, which belongs to the superfamily of non-enveloped DNA viruses, we hypothesized a link between the regular array of epitopes presented by PyV capsids and the emergence of IgM response. To test this hypothesis, we gathered experts in immunology, cell biology, biochemistry, biophysics, structural biology, and biocomputing. The goals of our IBS group are to produce a library of anti-PyVBK IgMs, characterize their bindings to antigens, and determine the structure by cryo-EM of complexes between IgMs and viral particles.

The master student will be involved in recombinant IgM productions using human cell expression systems and specific biochemical purification methods, extensive quality controls of the samples using biophysical methods such as SEC-MALLS and Mass Photometry, characterization of their binding to PyVBK antigen forms (proteins and/or vesicle-like particles) using ELISA, Surface Plasmon Resonance (SPR) or BioLayer Interferometry (BLI) and initiating preliminary structural characterization using electron microscopy, depending on the availability of samples.

The project is based on our expertise in IgM recombinant productions and characterizations, as well in biophysics and structural biology (Hennecke et al., 2020; Chouquet et al., 2022), and our collaborators' expertise in antigen productions, B-cell repertoire profiling, and antibody sequencing (Nguyen et al. 2023). The lab work is partly supported by an ANR funding (Rep2Esp - 2023-2027).

The team seeks an enthusiastic, autodidactic, and autonomous M2 student in biology, biochemistry, biophysics or related fields, who is willing to pursue the project after his/her internship with a 3-year thesis.

Keywords:

antibodies, immune response, biophysics

Relevant publications of the team:

Chouquet A., Pinto A.J., Hennicke J., Ling W.-L., Bally I., Schwaigerlehner L., Thielens N., Kunert R., Reiser J.-B.*

Biophysical characterization of the oligomeric states of recombinant Immunoglobulins type-M and their C1q binding kinetics by Biolayer Interferometry

Front. Bioeng. Biotechnol., 2022, 10:816275, DOI: 10.3389/fbioe.2022.816275

Hennicke J., Schwaigerlehner L., Grünwald-Gruber C., Bally I., Ling W.-L., Thielens N., Reiser J.-B., Kunert R.

Transient pentameric IgM fulfill biological function – effect of expression host and transfection IgM properties

PlosOne, 2020, 15:e0229992. DOI: 10.1371/journal.pone.0229992