

**Master 2 internship project
Year 2026-2027**

Laboratory/Institute: IBS

Team: Entry and budding of Enveloped Viruses

Director: M. Weissenhorn

Head of the team: M. Weissenhorn

Name and status of the scientist in charge of the project: Boscheron Cécile

HDR: yes ☒ no ☐

Address: 71 Avenue des Martyrs 38000

Phone: 0457 42 85 36

e-mail: cecile.boscheron@ibs.fr

Program of the Master's degree in Biology:

☒ Microbiology, Infectious Diseases and Immunology ☐ Biochemistry & Structure
☐ Physiology, Epigenetics, Differentiation, Cancer ☐ Neurosciences and Neurobiology

Title of the project:

Nanoscale mapping of lipid-ESCRT-III coupling during HIV-1 budding with DNA-PAINT

Objectives (up to 3 lines):

Map how specific lipids (e.g. sphingomyelin, and cholesterol) spatially and quantitatively couple to ESCRT-III assemblies.

Correlate lipid-protein nanoscale organization with budding progression and scission competence.

Abstract (up to 10 lines):

HIV-1 relies on ESCRT-III to execute membrane scission at budding sites, yet how ESCRT-III polymers couple to the local lipid composition remains unresolved at the nanoscale. This project will deploy super-resolution DNA-PAINT to reconstruct the spatial organization of ESCRT-III filaments and lipids (e.g., sphingomyelin, and cholesterol) at individual budding events with 10 nm precision. We will combine endogenous tagging/fluorescent labeling with quantitative analysis to derive stoichiometry, curvature geometry, and lipid enrichment profiles at the neck. By integrating perturbations of ESCRT function and lipid availability, we will establish how lipid-ESCRT coupling governs the transition to membrane scission.

Methods (up to 3 lines): (i) Production of lipid probes and click chemistry to label them with an oligonucleotide, (ii) Super-resolution DNA-PAINT on ESCRT-III filaments together with lipids sensors. Image reconstruction and analysis., (iii) Targeted perturbation with ESCRT interference constructs to test causal coupling.

Up to 3 relevant publications of the team:

Wang, H., W. Weissenhorn, and C. Boscheron. 2025. Protocol for HIV-1 budding control by inducible inhibition of ESCRT-III. *STAR protocols*. 6:103808.

Wang, H., B. Gallet, C. Moriscot, M. Pezet, C. Chatellard, J.-P. Kleman, H. Göttliger, W. Weissenhorn, and C. Boscheron. 2023. An inducible ESCRT-III inhibition tool to control HIV-1 budding. *Viruses*. 15:2289.

Master's degree in Biology – Chemistry-Biology Department

Azad, K., D. Guilligay, C. Boscheron, S. Maity, N. De Franceschi, G. Sulbaran, G. Effantin, H. Wang, J.P. Kleman, P. Bassereau, G. Schoehn, W.H. Roos, A. Desfosses, and W. Weissenhorn. 2023. Structural basis of CHMP2A-CHMP3 ESCRT-III polymer assembly and membrane cleavage. *Nature structural & molecular biology*. 30:81-90.

Requested domains of expertise (up to 5 keywords): Super-resolution microscopy, DNA-PAINT, Membrane Biophysics/Lipids, ESCRT/HIV-1 cell biology, Image analysis. We warmly welcome serious, curious, and dynamic students!