Internship Proposal Master 2 Research – 2024-2025

Mechanisms of synthesis and release of fungal extracellular vesicles produced by phytopathogens

Keywords : Extracellular Vesicles, fungal phytopathogen, biomimetic systems

Candidate profile : We seek a highly motivated candidate with knowledge and skills in microbiology, biochemistry and biophysics. Candidates must be able to work as part of a team and have good communication and writing skills. The internship will ideally start in January 2025 and last 6 months.

Project description : Extracellular vesicles (EVs) are small cargo-bearing vesicles secreted by cells that play crucial roles in intercellular communication in animals, plants and fungi. Limited information is currently available on fungal EVs. The objectives of the project are to understand the mechanisms of synthesis and release of fungal EVs. We will investigate the effect of overexpression and deletion of candidate proteins (whose homologs have been identified in animals) on these processes. After isolation, the different populations of EVs will be characterized in terms of size, number, content and mechanical properties using a combination of biochemical and biophysical approaches.

Presentation of the Research Team : The research team ECCP (Effectors of Cellular Communication at the fungal-Plant interface, https://bioger.versailles-saclay.hub.inrae.fr/equipes/eccp-effectors-of-cellular-communication-at-the-fungal-plant-interface) is focusing on fungal diseases in plants. The main objectives of our group are to understand (1) the mode of action and plant targets of fungal effectors and (2) the mechanisms of communication between fungi and plants.

Methods used during the internship :

- Microbiology: generation and growth of transgenic strains from fungal phytopathogen
- Biochemistry: isolation, characterization and quantification of different populations of extracellular vesicles: Western blots, Electron Microscopy (EM), Nanoparticle Tracking Analysis (NTA)
- Biophysics: Characterization of Giant Unilamellar Vesicles (GUVs) prepared from extracellular vesicles by Fluorescence Life time Imaging Microscopy (FLIM)

References :

2024 - Rutter et al, **Journal of Extracellular Vesicles**, *The development of extracellular vesicle markers for the fungal phytopathogen Colletotrichum higginsianum*, PMID: 35524440

2023 - **Pernier** et al, **Journal of Cell Science**, *Talin and kindlin cooperate to control the density of integrin clusters*, PMID: 37083041

2023 - He et al, **Nature Communications**, *Fungal small RNAs ride in extracellular vesicles to enter plant cells through clathrin-mediated endocytosis*, PMID: 37474601

2021 - Rizzo et al, **Journal of Extracellular Vesicles**, *Cryptococcus extracellular vesicles properties and their use as vaccine platforms*, PMID: 34377375

2020 - Michels et al, **PNAS**, *Complete microviscosity maps of living plant cells and tissues with a toolbox of targeting mechanoprobes*, PMID: 32669427

Location : INRAE UR BIOGER, Campus Agro Paris-Saclay, Université Paris-Saclay, 22 Place de l'Agronomie, Palaiseau

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