Grenoble Alliance for Integrated Structural & Cell Biology

GRAL MSc RESEARCH SCHOLARSHIP 2020-2021

RESEARCH INTERNSHIP PROPOSAL

Institute / Group

IRIG / PCV

Supervisor	E-mail	Phone
Chloe Zubieta	chloe.zubieta@cea.fr	+33 4 38 78 05 91

Research Project Title

Phyllogen-MADS Transcription Factor Interactions and Dynamics

Description of the project

Phytoplasmas are obligate plant pathogenic bacteria that are spread by insects and infect plant phloem cells. There are no effective treatments for phytoplasma infections apart from control of the insect vector via pesticide application. Phytoplasmas reprogram their host plants' metabolic and reproductive pathways by secreting effector proteins, which bind to host transcription factors, causing symptoms such as phyllody (homeotic conversion of floral organs to leaf-like structures). Hence, phytoplasmas prevent reproduction of the host plant, rendering it a « zombie »- a dead end organism existing only to propagate the infecting pathogen.

Recently, a family of phytoplasma effector proteins, called phyllogens, has been identified as the causative agents of phyllody. Phyllogens interact with specific MADS family transcription factors (TFs) critical for floral identity. We seek to determine the molecular and atomic basis for phyllogen- MADS TF interactions using protein crystallography and small angle scattering. We are able to produce soluble phyllogen and MADS TF proteins and have tested these interactions using size exclusion chromatography. We are searching for a motivated master student from the biochemistry or structural biology field for this exciting project.

Keywords

MADS transcription factors, protein/protein interactions, plant pathogens, phytoplasma

Relevant publications of the team

Tetramerization of MADS family transcription factors SEPALLATA3 and AGAMOUS is required for floral meristem determinacy in Arabidopsis. Hugouvieux V, Silva CS, Jourdain A, Stigliani A, Charras Q, Conn V, Conn SJ, Carles CC, Parcy F, Zubieta C. Nucleic Acids Res. 2018 Jun 1;46(10):4966-4977. doi: 10.1093/nar/gky205. PMID: 29562355

Ezer, D., J. H. Jung, H. Lan, S. Biswas, L. Gregoire, M. S. Box, V. Charoensawan, S. Cortijo, X. Lai, D. Stockle, C. Zubieta, K. E. Jaeger and P. A. Wigge (2017). The evening complex coordinates environmental and endogenous signals in Arabidopsis. Nat Plants 3: 17087.

Conn, V. M., V. Hugouvieux, A. Nayak, S. A. Conos, G. Capovilla, G. Cildir, A. Jourdain, V. Tergaonkar, M. Schmid, C. Zubieta and S. J. Conn (2017). A circRNA from SEPALLATA3 regulates splicing of its cognate mRNA through R-loop formation. Nat Plants 3: 17053.