

Supervisor(s):

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Host laboratory:

LPCV www.lpcv.fr

Host group/team:

ChromDev

Title of the M2 research internship:

Characterisation of a dual chromatin switch in plants

Project summary:

The plant-specific ULTRAPETALA1 (ULT1) protein is a versatile chromatin switch required for proper reproductive transition and flower development. We initially characterised it, by a developmental genetics approach, as antagonist of the Polycomb (PcG) Repressive Complex 2 (PRC2). More recently, using genome-wide, interactomics and biochemistry approaches, we also revealed a PRC2 cofactor function for ULT1.

The Master student will contribute to the investigation of this novel role, using molecular genetics to assess to which extent ULT1 and PRC2 effects on gene regulation are mutually dependent. For this, he/she will analyse a set of plant lines (combining gain- and loss-of-functions, among which some CRISPR-induced), for :

- Developmental phenotypes, including histology for flower morphogenesis
- Expression of key target genes, using RT-qPCR and RNA in situ hybridization
- Chromatin binding and mark analyses, using ChIP-qPCR (for PRC2 binding and H3K27me3 repressive marks).

We are seeking candidates with a strong interest in epigenetics regulation of development and with some expertise in chromatin biology and molecular genetics. Knowledge on the *Arabidopsis thaliana* plant model isn't a pre-requisite.

Keywords:

cell fate, gene expression, chromatin complexes and histone marks

Relevant publications of the team:

Carles CC, Fletcher JC. The SAND domain protein ULTRAPETALA1 acts as a trithorax group factor to regulate cell fate in plants (2009). *Genes Dev.* 23(23):2723-8. doi: 10.1101/gad.1812609.

Monfared MM, Carles CC, Rossignol P, Pires HR, Fletcher JC. The ULT1 and ULT2 *trxG* genes play overlapping roles in *Arabidopsis* development and gene regulation (2013). *Mol Plant.* 6(5):1564-79. doi: 10.1093/mp/sst041.

Moreau F., Thevenon E., Blanvillain R., Lopez-Vidriero I., Franco-Zorrilla J. M., Dumas R., Parcy F., Morel P., Trehin C. and Carles C. C.* (2016). The Myb-domain protein ULTRAPETALA1 INTERACTING FACTOR 1 controls floral meristem activities in *Arabidopsis*. *Development* 143 (7): 1108-1119.

Engelhorn, R. Blanvillain, C. Kröner, H. Parrinello, M. Röhmer, D. Pose, F. Ott, M. Schmid, C.C. Carles* (2017). Dynamics of H3K4me3 chromatin marks prevails over H3K27me3 for gene regulation during flower morphogenesis in *Arabidopsis thaliana*. *Epigenomes*, 1(2), 8. doi:10.3390/epigenomes1020008

K. Fal, A. Berr, M. Le Masson, A. Faigenboim, E. Pano, N. Ishkhneli, N-L Moyal, C. Villette, D. Tomkova, M-E. Chabouté, L Eshed Williams and C. C. Carles* (2023). Lysine 27 of histone H3.3 is a fine modulator of developmental gene expression and stands as an epigenetic checkpoint for lignin biosynthesis in *Arabidopsis*. *New Phytologist*. doi: 10.1111/nph.18666