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<https://www.ibs.fr/research/research-groups/epigenetics-and-molecular-pathways-group-c-petosa/kadlec-team/>

**Title of the M2 research internship:**

Structural analysis of plant Polycomb Repressive Complex 2

**Project summary:**

Polycomb Repressive Complex 2 (PRC2) is a multi-subunit protein complex essential for the development of multicellular organisms. Recruitment of PRC2 to target genes, followed by deposition and propagation of its catalytic product histone H3 lysine 27 trimethylation (H3K27me3), are key to the spatiotemporal control of developmental gene expression. In mammals, PRC2 was the first chromatin regulatory complex characterized by X-ray crystallography and recently also by cryo-electron microscopy (cryo-EM). In contrast, in plants, the composition and structure of PRC2 remains poorly studied.

The aim of the project is to determine the cryo-EM structure of the *Arabidopsis thaliana* core PRC2 complex. The production of the ternary PRC2 complex in insect cells has already been established and preliminary cryo-EM analysis has been performed. Successful accomplishment of the project will require further optimization of the cross-linking strategy, cryo-EM data collection and structure determination. This analysis will provide first structural insights into the PRC2 complex structure in plants and will enable follow-up functional in-vivo studies to clarify the observed functional differences between plant and animal PRC2 epigenetic regulatory activities.

**Keywords:**

epigenetics, cryo-EM, plant gene expression

**Relevant publications of the team:**

Kumar, R., Oliver, C., Brun, C., Juarez-Martinez, A.B., Tarabay, Y., Kadlec, J. and de Massy B. Mouse REC114 is essential for meiotic DNA double-strand break formation and forms a complex with MEI4. *Life Sci. Alliance*, 1:e201800259. (2018)

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Touat-Todeschini, L., Shichino, Y., Dangin, M., Thierry-Mieg, N., Gilquin, B., Hiriart, E., Sachidanandam, R., Lambert, E., Brettschneider, J., Reuter, M., Kadlec, J., Pillai, R., Yamashita, A., Yamamoto, M., and Verdel, A. Selective termination of lncRNA transcription promotes heterochromatin silencing and cell differentiation. *EMBO J.* 36:2626-2641 (2017)

Dias, J., Nguyen, N., Georgiev, P., Gaub, A., Brettschneider, J., Cusack, S., Kadlec, J.\* and Akhtar, A.\* Structural analysis of the KANSL1/WDR5/KANSL2 complex reveals that WDR5 is required for efficient assembly and chromatin targeting of the NSL complex. *Genes Dev.* 28: 929-942 (2014)

Wu, H., Mathioudakis, N., Diagouraga, B., Dong A., Dombrovski, L., Baudat, F., Cusack, S., de Massy, B.\* and Kadlec, J.\* Molecular basis for the regulation of the H3K4 methyltransferase activity of PRDM9. *Cell Rep.* 5:13-20 (2013)