

Triacylglycerols (TAGs) are essential energy reserves in plants and accumulate during seed maturation within cytosolic **lipid droplets (LDs)**. LDs consist of a neutral lipid core surrounded by a phospholipid monolayer decorated by proteins that control droplet stability, remodeling, and mobilization during germination. Seed performance during imbibition relies on dormancy and desiccation tolerance—two key traits acquired during maturation that allow survival after extreme water loss (up to ~90%). Neutral lipid storage and controlled mobilization are therefore central to plant survival and adaptation, including in the context of climate change.

Recent proteomic analyses of LD-associated proteins revealed unexpected enrichment of **PHOSPHATIDYLETHANOLAMINE-BINDING PROTEIN (PEBP)** family members. Two homologs, MFT (MOTHER OF FT and TFL1) and SMFT (STEP-MOTHER OF FT and TFL1), accumulate specifically in seeds. While MFT is well known for its role in dormancy and germination, SMFT remains poorly characterized. Preliminary results from V. Gomez's team suggests that SMFT directly interacts with LD interfaces, pointing to a potential structural or regulatory function at the LD surface.

This project aims to (i) determine the biological role of SMFT during seed maturation and germination in *Arabidopsis thaliana*, (ii) establish the physical and chemical determinants (lipid composition, interfacial tension, curvature, temperature) controlling SMFT binding to LD-like interfaces, and (iii) test evolutionary conservation by studying the SMFT homolog in the moss *Physcomitrium patens* spores using microfluidic-based quantitative germination assays. By combining plant genetics and molecular biology with microfluidics, quantitative fluorescence imaging, and biomimetic reconstitution of LD interfaces (GUVs and artificial droplets), the project will deliver a mechanistic framework for PEBP–lipid interactions at LD surfaces.