The other side of the ER bodies: Revealing the function of ER body membrane proteins in Arabidopsis thaliana

Brassicaceae and its closely related family plants have a specific subcellular structure derived from the endoplasmic reticulum (ER), namely, the ER body (also known as the fusiform body or dilated cisternae), which can be visualized by green fluorescent protein with an ER-retention signal. ER bodies are involved in the plant resistance against insect herbivory or pathogens by accumulating β-glucosidases that activate defensive metabolites. These are spindle-shaped structures of 5 to 10 μm in the longitudinal, and they are morphologically distinct from the ER and other cellular vesicles.

In a model plant of Brassicaceae, *Arabidopsis thaliana*, the epidermal cells of seedlings and roots constitutively accumulate ER bodies. The constituents of the ER bodies are discovered and the function of the major components of ER bodies that are involved in the defence are shown. Additionally, ER bodies have specific integral membrane proteins MEMBRANE OF ER BODY 1 (MEB1) and MEB2. Recently, we found that absences of the MEB1 and MEB2 show smaller and aggregated ER bodies and absence of MEB2 shows reduction in movement of ER bodies along the ER network. ER network has proteins for ER streaming that are responsible for the movement of ER network, which causes streaming of other cellular compartments like Golgi bodies and endosomes. However, the role of these ER streaming proteins in the movement of the ER bodies is not understood.

Both MEB1 and MEB2 are predicted to have specific cation binding sites and they are structurally similar to iron transporter family proteins localised on the vacuolar membrane. Previous study showed that MEB1 and MEB2 have a transport activity with iron and manganese when expressed in yeast (*Saccharomyces cerevisiae*). MEB1 and MEB2 translocate these cations from cytosol to vacuole or ER when expressed in yeast. However, it is unclear whether they have similar cation accumulation function in plants as nutrients.

In this project, we aim to reveal the function of these membrane proteins in plants by investigating their role in interacting with ER streaming proteins and nutrient allocation under nutrient available and unavailable condition. The specific questions in the project are follows:

(1) How the integral membrane proteins in ER bodies co-ordinate their movement? We hypothesize **that these proteins are interacting with the ER streaming proteins for the movement of ER bodies along the ER network.**

(2) Are the integral membrane proteins in ER bodies involved in metal allocation?
We hypothesize **that these proteins are involved in metal exchange between cytosol and ER bodies to maintain overall cation homeostasis in plant cells.**

Our research aims to shed light on the unexpected function of the ER bodies by addressing on the factors associated with the movement of ER bodies and nutrient allocation in plant physiology.