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New insights into the targeting of tail-anchored membrane proteins to plant organelles

Hsin-Yang (Calvin) Chang

National Sun Yat-sen University, Taiwan

Most eukaryotic membrane proteins are first inserted into the endoplasmic reticulum (ER) by an evolutionarily conserved co-translational pathway. However, a functionally diverse set of membrane proteins, known as TA proteins, cannot access this pathway. Instead, they are inserted into the ER via a novel post-translational pathway. The core mechanisms underlying the selective targeting of TA membrane proteins to their proper intracellular destinations are well established in mammalian and yeast cells. However, little is known about the molecular machines that mediate intracellular membrane trafficking of TA proteins in plant cells. Previous researches suggested that TA proteins may play an essential role in metabolic regulation, defense response, environmental stress response, etc., throughout plant growth and development. Recent studies also showed that green alga arsenite transporters (termed ArsA1 and ArsA2) could control the insertion of TA proteins into the chloroplast outer envelope. In a recent breakthrough, we have successfully overproduced and purified these hydrophilic proteins to near homogeneity by using *E. coli* as the host organism. The analysis of their catalytic properties clearly demonstrates that ArsA proteins exhibit oxyanion-independent ATPase activity, as neither arsenite nor antimonite showed strong effects. The co-expression of ArsA2 with green algae Sec61 β or ArsA1 with TOC34 TA proteins is also capable of forming a complex, demonstrating that both ArsA proteins are TA-protein targeting factors. This discovery will have broad implications in membrane biophysics as well as in regulation of cellular signaling pathways, and thus could provide more agricultural biotechnology tools for crop improvement to overcome food shortage.

Biography

Hsin-Yang (Calvin) Chang has obtained his PhD degree from University of Illinois at Urbana-Champaign and Post-doctoral studies from the University of Chicago. He is an Assistant Professor at the Department of Marine Biotechnology and Resources from National Sun Yat-sen University (Taiwan) since 2015. He has been working on the molecular mechanisms of insertion of tail-anchored membrane proteins which is an exciting field with many important unanswered questions. He has published papers in reputed journals, such as *Science*, *PNAS*, *Scientific Report*, *JBC*, *Biochemistry*, etc.

hychang@mail.nsysu.edu.tw

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