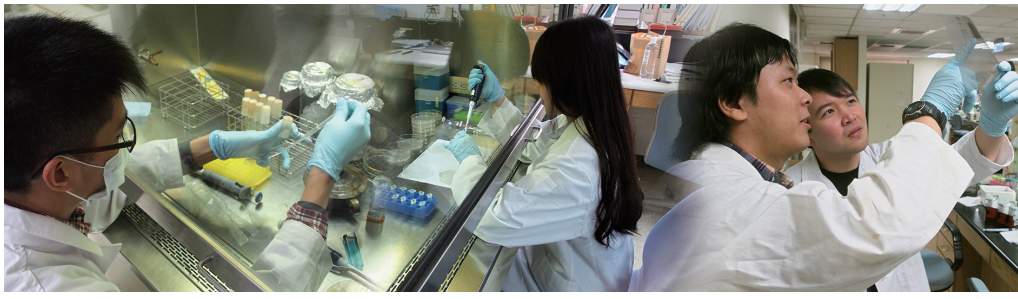
Study reveals inducing endoplasmic reticulum stress regulates golgi apparatus



Researchers led by Prof. Fang-Jen S. Lee of the College of Medicine's Institute of Molecular Medicine recently published an innovative study revealing for the first time that inducing stress in a cell's endoplasmic reticulum (ER) regulates signal transduction and vesicular transport performed by the Golgi apparatus. As numerous investigations have implicated the ER in neurodegenerative and prion diseases, the team's discovery has opened new research directions for understanding the role of endoplasmic reticulum stress in causing these diseases.

The study, titled "Unfolded Protein Response Regulates Yeast Small GTPase Arl1p Activation at Late Golgi via Phosphorylation of Arf GEF Syt1p," attracted the attention of researchers around the world when it appeared in the *Proceedings of the National Academy of Sciences* on March 10.

The endoplasmic reticulum, an organelle in the cells of eukaryotic organisms, serves a crucial role as a starting point for the synthesis, packaging, and transport of proteins and lipids. Proteins manufactured within the endoplasmic reticulum are first folded, processed, and modified before being delivered to the Golgi apparatus. Upon receiving the proteins, the Golgi apparatus makes additional modifications, packages them by type, and ultimately sends them either to the cell membrane via vesicular transport or to the extracellular space through secretion. The proper function of this mechanism is vital for sustaining the life of the organism.

Stress from the cell's external environment or internal changes in its genes will lead to abnormally folded proteins. The accumulation of these abnormal proteins within the endoplasmic reticulum causes endoplasmic reticulum stress as well as an increase in the unfolded protein response.

The endoplasmic reticulum has been reported to affect diseases including Alzheimer's and Parkinson's, as well as diabetes and cancer. Further research into the cellular regulation of the unfolded protein response is expected to significantly advance our understanding of cell physiology and human diseases.

This latest study used the yeast *Saccharomyces cerevisiae* as its model organism. For years, Prof. Lee's laboratory has used this eukaryotic organism, commonly known as brewer's yeast, as a means to understand the regulatory mechanisms controlling vesicular transport.

The study demonstrated that while endoplasmic reticulum stress induced by unfolded proteins influences the distribution of proteins in the Golgi apparatus through Ire1 signal transduction, it also regulates vesicular transport within the Golgi apparatus. Based on these findings, Prof. Lee's team has set a future research goal of gaining a better understanding of the control mechanism through which the Golgi apparatus addresses the accumulation of unfolded proteins and how the Golgi apparatus is impacted by endoplasmic reticulum stress.

Reference

Jia-Wei Hsu, Pei-Hua Tang, I-Hao Wang, Chia-Lun Liu, Wen-Hui Chen, Pei-Chin Tsai, Kuan-Yu Chen, Kuan-Jung Chen, Chia-Jung Yu, and Fang-Jen S. Lee. Unfolded protein response regulates yeast small GTPase Arl1p activation at late Golgi via phosphorylation of Arf GEF Syt1p. (2016). *Proceedings of the National Academy of Sciences of the United States of America (PNAS)*, 113(12), E1683-E1690. Published online before print March 10, 2016. DOI: 10.1073/pnas.1518260113

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