PB GS I -1

A Membrane-regulated NAC Transcription Factor Mediates Cold Sensing in *Arabidopsis*

Pil Joon Seo, Sun-Young Kim, Youn-Sung Kim, Ju Yun, Suk Ki Kang, Xiang Fengning, An-Gyo Lee, Sang-Gyu Kim and Chung-Mo Park

Department of Chemistry, Seoul National University, Korea

Plant survival and growth is dependent on its ability to cope with biotic and abiotic stresses in nature. Abiotic stress signals interact with biotic stress signals through complex network of interactions, but little is known about the underlying molecular mechanisms. Here, we show that a membrane-bound NAC transcription factor, NTL6, modulates interactions between abiotic and biotic stress signaling. *NTL6* encodes a NAC transcription factor that contains a transmembrane motif (TM) in its far C terminus. Controlled liberation of membrane-tethered, dormant precursors is an intriguing activation mechanism that regulates diverse cellular functions in eukaryotes. An exquisite example is the proteolytic activation of membrane-bound transcription factors. Transgenic plants overexpressing a truncated *NTL6* construct (ΔC) without TM has significant phenotypic alterations, such as growth retardation and serrated leaves. However transgenic plants overexpressing a full-length *NTL6* exhibit essentially identical phenotypes to those of wild type plants. In the ΔC transgenic plants, *PR* and *CBF* genes are up-regulated, suggesting that NTL6 may regulate *PR* and *CBF* genes. Consistent with this, the ΔC transgenic plants show elevated pathogen resistance. Interestingly, NTL6 cleavage is enhanced by cold stress. Accordingly, *NTL6* RNAi plants show reduced level of *PR* gene expression under cold stress. In addition, *PR* genes are not induced by abiotic stresses in *NahG* OX plants, suggesting that basal SA level is required. We thus propose that *NTL6* mediates interactions between cold stress and biotic stress signaling via a posttranslational mechanism.