

# Host Selective Toxins and Suppressor Effector from Plant Pathogens Regulate Ca<sup>2+</sup>-Dependent Protein Kinase in the Plant Cell

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Seven members of the family of host selective toxins were reported from *Alternaria alternata* and *Alternaria solani* by Nishimura lab [1]. The suppressor effector for hypersensitive response of host cells were reported firstly by using *Phytophthora infestans* by Tomiyama lab [2-4]. The host selective toxin (HST) effect on the host plant and induced the infection of the pathogen into the tissue, which has no resistant genes against HST. The suppressor effector induced the inhibition of hypersensitive cell death, accumulation of phytoalexins and the symptom of HR, hypersensitive response, in host tissues. Recently, the Ca<sup>2+</sup>-dependent protein kinase in the plasma membrane of host cells was stimulated after the treatment of Alternaric acid, a HST, from *A. solani* and the suppressor effector from *P. infestans in vitro*, in the assay as reported [5]. This means that the kinase, CPKs, could recognize the HST and suppressor in host plasma membrane and regulate the occurrence of HR in host cells. So far, the receptor sites for the PAMPS [6] were reported by several groups. However, there are few reports with regard to the receptor for HST in plant cells. The CPKs in the host plasma membrane are the candidate against receptor of HST in potato and other plants. The suppressor of *P. infestans* has a β-1,3 and β-1,6 linkages of glucose, and also contains β-linkages of glucosamine [7].

Recently, cyclic nucleotide gated protein channel (CNGC) activity was induced by the treatment of At Pep peptides effector in host cells, resulting the HR response in the cells. The CNGC channel activity was reported by using the Fluorescent protein detection method [8]. For the activation of CPKs and calmodulins, the influx of calcium into the cytoplasm is important physiological phenomena in host cells. In *Arabidopsis*, CNGC played a role for the occurrence of Ca<sup>2+</sup> influx into the cytosol in host cell, as reported [8].

The CPKs signaling cascades regulated the occurrence of HR response in host cells [9], and the HST effect on the inhibition of HR

in potato and tomato [5]. For the key signaling in the regulation of HR, HR cell death, and the necrosis of host cells, the CNGC, CPKs cascades are now of considerable interest for the analysis of the pathway.

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