# SL404

## LOW TEMPERATURE AND SIGNAL TRANSDUCTION IN PLANTS

**Beungtae Ryu**
Dept of Biochemistry, Kansas State University, Manhattan, KS 66506, USA

How an environmental signal (low temperature) is translated into responses by the plant such as an increase in abscisic acid (ABA) and a subsequent development of cold hardness is an interesting question. It has been suggested that ABA is a signal transducer, which transmits low temperature into biochemical responses of plants. The physiological, biochemical and/or molecular changes triggered by ABA have been examined in many plant species. There is, however, little information available on the aspect of ABA increase *per se* at the early stage of cold acclimation. We have recently reported that a transitory increase in free ABA during potato cold acclimation is not a result of the conversion of conjugated ABA but is probably the result of biosynthesis of ABA (Ryu and Li, 1994a). This information led us to investigate if *de novo* synthesis of proteins is required for the transitory increase in ABA during the induction period of cold acclimation. We therefore applied cycloheximide, a cytoplasmic protein synthesis inhibitor, to stem-cultured potato plantlets (*Solanum commersonii*), and examined the changes in ABA content and the development of cold hardiness under a low temperature (4/2℃, day/night) regime. The results provide an insight into an integrated aspect of potato cold acclimation: the ABA increase is regulated by the newly synthesized proteins in response to low temperature, and the subsequent development of cold hardiness depends on ABA-mediated gene expression (Ryu and Li, 1994b).

The mechanisms by which plants sense low temperature signal have been proposed in several studies. There is a general consensus that the plasma membrane is a primary site of low temperature perception. However, how the components of membrane are involved in signal transduction pathway in response to low temperature is presently unknown. Studies in animal systems have demonstrated that phospholipases, a group of membrane lipid-hydrolyzing enzymes, are key enzymes in signal transduction, cell activation and proliferation. The current thinking is that phospholipase D (PLD) is an integral part of the signal network in animals. Despite the prevalence and potential significance of PLD in the plant stress response, the mode and role of PLD-mediated membrane lipid changes is poorly understood. We have recently studied the modes of PLD activation and membrane lipid turnover during plant response to stresses including chilling, wounding and senescence (Ryu and Wang 1994, Ryu et al., 1994). Several present findings support that PLD and PLD-mediated membrane lipid turnover are potentially involved in the early perception of low temperature in Castor bean (*Ricinus communis* L.) The mechanism by which PLD is activated and membrane lipid components constitute signal transduction pathway leading to ABA increase and cold hardiness development is under study.

References

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