



ABSTRACT

*“Coping with insufficient oxygen:
From the cellular response to submergence tolerance”*

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Oxygen is vital for aerobic respiration in plants. Cells faced with insufficient oxygen must conserve energy to survive. My lecture will provide a perspective on the response to low oxygen stress from the cellular to the whole plant level. Our recent exploration of the responses of individual cell types of the seedling root and shoot of *Arabidopsis thaliana* to low oxygen stress has revealed an unified response that reconfigures metabolism to enhance substrate-level ATP production. The response is fine-tuned at the cellular level, providing distinctions in response of individual cell types and organs. A decline in cellular oxygen content is a component of the stress invoked upon waterlogging of a root system or complete submergence of a plant. The characterization of the submergence response governed by the multi-gene *Sub1* locus of rice (*Oryza sativa*) has uncovered the molecular basis of distinct strategies in energy utilization during submergence that permit survival under different flooding regimes. These acclimation responses involve a cascade of regulation mediated by the phytohormones ethylene, abscisic acid and gibberellins. I will describe how the *Sub1A*, an ethylene responsive transcription factor orchestrates a robust submergence tolerance phenotype that has the potential to dramatically improve the yield of rice from submergence prone fields in Asia.