October 2nd, 2018

“Nitric Oxide: A multipurpose biomolecule modifier important in the biological processes of plants and animals”

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Nitric oxide (NO) is an essential biological messenger that is involved in myriads of cellular and biological processes and widely conserved from prokaryotes to eukaryotes. NO is a gaseous, short lived biological molecule that plays a significant role in plants from seed germination to senescence especially in hormonal signaling, germination, pollen tube growth, stomatal closure, flowering, organization of root architecture, or iron homoeostasis\(^1\). In animals, NO induces vasodilation, prevents neutrophil/platelet adhesion to endothelial cells, inhibits smooth muscle cell proliferation and migration, and regulates programmed cell death (apoptosis)\(^2\). NO biosynthetic processes involve two pathways: NO synthases, which favor NO production under normal conditions and nitrite reductase (NiR), which favor NO production under hypoxic conditions. Fine-tuned NO signaling contributes to improved cellular metabolism, stress resistance and cytoprotective effects while dysregulation of NO signaling result in nitrosative stress with downstream effects triggering cell death\(^1\).

The understanding of the genes/proteins that are involved upstream or downstream of the NO signaling pathway is an important step in delineating the physiological functions of NO in vivo. Similarly, NO mediated posttranslational modifications like S-nitrosylation, metal nitrosylation and Tyr nitrosylation of target proteins\(^3\) have been observed to contribute to NO signaling and are critical to plant and animal developmental processes. To this end, this presentation will discuss NO biosynthesis and detoxification processes, NO-dependent stress responses, NO-dependent immune responses and NO’s role in legume-rhizobia relationship. To better understand the NO signaling at the molecular level, a focus on the nitric-oxide-based S-nitrosylation of S-nitrosogluthathione reductase (GSNOR1) for selective autophagy during hypoxia responses in plants will be examined. This will help reinforce our understanding of the functional roles of NO target proteins in response to hypoxia stress.

