

## **The role of membrane transporters in the cytokinin signaling upon of Legume- Rhizobia Symbiosis**

Cytokinin, an adenine-derived ubiquitous plant hormone is one of the foremost signaling intermediate controlling plant's growth and development. In legumes cytokinin signaling can dictate the nature of both the epidermal and cortical nodulation processes. It is postulated that cytokinin participates in orchestrating signaling events that promote Rhizobial colonization of the root cortex and limits the extent of subsequent infections at the root epidermis. Endogenous cytokinin's concentration is precisely regulated in roots and depends on stage of infection, needs and plant's condition. We have just started to recognize the mechanisms that allow the changes in cytokinin's pools and transfer the appropriate message to the site of hormone's action. An open question still remains whether the change in the local concentration of cytokinin is achieved by its: metabolism and/or transport /perception? It is postulated that membrane transporters can participate in the cytokinin signaling upon of Legume- Rhizobia Symbiosis (LRS) however up to date none of them have been identified.

### **Research project objectives/Hypothesis**

In agreement with recent findings that ABC (ATP-binding cassette) transporters are involved in translocation of root derived active form of cytokinins (trans zeatin) we postulate in model legume *Medicago* the role of such membrane transporters in the cytokinin signaling/transport upon of LRS.

### **Research methodology**

In the presented proposal we are going to explore *M. truncatula* - a well-established model plant for studying legumes biology. *M. truncatula* is easily transformable, has a short life cycle and the genetic and genomic tools which are rapidly expanding. We are going to test if the dysfunction of selected ABCs can influence the nodulation efficiency. This experiments will be supplemented by the use of modified *Rhizobium* strains (permanent, flavonoid-non- dependent Nod factor production) as well as *Medicago* mutants deficient in cytokinin signaling cascade. For selected candidates, further functional analyses will be conducted by usage of biochemical methods (transport experiments, localization, etc.) as well as biological assays on hairy roots, composite and transgenic plants.

### **Research project impact**

The investigation of the role of active transport systems like ABC proteins in symbioses have just begun and it provides a novel impetus for examining their role in the inter/intracellular regulation/signaling. The results of this study might shed new light on cytokinin translocation and the events crucial for effective nitrogen fixation. The proposal may have also an impact on current recognition of transporters as key players in coordinating via the same signaling molecule various morphological processes like e.g. lateral root formation and/or nodulation. Obtained data will contribute to the knowledge about cytokinin transport/signaling upon LRS and the role of membrane transporters in it.

This is a novel approach for plant ABCs which supplements the fundamental research on those proteins in the post genomic era. This project will also benefit plant breeders as it will facilitate establishing new selection criteria based on the proper intracellular accumulation/intercellular distribution of hormones like cytokinins.