AUXIN - the first phytohormone to be studied - acts as a common integrator of many endogenous and environmental signals regulating plant architecture. Many studies have shown that auxin signalling functions in virtually every aspect of plant growth and development. The major function of auxin was proposed to be regulation of root growth. Auxin exhibits a unique property, as it undergoes directional, cell-to-cell transport which is coordinated with transport proteins. In accordance with that, after its synthesis in shoots, auxin is directly transported to roots. It is known that high concentrations of auxins in the root tip are required for correct cell division, cell elongation, and final cell size.

The developmental plasticity of the root system represents a key adaptive trait enabling plants to cope with abiotic stresses or changes in nutrient availability, including nitrogen. Nitrogen is the mineral element that plants require in the greatest amounts, since it is a constituent of many plant cell components, such as amino acids, nucleic acids and other molecules including plant hormones. Plants mainly utilize inorganic nitrogen sources such as nitrate (NO_3^-) or ammonium (NH_4^+). In many natural ecosystems, NH_4^+ is the predominant nitrogen resource in the soil, but is toxic at high concentrations, especially when available as the exclusive source of nitrogen. Ammonium-mediated inhibition of plant growth was summed up as the "ammonium toxicity syndrome". Despite numerous studies addressing the reasons for NH_4^+ toxicity to plants, this phenomenon remains unsolved. Ammonium stress rapidly leads to various metabolic imbalances that ultimately inhibit growth. One phenotypic characteristic of NH_4^+ fed plants are defects in root morphology. Prolonged exposure to NH_4^+ was correlated with low auxin levels in roots. Also the expression of some auxin transport proteins was down-regulated during NH_4^+ nutrition. Therefore it is possible that the growth retardation of plants when grown on NH_4^+ may be connected to disturbed auxin distribution. The aim of this project is to elucidate whether changes in auxin transport are a major determinant of symptoms of NH_4^+ toxicity. The proposed study will contribute to the understanding of the mechanisms behind toxicity of NH_4^+ to plants. The symptoms of toxicity affect most crop plants and constitute therefore a global issue. The necessity of finding a solution for the ammonium toxicity syndrome is one of the most important cues especially in the light of agriculture, food industry, and environmental protection is unquestionable.