Autophagy is a lysosome-dependent mechanism for intracellular degradation, which enables cells to self-degrade intracellular components within lysosomes for recycling. Dysregulation of autophagy is associated with multiple human diseases. Activation of autophagy is essential for therapeutic approaches in neurodegenerative diseases such as Alzheimer disease (AD), Parkinson disease (PD), Huntington Disease (HD), and amyotrophic lateral sclerosis (ALS). Many autophagy-regulating compounds are under development for therapeutic purposes, trehalose is among them. It is very well documented that trehalose induces autophagy *in vitro* and *in vivo* and was tested as a safe, cheap, neuroprotective agent in preclinical and clinical studies. Unfortunately, due to its low bioavailability very high trehalose concentrations and frequent administration are needed *in vivo* for efficacy. Therefore, materials, especially nanoparticles, that release trehalose at physiologically relevant conditions could be an alternative for simple administration of trehalose in classical formulations. Such materials should have the advantage of reduced trehalose clirens, as well as extended stability by protecting it from rapid enzymatic hydrolysis into glucose by trehalase.

In order to improve pharmacokinetic properties of trehalose, nanogels containing covalently incorporated and releasable trehalose will be manufactured. The most crucial feature of such trehalose-rich polymeric nanoparticles intended to be administered intravenously is that they should be internalized by cells *via* endocytic pathways, possess a long residence time in blood circulation and finally release free trehalose at its site of action.

Recent study has shown that the degradation rate of hydrogels in slightly alkaline solution could be tuned by the selection of an appropriate acrylamide-type monomer for hydrogel preparation. It was shown that acrylamide contained in hydrogel network significantly accelerates hydrolysis of the ester groups of other network components. The previously described chemistry, in this project, will be further expanded to covalently incorporate the trehalose acrylate into nanogel network.

Within the current project, we examine the attachment of trehalose to polymers for its subsequent controlled release under physiological pH 7.4. These materials will be fabricated *via* copolymerization of acrylamide with trehalose acrylate. The composition of reaction mixture, appropriate ratio of monomers to crosslinker, initiator type and amount, all these parameters will be adjusted to obtain sustained trehalose release profiles and relevant nano sizes. Release of free trehalose from nanogels will be studied enzymatically.

Considering trehalose's high therapeutic potential and lack of approaches towards synthesis of trehalose releasing polymers, nanogels synthesized within the current project could be attractive candidates for *in vivo* studies.