

Title: Influence of phosphorylation on the conformation of peptides and proteins

Author: Ing. Veronika Jurásková

Department: Department of Physical and Macromolecular Chemistry

Supervisor: RNDr. Jiří Vondrášek, CSc.

Consultant: Mgr. Jiří Vymětal, PhD.

Abstract: The aim of the thesis was to study the effect of phosphorylation on the conformation of peptides and proteins. I focused on three amino acids which are phosphorylated the most – serine, threonine and tyrosine. I studied the conformational changes upon phosphorylation in dipeptides and pentapeptides by the metadynamics technique. I found out that the phosphorylation of amino acid residues led to the conformational changes characteristic for each amino acid. Whereas the phosphorylation of serine increased the preference of right-handed alpha helix conformation, the phosphorylation of threonine led to the extended structure and the conformation of tyrosine was not influenced by phosphorylation at all. Using classical molecular dynamics, I also studied the conformational changes in longer peptides derived from the phosphorylation sites of disordered proteins. Moreover, I simulated phosphorylated and unphosphorylated variants of three proteins with a known structure from the RCSB PDB database. I compared the calculated results with available experimental and computational studies.

Keywords: phosphorylation, dipeptides, pentapeptides, metadynamics, molecular dynamics, post-translational modifications