Abstract:
Impaired phosphate metabolism is an obligatory part of the biochemical manifestations of chronic kidney disease and manifest hyperphosphatemia is a frequent consequence of positive phosphate balance in conditions of advanced renal insufficiency and/or renal failure. Natural compensatory mechanisms responding to phosphate retention, i.e. increased production of the so-called phosphatonins (phosphaturic factors: parathyroid hormone (PTH) and FGF-23), are not sufficient and are even counterproductive from a certain level of renal dysfunction. The disorder of phosphate metabolism is part of the broadly defined CKD-MBD syndrome (chronic kidney disease - mineral and bone disorder), which includes laboratory parameters of bone metabolism, abnormalities in bone morphology, and vascular and other extraosseous calcifications. The clinical consequences of CKD-MBD are most pronounced in hemodialysis patients, with impaired phosphate metabolism being a key pathophysiological factor in their development. Three main therapeutic approaches are used to correct hyperphosphatemia: a diet with reduced phosphate intake, effective removal by hemoelimination, and pharmacological use of agents that reduce phosphate absorption from the gastrointestinal tract. The review part of the thesis is a summary of the existing knowledge on biochemical and physiological principles of phosphate balance control in health and renal insufficiency/renal failure. A separate chapter is devoted to models of phosphate kinetics, with a special focus on how they deal with the atypical kinetics of phosphate in dialysis compared to other metabolites. The second part of the dissertation is the description and results of own author´s observations. These focused on quantification of phosphate elimination by dialysis, differences in its effectiveness with different dialysis modalities (low-flux hemodialysis, high-flux hemodialysis, hemodiafiltration and frequent home hemodialysis), applicability of different phosphate binders and dietary counseling. The results of the study on the effectiveness of different dialysis modalities are reflected in a critical evaluation of current clinical guidelines.

Keywords: phosphate metabolism, chronic kidney disease, kidney replacement therapy, hemodialysis