## SUMMARY

Vitamin K belongs to the family of fat-soluble vitamins, which is not determinated in clinical laboratories. It is a cofactor necessary for posttranslational γ-carboxylation of glutamyl residues in selected proteins such as the osteocalcin, and procoagulation factors II, VII, IX, X. Vitamin K deficient individuals appear to have more undercarboxylated proteins, which are functionally defective. Lack of this vitamin has been associated with risk of developing osteoporosis and cardiovascular diseases. The aim of this work was to develop and validate the HPLC method and the LC-MS/MS method for determination of three vitamin K´s forms – vitamin $K_1$, MK-4 and MK-7 in serum. After successful validation of both methods, patient samples and healthy population samples were measured. There were measured 350 patient samples by HPLC method. These samples were divided into two groups – patients with diagnostic of osteoporosis and patients without osteoporosis.

We measured 946 samples by LC-MS/MS method. Samples were divided into groups: patients with osteoporosis, patients without osteoporosis, healthy population, patients with osteopenia and patients with cystic fibrosis. The reference range of vitamin K in healthy population was obtained by LC-MS/MS method.

The next aim was to compare the effectiveness of treatment of patients with osteopoenia who were taking extra vitamin $K_2$ (MK-7) in addition to vitamin D and calcium. The first group of patients was treated with Femoralex forte (PharmaSuisse Laboratories) containing vitamin $K_2$, vitamin $D_3$ and lactoferrin. The second (control) group was treated with vitamin $D_3$. There was a slight improvement in BMD in patients taking vitamin $K_2$ after six months of the treatment.

The last aim was to compare vitamin K concentrations measured by HPLC method and LC-MS/MS method. The result showed a significant difference in concentrations of MK-4, especially in low concentrations.