Streszczenie w języku angielskim

Introduction: Osteoporosis is a disease characterized by a gradual loss of bone mass, which leads to weakening of the bone structure and an increased risk of fractures. Postmenopausal osteoporosis usually occurs around the age of 45-55 as a result of a decrease in the amount of female hormones, especially estrogen. Calcium is the main mineral component of bones, therefore its adequate supply is an important factor in the prevention and treatment of osteoporosis. An effective and easy way to increase the amount of calcium in a diet is to use calcium-enriched foods. One of such innovative products is pumpkin enriched with calcium through osmotic dehydration using inulin.

The aim of the study was to determine the effect of selected nutritional and pharmacological factors on mineral metabolism and bone tissue metabolism in an animal model of postmenopausal osteoporosis.

Materials and methods: One hundred 12-month-old Wistar rats were divided into 10 groups. 90 rats had their ovaries removed (OVX) to create a rat model of postmenopausal osteoporosis. Then, a 12-week nutritional intervention was performed: the control group (C) and one of the ovariectomized groups (OVX_C) received a standard diet (without modification), the DEF group received a calcium-deficient diet, the CaC_B group received a standard diet with alendronate, the P_CaC group were fed a diet with calcium carbonate-enriched pumpkin, the P_CaC_B group were fed a diet with alendronate and calcium carbonate-enriched pumpkin, the CaL group were fed a standard calcium lactate diet, the P_CaL group was fed calcium lactate-enriched pumpkin, the CaL_B group were fed alendronate and calcium lactate, and the group P_CaL_B - alendronate and pumpkin enriched with calcium lactate. The pumpkin was previously enriched with calcium salts in the process of osmotic dehydration with inulin.

At the end of the experiment, the rats were decapitated and blood and tissues were collected. Serum concentrations of procollagen type I N propeptide (PINP), parathyroid hormone (PTH), estrogen and osteocalcin (OC) were determined using the enzyme-linked immunosorbent assay (ELISA). Complete blood count analysis was performed. Serum calcium and tissue calcium, magnesium and iron content were determined by atomic absorption spectrophotometry.

Results: It was observed that ovariectomy caused a decrease in the content of calcium, magnesium and iron in rat tissues. It was also shown that in groups P_CaC and P_CaL the content of calcium in the femur bones of rats after ovariectomy was increased. In the CaC_B

and P_CaC_B groups, the number of osteoblasts and osteocytes increased compared to the OVX_C group. In addition, it was observed that in the P_CaC and CaC_B groups, the percentage share of woven bones was reduced compared to the OVX_C group. It was also observed that the modified diets decreased the serum PINP concentration, except for the P_CaL_B and P_CaC_B groups, and increased the serum PTH concentration. The addition of alendronate decreased the concentration of OC compared to the control group.

In the P_CaC and P_CaL groups, there was an accumulation of calcium in the kidneys, and this effect was enhanced by the addition of alendronate. Also, the concentration of magnesium in the kidneys was increased in the groups receiving the drug. The DEF diet increased bone magnesium content compared to the OVX_C group. It was also observed that in the P_CaL_B group there was a significant increase in hemoglobin concentration compared to the control group.

Conclusions: Pumpkin enriched with calcium lactate or calcium carbonate increases the calcium concentration in the femur and improves bone metabolism in ovariectomized rats. Calcium-enriched pumpkin also causes calcium accumulation in the kidneys of ovariectomized rats, and alendronate in combination with enriched pumpkin promotes calcium and magnesium accumulation in the kidneys of ovariectomized rats. On the other hand, ovariectomy reduces the content of calcium, magnesium and iron in rat tissues.

15.06.2023

Wawrzyniak