

POPULAR SUMMARY

Osteoporosis is a metabolic disease that mainly affects people over 50. In women, osteoporosis often occurs after menopause. The reason is the cessation of ovarian function and, as a result, a reduction in sex hormone levels. Postmenopausal osteoporosis is characterized by deterioration of bone condition, which can lead to fractures. The quality of life of patients after osteoporotic fracture is reduced because they have limited mobility and require family care. The necessary rehabilitation or surgery, however, is very expensive, so the economic situation of people suffering from osteoporosis is also worse. For the health of bones, it's important to provide enough calcium in food. A proper diet can not only prevent, but also help treat osteoporosis. There are many factors that affect the absorption of calcium from the digestive system into the blood. Therefore, it is important not only to take the right amount of calcium, but also to reduce the inhibitory effects and increase the effects of beneficial factors affecting calcium absorption. One of them is a diet rich in substances found in soybean, namely soy isoflavones. It has been scientifically proven that isoflavones increase calcium absorption and improve bone condition. When daidzein (one of the isoflavones) is found in the intestine, it is transformed into a compound called equol, which is even more beneficial to bone health. Unfortunately, not everyone is able to produce equol in the intestines, so it may be important to provide equol in the form of a dietary supplement. **The aim of the project** is to determine the effect of equol on calcium metabolism and changes in bone structure in an animal model of postmenopausal osteoporosis. The results of the study can be used to modify the treatment of osteoporosis, which in turn will reduce the number of fractures and improve the overall health of the postmenopausal population.

We planned experimental studies in rats using a postmenopausal osteoporosis model. In the first stage of the experiment, 96 female rats will be divided into three groups. The first group will not undergo any surgery, the second group will be sham-operated (without ovariectomy), while the third group will have ovariectomies (OVX). This surgery will cause similar changes in the bones as postmenopausal osteoporosis. During the first three-week stage, rats from all groups will eat a standard diet. At the end of this part of the experiment, blood and tissue will be collected from eight rats from each group. Both calcium content and changes in bone structure will be analyzed. The purpose of the first stage is to determine the effect of ovariectomy on osteoporotic changes and calcium metabolism, as well as to induce changes in bone metabolism in rats, thus observing the therapeutic effect of the diet administered in the second stage. In the second stage (lasting six weeks), the remaining rats will be divided into 9 groups and will receive a standard or calcium deficiency diet with various modifications: 1. control group, 2. sham operated group - standard diet, 3. OVX - standard diet, 4. OVX - deficit diet, 5. OVX - deficit diet + calcium citrate, 6. OVX - deficit diet + equol + calcium citrate, 7. OVX - deficit diet + daidzein + calcium citrate, 8. OVX - deficit diet + bisphosphonates + calcium citrate, 9. OVX - deficit diet + bisphosphonates + equol + calcium citrate. The calcium compound used in the experiment will be calcium citrate due to its high bioavailability in the digestive tract. After completing the second stage of the experiment, blood and tissue will be collected and the same parameters will be analyzed as after the first stage.

It may turn out that equol not only improves bone structure, but also is a factor that has a positive effect on bioavailability and calcium metabolism. This fact can be used to develop new dietary supplements or innovative functional foods used in the prevention and treatment of osteoporosis. Equol may also become a component of new drugs that will cause fewer side effects than currently available drugs on the pharmaceutical market.