

The increase in life expectancy of the world population is associated with challenges regarding health issues. For instance, osteoporosis is a medical condition mostly observed in elderly people, in which the quality and quantity of the bone are severely affected. Not only for women but also for men, osteoporosis is recognized as an important public health issue. Osteoporosis is a systemic skeletal disorder and is a result of loss of skeletal mass. Osteoporosis is characterized by low bone mass, microarchitectural deterioration of bone tissue and an increase in bone fragility and susceptibility to fracture. Osteoporotic fractures are a significant cause of morbidity and mortality. The longterm use of drugs such as antiepileptics and antidepressants could affect the onset of osteoporosis.

The aim of the study was to evaluate the effect of orchidectomy, the effect of newer antiepileptic (levetiracetam, lacosamide, topiramate, lamotrigine) and antidepressive drugs (mirtazapine, venlafaxine and trazodone) on bone metabolism in healthy male Wistar rats.

The first specific aim was to determine the effect of orchidectomy on bone metabolism in rats. We found that after 12 weeks post-orchidectomy there was a negative effect on bone metabolism in rats. These results established these animals as suitable models for investigating androgenic modulation of body composition.

The second specific aim was to determine the effect of selected antiepileptic drugs (levetiracetam, lacosamide, topiramate, lamotrigine) on bone metabolism in rats and the extent of the (negative) effect of selected antiepileptic drugs in comparison to the control group. We determined that long-term administration of levetiracetam, lacosamide and topiramate can have a negative effect as judged by reduced femoral BMD. However, after 12 weeks the results showed no reduction of biomechanical bone strength. On the other hand, as well as a reduction in BMD, long-term administration of lamotrigine resulted in impairment of the mechanical strength of the bone. We detected a negative effect in all selected antiepileptic drugs. The extent of the negative effect was greatest for lamotrigine, and decreased sequentially in lacosamide, topiramate and levetiracetam.

The last specific aim was to determine the effect of selected antidepressant drugs (mirtazapine, venlafaxine, trazodone) on bone metabolism in rats and we were interested in the extent of the (negative) effect of selected antidepressant drugs in comparison to the control group. Our findings after 12 weeks suggest that administration of mirtazapine may suppress bone turnover, especially in the femoral neck. Long-term administration of venlafaxine and trazodone indicated inhibition of osteoblast activity. In all the selected antidepressant drugs we determined a verifiable negative effect on bone metabolism in rats. However there were differences between the individual drugs in the extent of the negative effect. Osteoblastic activity was impaired the most by trazodone and least by mirtazapine. Surprisingly in mirtazapine, we also confirmed the highest reduction in femoral neck mechanical resistance.