Summary

With an aging population and increasing life expectancy, osteoporosis represents a major global health problem. Currently it is estimated that more than 200 million people suffer from osteoporosis. Fractures due to osteoporosis are the major cause of morbidity and mortality in the elderly (Compston et al., 2019). A large body of evidence suggests an association between AEDs and bone abnormalities. The prevalence of osteoporosis and osteopenia in long-term treated epileptics is high. More than 50% of patients with epilepsy have low bone mineral density (BMD) (Ko et al., 2020).

The aim of the dissertation was to evaluate the effect of orchidectomy and the effect of selected new antiepileptic drugs (zonisamide, gabapentin, pregabalin, levetiracetam) on bone metabolism in young Wistar rats.

The negative effect on bone tissue after rat orchidectomy was confirmed after 12 weeks. Orchidectomy led to a statistically significant reduction in BMD and had a negative effect on the biomechanical properties of bones. Our results confirm that young rats after orchidectomy can be considered a suitable animal model for the study of osteopenia.

After 12 weeks of administration of new antiepileptic drugs (zonisamide, gabapentin, pregabalin, levetiracetam), there was no statistically significant effect on BMD in orchidectomised rats or gonadally intact rats. In the orchidectomised rat group, a significant increase in bone markers – BALP, CTX-I and RANKL – was confirmed after the use of levetiracetam, and a significant increase in bone turnover marker RANKL was observed after the use of gabapentin and pregabalin. In gonadally intact rats, a statistically significant increase in the markers BALP and CTX-I was measured after the use of levetiracetam, while a significant increase in the bone marker sclerostin was observed with pregabalin. None of the more recent antiepileptic drugs mentioned above has been confirmed to have a statistically significant effect on the biomechanical properties of bone in either orchidectomised rats or gonadally intact rats.

Long-term administration of the newer antiepileptic drugs (zonisamide, gabapentin, pregabalin, levetiracetam) can be considered as less risky for health.