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Examining of changes in the structure of rat bone maxilla and mandible treated with Hydrocortisonum hemisuccinatum

Badanie zmian w strukturze kości szczęki i żuchwy szczura pod wpływem Hydrocortisonum hemisuccinatum

Glucocorticoids have marked effects on bone metabolism, regulating bone formation and bone resorption (3). In vitro studies have shown that glucocorticoids have complex effects on osteoblast gene expression and regulate bone collagen degradation (2). The osteopenia associated with glucocorticoids is termed osteoporosis because there is no obvious defect in mineralization. This may be because glucocorticoids also inhibit the formation of new matrix, so that wide osteoid seams do not appear (1,8). Osteoporosis is the most serious side effect of longterm corticosteroid therapy. The bone mass in corticosteroid-treated patients is reduced in the forearm, spine and proximal femur, with more loss in trabecular than in cortical bone (4). There are few studies about signs of osteopenia in maxilla and mandible in drug-induced osteoporosis.

The aim of this study was to evaluate the dynamics of bone mass loss in rats maxilla and mandible after experimental *Hydrocortisonum hemisuccinatum* treatment.

## MATERIAL AND METHODS

The young, adult male rats were chosen for the experiment and they were divided at random into 2 groups – 20 rats in each. Every group comprised 2 subgroups (10 rats in

each) according to the length of the experiment. In the first one examination was carried out after 4 weeks of research and in the other, after 8 weeks. The first group (control group) consisted of rats, to which 0.9% NaCl was given. The second group (examined group) was composed of rats taking *Hydrocortisonum hemisuccinatum* (Polfa) in a dose of 30 mg/kg of the weight.

After finishing experiments the rats were anaesthetised, decapitated and maxilla and mandible bones were prepared. After working out the experimental material some density measurement of above mentioned bones was carried out. Such parameters as bone mass density of maxilla and mandible (BMD) and bone mineral content (BMC) were collected by dual-photon absorptiometry DPX – A (Lunar).

The data were statistically analysed and shown in the tables. All results were expressed as means (M  $\pm$  SD). The differences between means were tested using Student's test. Values were considered significant when p $\leq 0.05$ .

#### **RESULTS AND DISCUSSION**

The average arithmetic values of BMD of maxilla and mandible bones were statistically lower  $p \le 0.05$  in the group of rats taking *Hydrocortisonum hemisuccinatum*, both for 4 and 8 weeks comparing to control group. Remarkable lower contents of mineral components (BMC) were observed in maxilla and mandible bones in rats getting *Hydrocortisonum hemisuccinatum* too, significance level  $p \le 0.05$  (Tabs 1, 2). The received

Parametr Week		Examined group		Control group		Significance
		Me	SD	Me	SD	р
BMD	4	0.220	0.025	0.248	0.024	p≤0.05
(g/cm <sup>2</sup> )	8	0.235	0.030	0.261	0.019	p≤0.05
BMC	4	0.621	0.049	0.673	0.050	p≤0.05
(g)	8	0.634	0.068	0.697	0.027	p≤0.05

Table 1. Mean BMD and BMC values in rats maxilla

results of own study showed early occurring disadvantageous influence of *Hydrocortisonum hemisuccinatum* on maxilla and mandible bones used in this experiment (after 4 weeks). These changes were measured by dual energy X-ray absorptiometry-actual method. The obtained results of bone mass density (BMD) and bone mineral

Parametr	Weeks	Examined group Me SD		Control group Me SD		Significance p
BMD	4	0.133	0.008	0.141	0.007	p≤0.05
(g/cm <sup>2</sup> )	8	0.139	0.011	0.151	0.007	p≤0.05
BMC	4	0.470	0.048	0.523	0.050	p≤0.05
(g)	8	0.487	0.045	0.536	0.038	p≤0.05

Table 2. Mean BMD and BMC values in rats mandible

content (BMC) were characteristic of drug-induced osteoporosis (7). Olchowik also observed the lower bone mass density (BMD) in rats forearm and femur but after 12 weeks' hydrocortisone therapy (5). Olgaard and others noticed that steroid-treated patients had a significant reduction of the BMC levels in all parts of the skeleton (lumbar spine, forearm and mandible). However, the bone decay rates per month were significantly different in different bone regions (6).

## CONCLUSIONS

1. Bone mass density (BMD) and bone mineral content (BMC) of rats maxilla and mandible in hydrocortisone group were lower than in the control group.

2. The osteopenic changes were observed already after 4 weeks' experimental *Hydrocortisonum hemisuccinatum* treatment.

3. It seems that densitometric examination can be useful in evaluation of early osteopenia in drug-induced osteoporosis.

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#### STRESZCZENIE

Celem pracy była ocena zmian w strukturze kości szczęki i żuchwy szczura rasy Wistar pod wpływem działania *Hydrocortisonum hemisuccinatum* (Polfa). Na podstawie przeprowadzonych badań stwierdzono obniżoną w sposób istotny gęstość tkanki kostnej (BMD) i zawartość składników mineralnych (BMC) w doświadczalnej osteoporozie polekowej, zarówno po 4, jak i po 8 tygodniach trwania eksperymentu.