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SUPAPORN PUNTHEERANURAK : INFLUENCE OF ESTROGEN ON THE ACTION OF PROLACTIN ON BONE TURNOVER IN FEMALE SEXUALLY MATURE RATS. THESIS ADVISOR : NATEETIP KRISHNAMRA ,Ph.D., LIANGCHAI LIMLOMWONGSE, Ph.D., JONGGONNEE WATTANA-PERMPOOL, Ph.D., 116 p. ISBN 974-589-465-6

The purposes of the present study were i) to investigate the role of a high dose of exogenous prolactin (PRL) and endogenous PRL on bone Ca turnover in compact (tibia and femur) and trabecular bone (sternum and lumbar vertebrae 5-6), and ii) to evaluate the significance of estrogen (E_2) on PRL action on bone Ca turnover. Eight-week-old sexually mature female Wistar rats were divided into basal and sample groups for determination of bone formation and bone resorption. The sample group which was studied 2 weeks later was subdivided into control, prolactin treated (PRL) and bromocryptine treated (BROMO). A high dose of exogenous PRL (2.5 mg PRL/kg BW) subcutaneously (sc.) administered every day for 2 weeks markedly increased bone resorption in trabecular bone with a significant 67% change and an increase in total Ca content from 4.80 ± 0.08 to 5.21 ± 0.09 mmoleCa/g dry weight ($P < 0.05$) in the sternum. Bone formation was also increased by 125% in the sternum and 58% in the vertebrae. In an absence of endogenous PRL ie., in rats receiving 3 mg bromocryptine/kg BW intraperitoneal injection twice a day for 2 weeks, there was a 101% increase in bone formation in sternum, resulting in marked increases in net Ca gain and total Ca content to 5.27 ± 0.10 mmoleCa/g dry weight.

In the second part, the animals were divided into 2 main groups, sham operated (SHAM) and ovariectomized (OVX) groups. Both SHAM basal and OVX basal were sacrificed two weeks later while their respective sample groups were kept for a further two weeks. OVX sample was subdivided into control (NaCl); E_2 (daily sc. injection of 10 μg 17 β estradiol/kg BW); PRL (daily sc. injection of 2.5 mg PRL/kg BW); and E_2 + PRL (combined treatment with E_2 and PRL). After ovariectomy, bone Ca turnover accelerated in all four bones. Bone resorption significantly increased by 45% in tibia and 59% in vertebrae. Total Ca content in tibia was significantly reduced from the basal value of 6.07 ± 0.11 to 5.67 ± 0.14 mmoleCa/g dry weight ($P < 0.05$) which was also less than that of SHAM sample control (6.01 ± 0.11 mmoleCa/g dry weight). As expected, administration of E_2 slowed down bone Ca turnover in all bones and resulted in significant increases in net Ca gain and total Ca content in vertebrae. High dose PRL alone, on the other hand, did not alter bone Ca turnover in OVX rats, while E_2 + PRL treatment suppressed bone Ca turnover in tibia, sternum and vertebrae.

In conclusion, the present study demonstrated a biphasic action of PRL on bone ie., a high dose of exogenous PRL increased whereas the endogenous PRL (low circulating level) decreased bone Ca turnover in trabecular bone. It seemed that the action of PRL was estrogen dependent and was not detected in ovariectomized rats.