Bone Miner. 1994 Jan;24(1):43-58. Links

Gender dependent effects of testosterone and 17 beta-estradiol on bone growth and modelling in young mice.

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This study examined the effects of estrogen (17 beta-estradiol) and testosterone on the growth of long bones in male and female mice, with and without gonadectomy. Weight and nose-to-tail length were determined at 3 weeks of age at time of gonadectomy, 7 days later at the onset of hormone therapy, and throughout the treatment period. Gonadectomized mice exhibited an initial weight gain during the pretreatment period but length was unaffected. Hormone treatment altered weight gain in surgical and intact animals in a gender- and hormone-dependent manner. Estradiol enhanced weight gain in intact mice, but inhibited weight gain in ovariectomized mice. Lower doses of estradiol increased weight gain in orchiectomized mice at early time points. Testosterone increased weight in intact females and males, but not in gonadectomized mice. Estradiol increased nose-to-tail length in intact females at early time points, but inhibited length in ovariectomized females at later times, and it decreased length in intact males. Testosterone increased length in normal females and normal males. Serum Ca was unaffected by ovariectomy, but orchiectomy resulted in decreased levels. Estradiol reduced serum Ca in gonadectomized animals; serum Ca was increased by estradiol treatment in intact females. Changes in tibial bone weight, ash weight and mineral composition, and relative sizes of epiphyseal and metaphyseal bone were gender-, gonadectomy- and hormone-specific. Bone weight was greater in ovariectomized mice. Ash weight per bone was comparable, but there was an increase in Ca and P content with ovariectomy. Estradiol increased bone weight, ash content, and bone Ca and P in ovariectomized and intact females. Orchiectomy alone did not alter bone weight, ash content, or Ca and P, but orchiectomized mice were sensitive to estradiol; all parameters were increased in the orchiectomized animals treated with estradiol. Analysis of the ash content and Ca and P per mg bone, rather than per bone, demonstrated estradiol and testosterone alter net bone formation, but not the amount of mineral per unit bone. Ovariectomy increased hypertrophic cartilage. While estradiol did not alter tibial area in ovariectomized mice, it caused an increase in intact females. The total amount of growth plate cartilage in ovariectomized animals was decreased by estradiol to levels typical of intact animals due to a greater decrease in the hypertrophic cartilage in the ovariectomized mice, as well as a greater increase in metaphyseal bone area. Testosterone had no effect on these parameters in the females. Orchiectomy decreased the amount of growth plate cartilage, but increased the hypertrophic zone.(ABSTRACT TRUNCATED AT 400 WORD