

Hormones and bone

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During childhood, skeletal growth velocity and growth plate activities are largely dependent on growth hormone, IGF-1 and thyroid hormone, along with the calcium-regulating hormones, parathyroid hormone and vitamin D. Altogether, the hormonal influence on optimal skeletal growth and peak bone mass is enormously important.

Sex hormones have considerable influence not only on bone density, but also on bone quality. Data from studies of long bone geometry have shown that both testosterone and estradiol influence the cross-sectional area. Testosterone acts mainly on the periosteal surface while estradiol appears to influence bone growth on the endosteal surface (1). The influence of estrogen on the male skeleton has been shown in the context of growth and epiphyseal maturation through studies of men with an inability to produce estrogen because of aromatase deficiency. In addition, men with genetic predisposition to have greater aromatase activity through polymorphisms of the CYP19 gene have higher estrogen levels and less age-related bone loss (2-3). Moreover, cross-sectional studies have emphasized the importance of estrogen levels in maintaining male skeletal mass (4).

Parathyroid hormone (PTH) is unique in its actions on bone strength as it may have profoundly negative or positive effects, depending on the manner in which it is secreted or administered. From a therapeutic point of view, intermittent, low dose administration of PTH is associated with important anabolic effects on the skeleton (5) that have been demonstrated in postmenopausal women and in men (6). In primary hyperparathyroidism, on the other hand, the chronically high levels of PTH are associated with a proclivity for bone loss at the distal 1/3 radius, a site that is comprised mainly of cortical bone (7,8). Marked improvements in bone mass are seen following successful parathyroidectomy in severe primary hyperparathyroidism in a state of hungry bones with hypocalcemia and secondary hyperparathyroidism (9). Improvements are also seen in subjects whose primary hyperparathyroidism is characterized primarily by densitometric and mild biochemical abnormalities (10). Vitamin D is becoming widely recognized as a pivotally important calcium regulating-hormone. Suboptimal serum concentrations of 25-hydroxvitamin D have been found in various populations worldwide, including those in countries with an abundance of sunlight. These observations challenge previous notions that sunny climates are associated with normal vitamin D levels (11,12). The epidemic of vitamin D deficiency has led to recognition that it is involved in many important non-skeleton systems that govern functions of muscle, cognition, vision, heart, immunity, insulin sensitivity and cancer risk (12-14).

Obesity is becoming the center of attention in view of adipocyte hormonal products that have important skeletal properties (15). In this regard, controversial issues related to hormones and bone strength arise, and some data suggest that the type of body fat distribution whether central or peripheral may have different effects on bone metabolism related to the degree of inflammation, insulin resistance and adipocyte hormone secretion. Although very high insulin levels present in some rare insulin-resistant states (16) may be anabolic to bone, data have emerged that leptin and insulin resistance may nega-

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tively influence BMD (Bone Mineral Density) in obese patients at the time of adolescent bone accrual (17).

In this special issue of the Brazilian *Archives of Endocrinology and Metabolism* (ABE&M) through the Brazilian Society for Endocrinology and Metabolism, these and other issues are covered. We would like to express our gratitude to all the contributors to this supplement, and very much hope that it will offer you an opportunity to update your knowledge in this fascinating and fast-moving field.

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