



Colorado Center for
BONE RESEARCH

Peak Bone Mass

Bones are the frame work of your body. Bone is living tissue that changes constantly, with old bone being removed and replaced by new bone. You can think of bone as a bank account, where you make “deposits” and “withdrawals” of bone tissue.

The majority of bone mass is achieved during the first two decades of life, with significant growth spurts occurring during adolescence. You could say that more bone is deposited than withdrawn. By age 18, skeletal growth is nearly complete, with minor accumulations in bone density occurring until about age 30. At that point, bones have reached their maximum strength and density, known as peak bone mass. In women, there tends to be minimal change in total bone mass between age 30 and menopause. However, most postmenopausal women experience rapid bone loss for the first five years after menopause, with bone loss occurring more slowly after that. In the case of men, they have larger skeletons, and their bone loss starts later in life and progresses more slowly than that of women. While men do not experience the rapid bone loss that affects women, declining testosterone levels may cause similar bone losses as that resulting from postmenopausal estrogen loss.

Peak bone mass is influenced by a variety of genetic and environmental factors. It has been suggested that genetic factors may account for up to 60-80 percent of bone mass. These factors include:

Genetic:

- Gender – Peak bone mass tends to be higher in men than in women.
- Race – African-American females tend to achieve higher peak bone mass than Caucasian females. Additional research shows significantly greater bone density in African-American men as well.
- Family History – Individuals with a family history of diagnosis of osteoporosis or non-traumatic fractures, especially maternal hip fractures, tend to have lower peak bone mass and are, therefore, at risk for osteoporosis.

Environmental:

- Hormonal – Estrogen is an important determinant of peak bone mass. Young women whose menstrual periods stop as a result of anorexia nervosa or excessive exercise may experience a significant drop in bone density that is often not replaced after menstrual periods resume. In young men, low production of testosterone also can adversely affect bone density.

- Calcium Intake – Calcium deficiency in young people can account for 5-10 percent lower peak bone mass and can significantly increase a person’s risk for hip fracture in later life.
- Physical Activity/Lifestyle – Studies suggest that increased physical activity in adolescence is associated with greater bone mineral density. Factors that negatively influence peak bone mass include smoking and alcohol consumption.

Adults can help children achieve peak bone mass in many ways:

- Serve as positive role models for children and adolescents. Be active, don’t smoke, limit alcohol use, and eat a balanced diet with an adequate calcium and vitamin D intake.
- Find and encourage ways for youth to be more active, such as dancing, participating in sports, gardening, walking to school, taking the stairs instead of elevators and hiking with the family.
- Encourage children to take an active part in selecting and preparing calcium-rich foods to maintain adequate calcium intake.

Watch for delayed sexual maturation, which may be associated with bone mineral deficits. Girls who have not begun menstruating by age 16 or whose periods have stopped for any reason should see a doctor for evaluation. Boys who have not begun puberty by the age of 15 may also require evaluation.

Peak bone mass is an important determinant of the risk of osteoporotic fracture. In both men and women, good bone mineral density in later life depends on the achievement of peak bone mass and on the subsequent loss of bone with age. Though peak bone mass is predominantly determined by factors that cannot be changed such as age or race, modifiable environmental factors such as calcium intake, exercise and lifestyle behaviors during childhood and adolescence are believed to play a significant role in bone health throughout life.

It is important to note that while all young people should follow preventive measures, these measures do not guarantee that those at high risk are totally protected from osteoporosis.