



Mineral Metabolism and Osteoporosis

Osteoporosis is a condition that affects the bones, causing them to become weak and fragile and more likely to break (fracture). These fractures most commonly occur in the spine, wrist and hips but can affect other bones such as the arm or pelvis. Hip and vertebral fractures, in particular, are associated with increased morbidity and mortality.

Osteoporosis is the most common bone disease in humans. For instance, over two million osteoporosis fractures occurred in the United States in the year 2005. Approximately 10,000,000 people in the United States have osteoporosis. An additional 34 million people in the United States have low bone density of the hip. Although commonly associated with post-menopausal women, osteoporosis can also affect men, younger women and children. One in 3 women older than 50 years will eventually experience osteoporotic fractures, as will 1 in 5 men. By 2050, the worldwide incidence of hip fracture is projected to increase by 240% in women and 310% in men.

Bone is made of a hard outer shell with a mesh of collagen (tough elastic fibers), minerals (including calcium), blood vessels and bone marrow inside. Healthy bones are very dense, and the spaces inside the bones are small. In bone affected by osteoporosis, the spaces are larger, and this makes the bones weaker, less elastic and more likely to break.

Bone is a living tissue that is constantly repairing itself. This process is called bone turnover. There are cells which break down old bone (osteoclasts) and cells which build new bone (osteoblasts). This process requires a range of proteins and minerals, which are absorbed from the bloodstream.

In childhood, bones grow and repair very quickly, but this process slows down as you grow older. Bones stop growing in length between the ages of 16 and 18, but continue to increase in density until you are in your late 20s. From about the age of 35, you gradually lose bone density. This is a normal part of aging, but for some people it can lead to osteoporosis and an increased risk of fractures.

Treatment of osteoporosis and other related conditions:

The core treatment of osteoporosis is calcium and vitamin D supplementation as noted in the chart below. This can be done with over-the-counter supplements. Calcium citrate preparations [i.e. Citracal] are better absorbed than calcium carbonate [i.e. TUMS]. Although most multi-vitamins are helpful for general nutrition, they typically do not contain enough vitamin D and calcium.

There are other options for the treatment of osteoporosis or osteopenia such as the use of anti-resorptive agents. These agents include the bisphosphonates, such as Fosimax (alendronate), risedronate, ibandronate, and zoledronic acid. On the other hand, there are side-effects to these agents including osteonecrosis of the jaw and fractures that are not typical of osteoporosis, such as thigh fractures. In addition, intermittent PTH (teriparatide) has been shown to be effective for the treatment of osteoporosis. Outside of the use of calcium and vitamin D supplementation, there is enough complexity to the use of these agents that it is advisable for you to see a primary care provider or endocrinologist who has a special interest in mineral metabolism before utilizing these particular medications. Additionally, there are other medical conditions and medications that can affect bone mineral metabolism that should be addressed by either your primary care physician or an endocrinologist.

For adults, the recommended vitamin D supplementation is 2000 international units [I.U.] per day. The recommended calcium intake varies by age and other conditions as noted in the table below:

Recommended TOTAL Calcium Intake per day:

Age	Amount (mg/day dispersed in two or three doses)
Birth to 6 months	210
6 months to 1 year	270
1-3 years	500
4-8 years	800
9-13 years	1300
14-18 years	1300
19-30 years	1000
31-50 years	1000
51-70 years	1200
71 or older	1200
Pregnant or lactating 14-18 years	1300
Pregnant or lactating 19-50 years	1000

This primer should serve as a mere introduction for optimizing the metabolic aspect of your neuro-musculoskeletal care and recovery. It is important to recognize that obtaining and maintaining proper a general medical condition is also very important to your neuro-musculoskeletal health.

Miguel Schmitz, MD

William Faloon, MD

Ryan Saunders, PA-C

Tim Brim, PA-C