OSTEOPOROSIS

An introduction to aging science brought to you by the American Federation for Aging Research
WHAT IS OSTEOPOROSIS?
Osteoporosis literally means “porous bone.” It refers to bone that is no longer dense, sturdy, or structurally sound, and as a result, is prone to fractures—especially in the hip, spine, and wrist. Breaks in these areas can result in serious and sometimes permanent consequences. For example, they can cause spinal vertebrae to collapse, which can lead to so-called “dowager’s hump.” Even wrist fractures are not trivial, as they can interfere with an individual’s ability to function independently.

THE IMPORTANCE OF OSTEOPOROSIS
The National Osteoporosis Foundation is one of several organizations providing support and information to patients and physicians interested in the disease. They have published statistics on the incidence of osteoporosis and its costs to society. They note that 10 million Americans have osteoporosis, at least 80 percent of whom are women. They further note that one in two women over the age of 50 will suffer an osteoporosis-related fracture. Menopause is the single greatest risk factor for osteoporosis. In the first decade after the onset of menopause, women lose as much as 20 percent of their bone mass.

The National Osteoporosis Foundation estimates that this disease causes 300,000 hip fractures, 700,000 spinal fractures, 250,000 wrist fractures, and 300,000 fractures at other sites annually in the United States.

WHAT CAUSES OSTEOPOROSIS?
From infancy to age 30, we add strengthening minerals, particularly calcium, to the structural tissue of our bones. In our third decade, however, most people reach peak bone mass. After that, they slowly begin losing more minerals than they add. For women, however, the process speeds up after the rapid hormonal changes that occur at menopause. Men in their 50s don’t experience bone loss at anywhere near the same rate that women of the same age do. By age 65 or 70, however, both sexes are losing bone mass at the same rate, and older men who experience fractures are more likely to die from complications.

Heredity and lifestyle can hasten the disease process.

28 million Americans have osteoporosis; at least 80 percent are women.
Whites and Asians, tall and thin people, and individuals with a family history of osteoporosis are at highest risk. Behavioral factors that increase the risk of osteoporosis and osteoporotic fractures include smoking, alcohol abuse, a diet low in calcium, too little exposure to sunlight (necessary for vitamin D metabolism and stronger bones), and prolonged inactivity.

A number of diseases, many associated with aging, can also cause osteoporosis. These include kidney failure, cancers, liver disease, Paget’s disease, endocrine or glandular diseases, rheumatoid arthritis, and gonadal failure (such as from surgical removal of the testes or ovaries). Medications, including steroids, thyroid hormone, seizure drugs, and blood thinners, can also cause osteoporosis.

**DIAGNOSING OSTEOPOROSIS**

All too often, osteoporosis is diagnosed only after a fracture has occurred. A specialized, non-invasive X-ray study called bone densitometry is available to measure the density of bone at specified sites (wrists, heels, spine, hip), and the percentage of bone loss from the sites can predict the risk of fractures. Recently, the FDA also approved tests that measure bone density in the middle finger and the heel or shinbone. Bone densitometry can also measure increases in bone density that occur through effective treatment.

**PREVENTING OSTEOPOROSIS**

Ideally, preventing osteoporosis is preferable to treating it after it has already caused damage, but preventive measures should start in childhood and continue through young adulthood, with regular exercise and a calcium-rich diet. For older adults, the reduction in bone density that occurs with the onset of osteoporosis can be slowed and sometimes reversed by doing weight-bearing exercise such as walking, dancing, and gardening. Smoking cessation and moderating the intake of alcohol, caffeine, and carbonated beverages can also help.

If osteoporosis is already present, you can limit its effects by reducing your risk of fractures. For example, avoid falls by choosing sensible shoes, removing scatter rugs, and reviewing your medications with your doctor to avoid those that can cause dizziness or decrease alertness.

**OSTEOPOROSIS AND AGING**

Age is the chief single risk factor for osteoporosis. With advancing age, and particularly after menopause in women, the activity of osteoclasts, cells that break down bone, is greater than that of osteoblasts, cells that build bone. This ultimately gives rise to osteoporosis. While older women suffer from osteoporosis at rates of four to six times those of men, more than 2 million men, according to the National Osteoporosis Foundation, currently have the disease.

**BONE KNOWLEDGE IS POWER**

Bone mineral density measurements can help predict osteoporotic fractures, but do these tests affect whether women take steps to preventing these debilitating breaks? One study by researchers at the Harvard Medical School sought to find out.

After conducting bone density tests (using DEXA or dual-energy X-ray absorptiometry) on 701 postmenopausal women over the age of 50, scientists followed these women for an average of nearly three years. They tracked their use of hormone replacement therapy, calcium intake, caffeine use, exercise, and smoking habits—all of which can influence a woman’s risk of osteoporosis.

Ultimately, the researchers found that compared to women with normal readings, women with moderate or severe low bone density were two to three times more likely to start hormone replacement therapy and significantly more likely to start taking calcium.

Osteoporosis can be slowed and sometimes reversed by doing weight-bearing exercise such as walking, dancing, and gardening.
In addition, the women in the study were significantly more likely to begin an exercise program, decrease their caffeine, and/or quit smoking. These findings held, even after adjusting for the women’s age, education, and history of osteoporosis or fracture.

While hardly definitive, this study suggests that the results of a bone mineral density test may have a real impact on a variety of health behaviors, some of which may not only reduce the risk of osteoporosis, but may also have more positive effects on general health, as well.

THE FUTURE OF OSTEOPOOROSIS RESEARCH

Several areas of investigation into osteoporosis, its causes, its accurate and timely diagnosis, and its treatment hold promise.

Prevention is the key to controlling any disease. To that end, researchers have determined that not only can a lifelong program of aerobic, weight-bearing exercise increase bone mineral density and reduce the incidence of osteoporosis, but it can also strengthen muscles and decrease the risk of falls and thus fractures in older adults.

Nutritional approaches to osteoporosis hold promise. Scientists are looking at soy foods and soy products with great interest.

Soy foods are the only food with naturally occurring isoflavones, estrogen-like compounds that in many (although not all) preliminary studies appear to increase spinal bone mineral density in women. One recent study, a collaboration between researchers at Florida State University and Oklahoma State University, suggests that eating dried plums may also help. Phytochemicals in the plums apparently have the ability to suppress the rate of bone breakdown in the body.

Further refinement in our understanding of the significance of blood levels of the markers of bone turnover might well lead to improvements in the diagnosis of osteoporosis and its treatments.

Currently, people either sustain fractures that lead to a diagnosis of osteoporosis, or because of their age, their doctors refer them for bone mineral density screening tests, such as bone densitometry, to make a diagnosis. Today, bone densitometry tests are repeated, typically annually, after treatment is started to assess improvement in bone mineral density. Blood markers as assessment tools offer the benefit of no radiation exposure, greater convenience, and less time lost to testing. If blood markers can be identified that are even more sensitive and predictive than those already known, they could be a real advance, particularly in the assessment of osteoporosis treatment.