Aging, Inflammation, and Bone Health

Osteoporosis is usually thought of as a disease that affects older women. However, both men and women are at risk for this common condition, which can significantly impact mobility, quality, and length of life.

Changes in bone health start earlier than you might think. Aging and inflammation often go hand in hand, and together, they can accelerate bone tissue breakdown. Strategies to maintain bone density and reduce inflammation are essential for all adults.

Osteoporosis Risk Factors

Osteoporosis is a common bone disease affecting approximately 54 million Americans.[1] It causes loss of bone density, resulting in thin, porous, fragile bones at a high risk for fracture. Aging is a significant risk factor, as bone density begins to decrease around age 30 in all adults and accelerates with each decade.

Bones constantly undergo remodeling, a process by which your body breaks down and removes old or damaged bone and replaces it with new, healthy bone material. However, as you age, more bone breaks down than is replaced during remodeling. Eventually, this leads to brittle or porous bones. By age 50, one out of two women and one out of three men develop osteoporosis, putting them at risk for bone fractures.[1,2]

Low bone density is more common in women than men because most women have naturally smaller, less dense bones. A woman's risk increases significantly just before and after menopause because estrogen deficiency increases bone breakdown relative to bone formation.

Besides menopause, these and other conditions and risk factors can also speed bone loss in both men and women, further increasing osteoporosis risk:[1]

- Autoimmune diseases such as rheumatoid arthritis, lupus, multiple sclerosis, and celiac disease
- Bariatric (weight loss) surgery
- Blood disorders such as sickle cell disease, thalassemia, and leukemia
- Certain medications that treat breast or prostate cancer
- Low levels of testosterone and estrogen in men
- Overactive thyroid
- Parkinson's disease
- Poor nutrition, including inadequate calories, chronic dieting, and eating disorders

- Smoking and excess alcohol use
- Spinal cord injuries
- Steroid medications and certain medications used to treat anxiety and depression, neurological disorders, and excess stomach acid
- Stroke

Inflammation and Bone Health

Research suggests inflammation plays a role in accelerating bone loss. Inflammatory diseases such as rheumatoid arthritis, inflammatory bowel disease, and periodontitis (gum disease) are associated with lower bone density and increased risk of bone fractures.[3,4,5]

Inflammation is a natural immune system response to something harmful. When your immune system senses an invader, such as a virus, toxin, or tissue injury, it immediately dispatches white blood cells and cytokines, proteins involved in immune system regulation, to stop the invader and begin healing.

Short-term inflammation helps your body fight infections or illnesses and heal from injuries. However, the immune system sometimes becomes overstimulated and fails to shut down, causing chronic inflammation lasting for months or years. Instead of protecting you, chronic inflammation can damage healthy tissues, including bone.

Chronic inflammation can result from:[5]

- Aging
- Chronic emotional stress
- Chronic infections or an illness that doesn't clear up
- Dysbiosis, or an imbalance in gut microbes
- Excess alcohol consumption
- Extended sleep disruptions
- Long-term exposure to low levels of environmental toxins or chemicals like cigarette smoke
- Obesity
- Physical inactivity
- A Western diet high in ultra-processed, packaged foods

Lab, animal, and human studies have shown that inflammation has a negative effect on bone. Immune cells, cytokines, and other proteins activated during inflammation promote bone remodeling, with a stronger tendency to break down bone tissue without rebuilding it.[3,4]

Aging and Inflammation: Inflammaging

While chronic inflammation often results from lifestyle and environmental stressors, aging also plays a role. With age, there is a gradual decline and dysregulation in immune function and an increase in low-grade, chronic inflammation.

This age-related inflammation, also known as inflammaging, is thought to contribute to chronic degenerative health conditions, including heart and vascular (blood vessel) diseases, diabetes, cognitive decline, kidney disease, cancer, and osteoporosis.

Aging is inevitable, but aging, in combination with other risk factors for inflammation, such as a poor diet, physical inactivity, or gut dysbiosis, may exacerbate bone loss and promote osteoporosis earlier than usual. Reducing inflammation is essential when considering strategies to protect bone health in midlife.

Reducing Inflammation and Protecting Your Bones

Medications are available to help slow bone loss, promote bone growth, and reduce high levels of underlying inflammation. However, it is crucial to establish a good health foundation with diet and lifestyle changes.

Diet is an excellent starting point for boosting bone health and reducing inflammation. A healthy, well-rounded diet provides nutrients to promote bone regeneration during the remodeling process. At the same time, it supports immune health and tames chronic inflammation by promoting a healthy weight, nourishing gut microbes, and providing antioxidant and anti-inflammatory compounds.

These are some key nutrients for bone health and anti-inflammatory food sources to include in your diet:

- Calcium from dairy or non-dairy plant milk, yogurt, tofu, and leafy green vegetables
- Vitamin D from eggs, salmon, fortified milk, and cereals
- Vitamin K from leafy green vegetables and prunes
- Vitamin C from citrus fruits, strawberries, sweet peppers, and broccoli
- Potassium from bananas, sweet potatoes, and orange juice
- Magnesium from nuts and seeds and whole grain bread or cereal
- Protein from eggs, tofu, legumes (beans), seafood, and poultry
- Omega-3 fats from oily fish such as salmon, sardines, and anchovies

Talk to your healthcare provider about supplementing any of these nutrients. Many people can benefit from taking a bone health formula in addition to eating a healthy diet.

While a whole-food, plant-rich diet is beneficial, a Western-style diet harms bones and promotes inflammation. Limiting or avoiding highly processed foods such as fast food, frozen, packaged, microwaveable meals, packaged snacks, and desserts is best. These

foods tend to be high in sodium, which causes your body to lose calcium and can lead to bone loss, and refined fats, grains, and sugar, which activate inflammation.[1,5]

Exercise or physical activity is also essential for healthy bones. A combination of weight-bearing and strength training exercises is recommended to help increase and maintain bone density and reduce inflammation.[1,5] Strength training exercises, such as working out with weights or resistance bands, also build and strengthen muscles, reducing your risk of a fall.

It's critical to check with a healthcare provider before starting an exercise routine, especially if you are at risk for or have osteoporosis. As long as they are approved, bone-building exercises include:[1]

- Dancing
- High or low-impact aerobics
- Hiking
- Jumping rope or jumping jacks
- Tennis
- Running or jogging
- Squats, lunges, and planks
- Strength training with weights or resistance bands
- Walking

Another effective way to reduce inflammation is by reducing exposure to chemical and environmental toxins. Examples include cigarette smoke, excess alcohol use, plastic bottles and containers, air pollution, household cleaning products, and lawn care products (fertilizers, pesticides, and herbicides). Long-term exposure to chemicals in these products activates inflammatory signals in the body. These chemicals are linked to some types of cancer, autoimmune diseases, and other inflammation-related diseases.[5]

Finally, many people are surprised to learn that poor sleep quality increases inflammation. Emotional stress from work, family, or health concerns, hormonal changes that come with age (especially menopause), and late-night exposure to blue light from phones or tablets can cause problems falling asleep, poor sleep quality, and disruptions in circadian rhythm. This negatively impacts hormone metabolism and immune health. Inconsistent sleep has been associated with higher levels of inflammation, especially in women.[6]

These strategies may help promote better sleep:

- Avoid alcohol and caffeine late in the day.
- Establish a consistent sleep and wake pattern. Don't allow yourself to sleep in on the weekends or stay up too late, even if occasionally.
- Keep the bedroom at a cool, comfortable temperature.
- Practice relaxation exercises like gentle stretching, meditation, or breathwork in the evening.

- Turn off all blue-light-emitting devices at least one hour before sleep.
- Keep WiFi out of the bedroom and ideally turn cell phones off or leave them on airplane mode.
- Use a botanical sleep supplement, which may promote relaxation and reduce the time it takes to fall asleep.

Poor bone health can leave you with fractures, long-term pain, and lack of mobility, all of which diminish your quality of life. Protecting your bones requires a multifaceted approach, but it is crucial for adults, especially women, to start as early as possible.

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