

Bone Health Support

Like many chronic health conditions, bone loss is silent but significant. We think of bone health when a patient has either broken a bone due to injury or is elderly and has likely developed some degree of weakened bone integrity or bone loss. The degree of bone loss will define the difference between osteopenia and osteoporosis, with the latter being more serious.

Loss of bone has a significant influence on well-being and is associated with:

- Feelings of anxiety and/or depression
- Diminished self-image
- Avoiding leisure activities due to feeling you have limitations
- Experiencing acute or chronic pain
- Feeling unable or challenged when performing activities of daily living
- Experiencing a loss of independence
- Changing or strained relationships with family and friends

Optimizing the microbiome and other functional support can set the stage for healthy bones throughout the lifespan.

Epidemiology

Currently, 53 million Americans have bone loss that puts them at risk. The incidence is expected to exponentially increase as our growing population ages and the number of older Americans increases. In the United States, 54% of postmenopausal women are osteopenic, and an additional 30% are already considered osteoporotic. By age 80, this relative trend predictably shifts in favor of osteoporosis as 27% of women are osteopenic, and 70% are osteoporotic.¹

Bone loss, which is conventionally considered an unavoidable consequence of aging, affects over 200 million individuals worldwide, with an annual healthcare cost of over USD 13.5 billion in the United States alone.²

¹ <https://www.ncbi.nlm.nih.gov/books/NBK499878/>

² <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8431678/>



Physiology/Diagnosis/Clinical Relevance

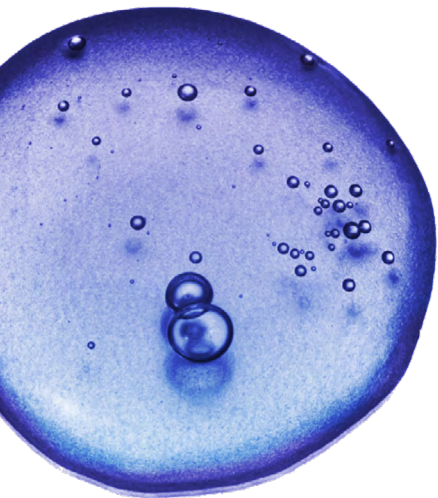
Skeletal bone gives the human body both structure (mobility and support) and function (producing our red blood cells, white blood cells, and platelets) while acting as a storage depot for minerals.³ Calcium and phosphorus are the predominant macro-minerals, along with magnesium, while trace minerals such as boron, iron, zinc, copper, and selenium are also important. The mineral content makes up 65% of bone tissue.⁴ Together, these minerals provide hardness and are deposited around proteins that are made up of a dense network of collagen. Collagen adds softness to the bone and allows for the bone to absorb shock without breaking.³

Our bones undergo the process of **modeling** – growing and changing shape – through childhood and adolescence until they reach a peak between the ages of 20 to 30. After this, they go through a process called **remodeling**, where bone tissue is removed and replaced. Remodeling continually optimizes tensile strength, minimizing the chances of bone fractures that can occur when old bones become brittle.³

Two primary cell types participate in the formation and remodeling of bone.

Osteoblasts (OBs) produce collagen, forming the structure for calcium, phosphorus, and other minerals to be deposited to create new bone. They are having a *blast* making new bones.

Osteoclasts (OCs) resorb bone by adhering and secreting hydrogen ions to the surface of the bone, which dissolves and releases the mineral deposits from the bone. They may seem like the bad guys, but remember, we need them to respond to stresses and participate in remodeling.



To maintain bone homeostasis, interaction between OBs and OCs is essential during bone remodeling. If the balance gets off, the outcome can be osteopenia and, eventually, osteoporosis. This is usually due to an over-activation of OC activity, which degrades bone more quickly than OBs are forming new bone. Conversely, bone loss can be the result of inhibited OB activity.³

A bone density test evaluates the mineral component of bone and produces a result called a **T-score**. The T-score compares a person's bone density with someone in their 20s and of the same sex and race. Because the test measures bone *loss*, the T-score is reported as a negative number. The World Health Organization defines osteopenia as a T-score of -1.0 to -2.5 Standard Deviations (SD), while osteoporosis is a T-score of -2.5 or less (e.g. -2.8, -3.0).²

³ <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7933548/>

⁴ <https://pubmed.ncbi.nlm.nih.gov/30467628/>

Osteopenia and Osteoporosis Risk Factors

- **Aging** - Bone density peaks around age 30 and declines with age as bone remodeling becomes imbalanced.
- **Females** - Women have lower peak bone mass, and experience accelerated bone loss after menopause due to declining estrogen levels.
- **Low body weight/low BMI** - Having a small frame and thin build provides less skeletal mass and mechanical loading to stimulate bone formation.
- **Family history** - A woman whose mother has osteoporosis is more likely to get it herself than a woman without this family history. This appears to be due to “inheriting” diet and lifestyle factors from family, rather than being genetic in origin.
- **Nutritional deficiencies** - Inadequate calcium, vitamin D, protein, and other nutrients inhibit bone matrix development and remodeling.
- **Inactive lifestyle** - Lack of physical activity and weight-bearing exercise weakens bones over time due to reduced mechanical stress.
- **Smoking** - Smoking can damage bone cells and increase loss of calcium and other minerals from bone.
- **Excessive alcohol intake** - Heavy alcohol consumption interferes with bone cell metabolism and can lead to low bone mass.
- **Certain medications** - Long-term use of glucocorticoids, anticonvulsants, proton pump inhibitors, antidepressants, chemotherapy, and other drugs can impair bone density.
- **Underlying conditions** - Rheumatoid arthritis, cystic fibrosis, celiac disease, hyperthyroidism, organ transplant, and other conditions affect bone health.

The Gut-Bone Axis

The gut-bone axis refers to the interaction between microorganisms, their metabolites, and bone health.⁵ Microbial diversity, balance and/or dysbiosis have all been shown to impact the following:

- Bone mineral density
- Strength parameters⁵
- Bone structure
- Fracture risk^{6,7}

⁵ <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9598716/>

⁶ <https://pubmed.ncbi.nlm.nih.gov/25497348/>

⁷ <https://pubmed.ncbi.nlm.nih.gov/27821775/>



The Gut-Bone Axis, continued

Research indicates that the gut microbiome plays a role in bone health throughout the lifespan, affecting the developing skeleton in early life,⁸ influencing adult bone density (with dysbiosis resulting in poorer bone microarchitecture), and in old age, when the gut microbiome undergoes changes that are thought to contribute to osteoporosis.⁹

Scientists have proposed several mechanisms through which the gut microbiome interacts with bone. These include:



MECHANISMS	MICROBIAL INFLUENCES
NUTRIENT ABSORPTION	The gut microbiome helps extract and absorb key bone-supporting nutrients like calcium, magnesium, and vitamin K from the diet. Dysbiosis can affect optimal nutrient absorption for bone growth and maintenance. ¹⁰
INFLAMMATION MODULATION	The gut microbiome regulates immune system activity and inflammation in the body. Chronic inflammation stimulates OCs that break down bone. A healthy microbiome may dampen inflammation to support bone health. ^{11,12}
HORMONE REGULATION	Gut bacteria produce metabolites and signaling molecules that can interact with hormone pathways important for bone, like estrogen metabolism and insulin-like growth factor 1. ¹³
MICROBIAL METABOLITES	Short-chain fatty acids (SCFAs), generated by fermentation of complex carbohydrates, have emerged as key regulatory metabolites produced by the gut microbiota. SCFAs have been identified as potent regulators of osteoclast metabolism and bone homeostasis. ¹⁴

⁸ <https://pubmed.ncbi.nlm.nih.gov/25126780/>

⁹ <https://pubmed.ncbi.nlm.nih.gov/23389860/>

¹⁰ <https://pubmed.ncbi.nlm.nih.gov/29079996/>

¹¹ <https://pubmed.ncbi.nlm.nih.gov/25840106/>

¹² <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6940820/>

¹³ <https://pubmed.ncbi.nlm.nih.gov/28620867/>

¹⁴ <https://pubmed.ncbi.nlm.nih.gov/31305265/>

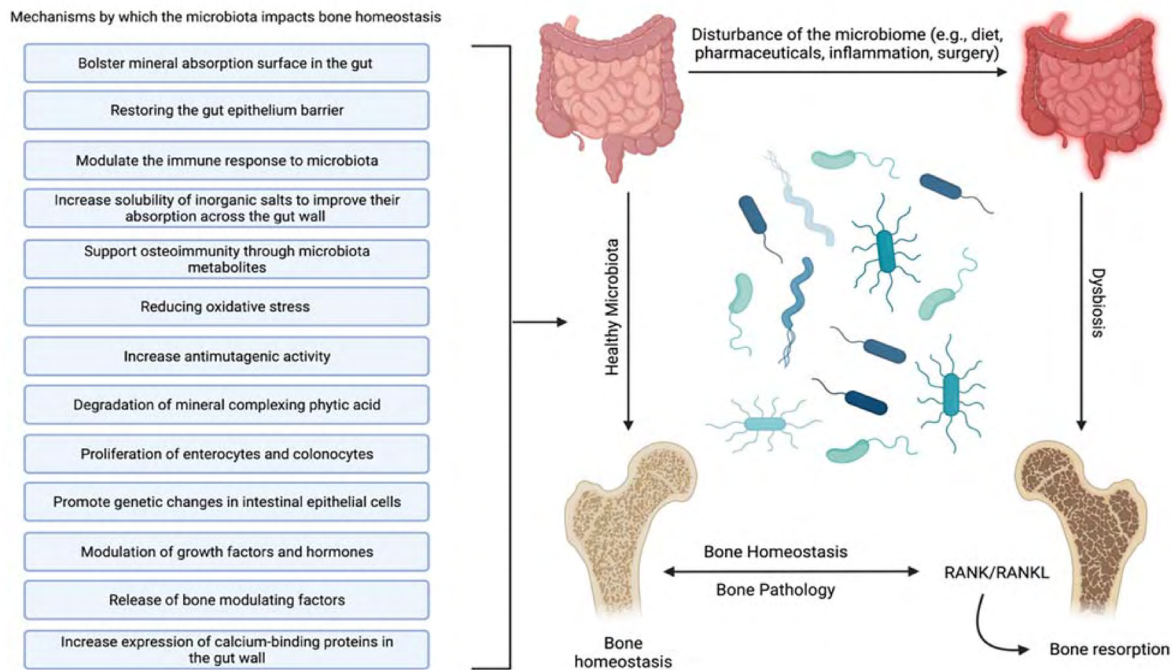


Fig. 1 <https://www.mdpi.com/1422-0067/22/17/9452#>

Clinical Pearl #1 – Don't Forget the Mouth!

Periodontitis is a polymicrobial infectious disease characterized by alveolar bone loss and is considered one of the most common inflammatory diseases globally. Addressing both gut and oral dysbiosis may reduce the impacts on bone remodeling and lessen the likelihood of bone loss.

Clinical Pearl #2 – Include Fiber

Research shows that high-fiber (plant-based) diets increase biodiversity and decrease non-favorable strains. Additionally, prebiotic fibers are metabolized by bacteria and create a range of metabolites, including short-chain fatty acids, which support a healthy intestinal barrier, modulate inflammation, and regulate bone homeostasis.

Lifestyle Recommendations

- Looking to support your treatment with simple yet effective lifestyle recommendations? Check out our [Lifestyle Guide](#).
- Ensure a diet that provides adequate sources of nutrients and minerals that will support bone growth, including calcium, phosphorus, magnesium, boron, silicon, and Vitamin K.
- Getting sufficient safe sun exposure to support production of Vitamin D or supplementing to ensure a healthy level is maintained in the body.
- Ensure daily movement and exercise, including strength training or weight-bearing activities.

Therapeutic Plan Suggestions

Bone Health Support

Bioclear™ Microbiome Detox Program

CHOOSE EITHER BIOCIDIN® LIQUID, CAPSULES, OR LSF

Biocidin® Liquid, Biocidin® Capsules, or Biocidin® LSF	Titrate to 10 drops 2x/day per instructions in the Lifestyle Guide included with each program	Titrate to 2 capsules 2x/day per instructions in the Lifestyle Guide included with each program	Titrate to 2 pumps 2x/day per instructions in the Lifestyle Guide included with each program
G.I. Detox™+	2 capsules at bedtime. 1 hour away from food, supplements, and medications. Temporarily increase dose to 2 capsules 2-3x/day if Herxheimer reaction observed/worsens.		
Proflora™ 4R	1 capsule any time		
ADDITIONAL SUPPORT (Sold Separately)			
G.I. InnerCalm™	1 stick pack mixed with water, 1-2x/day, taken any time		
Each program comes with a Lifestyle Guide with instructions and diet and lifestyle recommendations.			

Additional Bone Health Therapeutics by NBI

PRODUCTS	ACTIVITY	DOSING
Osteo-K Minis or Osteo-K	Promotes healthy bone density, maintains strong bones, promotes healthy collagen production, and supports inflammation balance.	2-3 capsules twice daily with meals as directed on the label
Collagen	Promotes healthy bone collagen production to support bone strength.	1 scoop daily
Supreme Multivitamin	Provides micronutrients required to promote bone health.	2-4 capsules daily with food

Questions?

For clinical questions, email clinical@biocidin.com
or call 800-775-4140, x3.

*These statements have not been evaluated by the Food and Drug Administration. These products are not intended to diagnose, treat, cure or prevent any disease.

