



The Rogue Pharmacist

EDUCATION BEFORE MEDICATION

**MAKE
NO BONES
ABOUT IT**



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MAKE NO BONES ABOUT IT

Bad bone health is a silent killer. You cannot feel it or see it. In most cases, you do not even know there is a problem until the first symptom, and the first symptom is usually a fracture. The repercussions of a fracture can be crippling and even lethal. Those who survive a fracture often suffer loss of mobility and independence, which can be life altering.

Statistics reveal the prevalence and devastating effects of bone fractures:

- 54 million Americans have osteoporosis or osteopenia (Pal, 2019).
- 21% of women who fracture a hip will die within one year (Standard of Care, n.d.).
- As many American women die each year from a hip fracture as women who die from breast cancer (Society for Women's Health Research, 2021).
- 40% of hip fracture survivors cannot manage to walk independently one year later (Salpakoski et al., 2014).
- Osteoporotic fractures generate more hospitalizations than those due to stroke, heart attack and breast cancer combined (Singer et al., 2015).
- For those over age 50, poor bone health is the reason for 50% of the fractures in women and 25% of the fractures in men (Kim, 2018).

Osteoporosis and Osteopenia

“Porous” bone is described as osteoporosis or osteopenia. And that’s what it is. Both conditions are due to bone loss or defects in bone production, or both. Osteopenia is a condition of low bone density that can progress to osteoporosis if steps are not taken to reverse it. It is a red flag that action is needed to stop further loss of bone density. We could call it “pre-osteoporosis.” A similar and related term is osteomalacia, which is defined as a softening of bone. It is caused by a Vitamin D deficiency. In order to take proper measures to reverse osteoporosis or osteopenia, we need to understand how bones are made, what makes them strong and what causes them to deteriorate.

Understanding Bone

Bones are made up of two main constituents: calcium, in the form of calcium phosphate, and collagen. Calcium phosphate forms the hard outer shell around the outside of the bone (sometimes called the bone cortex or cortical bone). Bone mineral density refers to the quality of this hard outer shell (mostly calcium) surrounding bone. Collagen adds strength to bones through the formation of inner-connected “girders” or a scaffolding-like honeycomb construction in the inner portion of the bone. This is what gives our bones their elasticity and flexibility. While bones need to be hard, the real strength of bone is due to its elasticity which allows our bones to bend and flex without breaking. This is why we need a balance of both calcium and collagen to have strong, healthy bones.

Remodeling. Bone cells consist of two types: osteoclasts and osteoblasts. Osteoclasts are cells that break bone down to remove old, weak or dead bone cells, so they can be replaced with new, strong bone cells. They are the demolition crew or “bone breakers.” Osteoblasts build

bone up by replacing the weak or dead bone cells removed by the osteoclasts. They are the construction crew or “bone builders.” During the bone-building process, osteoblasts secrete a vitamin-K dependent protein called osteocalcin. This process of breaking down bone and rebuilding it is called remodeling or bone turnover. We need a balance of breaking down old bone cells and building new bone in order to keep our bones healthy and strong.

Here is an analogy for bone strength. Glass is a hard, dense material, but if we try to bend it, it will shatter and break. Even though it is dense, it does not take much pressure to break it. Wood, on the other hand, is hard but not as dense as glass, but it can bend and flex because it has elasticity. Have you ever seen a tree bend in a strong wind but not break?

Although bones need density, it is not the only criteria for strong bones. Bones need to bend too. We do not want to break a bone every time we accidentally bump into a piece of furniture or trip and fall. Our bones have to have some elasticity to them. That is the role of collagen. It forms the girders between our bones in a honeycomb-like lattice on the inside of our bones. Strong bones have a hard, dense, calcium shell on the outside surrounded by softer latticework made primarily of collagen on the inside.

Mineral Storage. When bone cells are broken down by osteoclasts to get rid of old or defective bone cells, they are also releasing important minerals, like calcium and magnesium, into the body when needed. This means bones are important not just for their structural strength but also because they serve as a storage reservoir for many essential minerals our bodies use to carry out the multitudes of daily chemical processes that keep us alive.

Risk Factors for Osteoporosis and Osteopenia

- **Silent Disease.** Because there are no symptoms for this disease, it is difficult to know when your bones are deteriorating. Fractures are often the first sign of poor bone health.
- **Poor Screening.** Only 9% of women who suffered a fracture are screened within six months of the fracture (Society for Women’s Health Research, 2021).
 - Remember bone mineral density tests only measure bone hardness and the real strength of bone is found in its elasticity. While there are currently no tests to measure bone elasticity, there are ways to measure bone turnover and the effectiveness of bone-building therapies.
- **Diet.** We eat an acidic diet of highly processed foods which cause minerals to be extracted from bones and excreted. We also ingest excessive amounts of sugar, soda, alcohol and caffeine, which results in additional mineral deficiencies that are essential to good bone health.
- **Inflammatory Diseases.** Inflammatory diseases, which are damaging to bones, are now an epidemic. Chronic inflammatory diseases such as arthritis, heart disease, rheumatoid arthritis, diabetes and obesity are now the norm. Up to 23.5 million Americans have an autoimmune disease (Autoimmune Diseases Coordinating Committee, 2005).
- **Sedentary Lifestyle.** We don’t move. We sit too much. A recent study showed that 20-30% of Americans indicated that they had not done any physical activity outside of work in the last 30 days (Elflein, 2022).

- *Chronic Stress.* Stress causes the adrenal glands to produce cortisol. Excessive, long-term cortisol in the body causes breakdown of bone and inhibits bone build up.
- *Poor Sleep.* Bone health is affected by the quality of our sleep. A study in Norway found a 52% risk of osteoporosis in subjects with insomnia (Sivertsen et al., 2013) and a study in Taiwan (Chen et al., 2014) found osteoporosis was 2.7 times higher in individuals with sleep apnea.

Additional Risk Factors for Poor Bone Health

- *Being Female.* Females are at greater risk for osteoporosis than males because they generally have a smaller frame and smaller bones than males.
- *Age.* Women over age 50 and men over age 70 are at increased risk. Bone mineral density peaks around age 30. After age 40, we lose up to 5% of our bone density each decade thereafter.
- *Menopause.* Menopause is a major factor in bone loss in women. A woman can lose 20-40% of her bone density within the first five years of menopause.
- *Genetics.* A major risk factor for osteoporosis is family history. If one of your parents has been diagnosed with osteoporosis, routine screening will be important.
- *Dementia.* While dementia is not really a risk factor, there is a connection between dementia and Alzheimer's disease. Higher risk of Alzheimer's disease has been associated with low bone mineral density (Kostev et al., 2018).
- *Diabetes.* Both Type 1 and Type 2 diabetes are considered risk factors for osteoporosis (Chau et al., 2003). Diabetes increases the activity of osteoclasts and decreases the activity of osteoblasts. Diabetics are also more prone to falling due to hypoglycemia, diabetic neuropathy, frequent nighttime urination and visual impairment.

Why Do We Have This Problem? and How Do We Fix It?

Diet. Eat Right. Drink Right. Think Right. Move Right. Sleep Right. There is no substitute for a healthy diet. Diet alterations can have the most profound impact for improving any health issue. Eating a nutrient-dense diet allows our bodies to turn on genes that promote good health and turn off ones that cause disease.

The food industry produces cheap, nutrient-deficient food full of synthetic chemicals and agricultural toxins from pesticides and herbicides. Unfortunately, many Americans purchase food based on taste, convenience and price instead of food quality, purity or nutrients. Disease is not a coincidence; it is a consequence. It is directly related to our dietary choices as well as our levels of physical activity. If you develop a symptom or illness, it is a sign that something is wrong and the body needs to change. Remember there is no neutral food. Food either helps or harms you. It can serve as a powerful medicine or a slow-acting poison. The choice is yours.

There is no diet that is optimal for everyone, but a Mediterranean-type diet or a Pegan-type diet is a good option for most people. A study conducted by the University of East Anglia (2018) showed that eating a Mediterranean-type diet was able to reduce hip bone loss in only twelve months.

Beneficial foods include:

- Whole Foods
- Dark green leafy vegetables
- Fruits and vegetables
- Nuts and seeds. Sesame seeds in particular have more calcium than milk
- Quality meat protein. Grass-fed AND grass-finished
- Fatty fish. Salmon, sardines, mackerel and herring
- Eggs
- Olive oil

Foods to avoid or limit:

- Processed food
- Fried foods
- Restaurant food
- Fast food
- Fake meat
- Gluten
- Grains
- Dairy
- Soda
- Caffeine
- Alcohol
- Sugar
- Seed oils (aka vegetable oils), includes soybean, sunflower, safflower, peanut, canola, grapeseed and corn oils.

Soda contains phosphoric acid which increases the excretion of calcium. Caffeine may cause bones to lose calcium. One study reported that for every 100 mg of caffeine consumed, there is a calcium loss of 6 mg although some further studies did not come to the same conclusion (Heaney & Recker, 1982). Alcohol reduces the body's ability to absorb calcium and Vitamin D. Consuming sugar wreaks havoc on the level of sugar in the bloodstream which, in turn, causes inflammation. Seed oils are very inflammatory and all contain linoleic acid, an omega-6 fatty acid, which is incorporated into our cell membranes and can remain in cells for up to 7 years.

It's important to purchase organic products whenever possible. Today's commercialized man-made products are full of chemical additives, dyes, fillers, hormones, antibiotics and toxins. For example, 90 to 95 percent of America's corn and soybean crops are genetically-modified, meaning they have been contaminated with glyphosate (RoundUp). Avoid foods containing glyphosate as it is very destructive to the human microbiome and also causes leaky gut. When purchasing non-organic foods, always check the fine print on the label for corn or soy ingredients since these are likely to contain glyphosate.

Digestive Problems and Inflammation. Digestive problems such as leaky gut, colitis, Irritable Bowel Syndrome, Crohn's disease, Celiac disease, reflux disease, heartburn, etc. are all associated with inflammation. Inflammation in the digestive tract will hinder the body's ability to fully absorb nutrients, like minerals, from food. Consequently, any inflammatory condition, including a digestive condition, should be considered a risk factor for potential bone loss. Important minerals and vitamins should be monitored.

Exercise. Exercise is vitally important to overall bone health. Bones, like muscles, respond to physical stress such as exercise. Applying stress to bones will keep them strong and healthy. Researchers have found that astronauts experience a significant loss of bone mass after spending an extended amount of time in space due to their gravity-free environment. This is why weight-bearing exercises are so important. They protect and strengthen joints and prevent disability. You do not have to spend 2 hours weight lifting every day. While weight lifting is beneficial, the important thing is to do weight-bearing exercises every day. This includes bodyweight exercises, resistance band exercises, brisk walking, yoga, Pilates and TaiChi. Wen et al. (2011) found that just 15 minutes of daily exercise can reduce the risk of death by 14% and can increase life expectancy by three years. Muscle development improves balance, protects joints and increases metabolism and energy. Muscle size is determined by bone strength. Bones support muscle and muscle supports bones. To stay strong and agile you need both.

Weight. Being overweight or underweight increases the risk of developing osteoporosis. It was once thought that being overweight had a protective effect on bone density, and in some cases, bone mineral density may be higher in overweight people, but bone strength and bone quality is decreased. Adipose tissue (aka fat tissue) also creates low-grade inflammation in the body affecting bone health. A study in the United Kingdom concluded that overweight men had a significantly higher rate of spinal fractures than men of at or below normal weight (Luo & Lee, 2020).

Individuals who are underweight, thin or petite are also at risk. Schnatz et al. (2010) found that weighing less than 127 pounds was a risk factor for osteoporosis. Some studies claim that a body mass index (BMI) of less than 18.5 is a risk factor as well. Anyone on a weight-loss diet should be aware that bone loss will often accompany weight loss. Women who are reaching menopause should be cautious of dieting during this time as bone loss accelerates after menopause. The remedy is being at your optimal weight, eating a diet of quality nutrient-dense whole foods and exercising consistently. No prescription needed!

Toxins. Toxins can cause chronic inflammation and disrupt a number of biochemical pathways in the body. Heavy metal toxicity should always be considered a possibility due to the toxic environment in which we live. Lead is one of the primary metals that can deposit in bone. If testing for heavy metals proves positive, removal should be initiated with a trained experienced practitioner. Always keep detoxification pathways working efficiently by eating plenty of organic

whole foods, drinking plenty of clean water and exercising regularly. Saunas are another great detoxifying method and are very effective in removing toxins from the system.

Insulin. Diabetes can have an adverse effect on bone health. 40% of the U.S. population is now insulin resistant (Parcha et al., 2022). Insulin is required to move magnesium and potassium inside the cell where it can be utilized. If cells are resistant to the effects of insulin, minerals will not reach their intended target and cannot be utilized.

Fix Nutritional Deficiencies. Nutritional deficiencies are a major issue in America, especially nutrients involved in bone health. 68% of Americans are magnesium deficient (King et al., 2005). 90% of Americans are deficient in omega-3s (Better Living, n.d.).

Calcium. Is it okay to drink milk? Well, yes...if you are a cow! Cow's milk was not made to be consumed by humans. Dairy milk contains a protein called casein which causes an allergy in many people. Also, cow's milk contains growth factors to accelerate calf growth. These growth factors are to assist calves, not humans. Dairy products can also contain hormones, chemicals, pesticides and herbicide residues from feed, antibiotics, etc. Consequently, today's commercialized dairy products really aren't good for us. To read more about why dairy isn't healthy for humans, I recommend reading "Milk and Health" (Willett & Ludwig, 2020).

According to the US Dept. of Agriculture the average American consumes 600 pounds of dairy products per year. Despite these statistics, the rates of osteoporosis in America are the highest in the world (Roy, 2015). A study of 96,000 men and women found that participants who drank milk early on in life were not any less likely to develop osteoporosis later in life than participants who did not drink milk at all. They even concluded that for every 200 grams of milk consumed, the risk of osteoporosis increased by 9% (Malmir et al., 2020).

Calcium-rich foods: Sesame seeds, green leafy vegetables, cheese, sardines, salmon, yogurt, almonds and edamame. Diet is the best and safest source of calcium.

Magnesium. Magnesium is the body's fourth most abundant mineral and is a cofactor in over 600 enzymatic reactions in the body (de Baaij et al., 2015). It plays a role in bone and muscle health, heart rhythm and functioning of the nervous system. It is needed for vitamin D activation in the skin and prevents the accumulation of calcium in the cells that line the inside of blood vessels. The body also needs it to activate adenosine triphosphate (ATP), the body's main source of energy, and to convert the amino acid, tryptophan, into serotonin.

60% of our body's magnesium is stored in bones with less than 1% found in the bloodstream. Many researchers claim that magnesium may be the most important mineral in the body, yet magnesium deficiency is extremely common. King et al. (2005)

reported that 68% of Americans do not consume the recommended daily allowance (RDA) of magnesium. Dr. Norman Shealy (n.d.), considered to be the Father of Holistic Medicine, believes every known illness can be linked to a magnesium deficiency.

Low magnesium is a known risk factor for osteoporosis. In women with osteoporosis, magnesium deficiency is 84% and in diabetics it is 75% (DiNicolantonio et al., 2018). Kunutsor et al. (2017) found that participants with lower magnesium levels had a higher risk of bone fractures, particularly hip fractures, whereas individuals with high magnesium levels reduced their risk of bone fractures by 44%.

Chronic stress is a major cause of magnesium depletion. Vink and Nechifor (2011) discuss how the more anxious and stressed we are, the more magnesium deficient we become. If magnesium levels are low, our energy levels will drop, the conversion of vitamin D does not occur, the absorption of calcium decreases and blood vessels harden, which can lead to high blood pressure.

Symptoms of magnesium deficiency: High blood pressure, headaches or migraines, insomnia, anxiety, depression, twitching muscles or muscle cramps, restless leg syndrome, increased insulin resistance, diabetes and constipation.

Magnesium rich foods: Spinach, seaweed, cilantro, basil, parsley, cumin, pumpkin seeds, flaxseed, Brazil nuts, almond butter, cocoa powder and dark chocolate.

Vitamin D. Cholecalciferol, also known as vitamin D, plays a vital role in preventing osteoporosis and keeping bones healthy. It is necessary for the body to absorb calcium and phosphorus and deposit them into the outer shell of our bones. If the body is vitamin D deficient, only 14% of the calcium ingested will be absorbed versus the 58% which can be absorbed when vitamin D levels are normal. In 2011, Forrest & Stuhldreher cited that nearly half of the U.S. population was vitamin D-deficient, regardless of age, with the highest rates in African Americans (82.1%) followed by Hispanics (69.2%). Young adults are not exempt. A study conducted in Boston found that two-thirds of healthy young adults were vitamin D-deficient (Tangpricha et al., 2002). Other studies found 57% of hospitalized patients were vitamin D-deficient (Thomas et al., 1998); 70% of elderly Americans were vitamin D-deficient (Meehan & Penckofer, 2014); and 60% of nursing home residents were vitamin D-deficient (Coll, 2006).

Fair skinned people make more vitamin D than individuals with dark skin. Sunblock use seems to be one of the most limiting factors in vitamin D production in the skin. Using a sunblock with an SPF 15 will reduce the ability of the skin to make vitamin D by 99% (Matsuoka, 1987). Since sunblock can inhibit vitamin D production, it should be used appropriately but not excessively.

Symptoms of Vitamin D Deficiency: High blood pressure, headaches, sleep problems, mood changes or depression, frequent sickness, chronic muscle pain, bone pain, feeling tired or fatigued, poor wound healing, back pain and hair loss.

Sources of Vitamin D:

Sunlight. Sunlight is best. When skin is exposed to sunlight, ultraviolet light from the sun interacts with provitamin D3 in the skin to form Vitamin D3. Adequate sun exposure is required on a daily basis to maintain good blood levels of Vitamin D3. In order to absorb the right amount, approximately 70% of the body should be exposed to direct sunlight between the hours of 10 a.m. and 2 p.m. for 15 to 20 minutes EVERY DAY, which is difficult for most people to accomplish.

Vitamin D Rich Foods: American and cheddar cheese, vegetables, fatty fish (such as sardines, mackerel, anchovies and salmon), cod liver oil, beef liver, Portabella mushrooms, eggs and turkey. If you are unable to eat some of these foods on a daily basis, you will need to obtain your vitamin D from a supplement.

Vitamin K. Vitamin K is critical for good bone metabolism and for proper clotting of blood. There are two forms of Vitamin K: K1 and K2. Vitamin K1, or phylloquinone, is primarily involved in the clotting process of blood. It is also a cofactor for an enzyme that activates osteocalcin, a protein produced by osteoblasts. Be aware that the prescription drug Warfarin (coumadin) blocks Vitamin K1 and thins blood. Vitamin K2, also called menaquinone, regulates calcium metabolism by preventing calcium from accumulating in blood vessels causing calcification. The job of Vitamin K2 is to keep calcium in the bone and out of soft tissues.

Sources of Vitamin K1: Green leafy vegetables such as spinach, kale, broccoli and collard greens.

Sources of Vitamin K2: Fermented foods such as natto and sauerkraut. Other sources are beef liver, egg yolk, chicken, beef, and soft cheeses. Bacteria in our gut also make Vitamin K2.

Vitamin C. Vitamin C is necessary for collagen formation and increasing bone density. It mineralizes bones and stimulates bone-forming cells. Collagen is important for cross-linking proteins which impart structural integrity to bone and make bones strong, flexible and able to bend without breaking. If vitamin C is low, osteoclast activity increases, and new bone is not formed. Vitamin C should be sourced from ascorbic acid or ascorbate not from a corn source as many Vitamin C products are.

Symptoms of vitamin C deficiency: Muscle and/or joint pain, weakness and fatigue, weak bones, gum disease, bruising easily, poor wound healing, small hard bumps or small red-blue bruises on skin, dry skin and dry and breaking hair.

Vitamin C rich foods: Citrus fruits, spinach, broccoli, red peppers, potatoes, tomatoes, strawberries and cauliflower.

Vitamin B12. Although a relationship between Vitamin B12 deficiency and poor bone health has been identified, the mechanisms have not yet been identified. Until more is known it is important to maintain healthy Vitamin B12 blood levels.

Trace Minerals. Although calcium, magnesium and collagen are some of the main bone constituents, the importance of trace minerals in bone health should not be minimized. Trace minerals are important cofactors in the proper and efficient utilization of macro minerals, like calcium, and can have activity of their own. Zinc stimulates osteoblasts (bone builders) and will inhibit the activity of osteoclasts (bone breakers). Boron has been shown to lower inflammation markers and to elevate levels of vitamin D (Naghii et al., 2011). Other trace minerals that play varied roles in bone health include silica, manganese, strontium and copper. Even though they are not publicized as much, they each play an important role in keeping bones healthy.

Zinc. Zinc is an important mineral to bone health and immune system. It reduces inflammation by slowing down osteoclastic activity and increases osteoblast activity forming new bone.

Omega-3. Omega-3 oils play an important role in the development of cell membranes. They are incorporated into the lipid layer of cell membranes and assist with maintaining cell membrane integrity. Omega-3 oil is also a very potent anti-inflammatory chemical and helps reduce inflammation throughout the body. Inflammation increases the activity of osteoclasts, so any reduction in inflammation is beneficial and helps maintain bone mass.

Probiotics. Probiotics help maintain our microbiome. A healthy microbiome may be the most important element in our health along with a healthy gut. The importance of this cannot be overemphasized. In a recent double-blind study, women who took probiotics, specifically *Lactobacillus reuteri*, had half the bone loss as women who did not take it (University of Gothenburg, 2018). Good gut health does make a significant difference.

Melatonin. Melatonin, the hormone that regulates our sleep cycle, also increases bone mineral density. Melatonin has a positive effect on the interaction of osteoblasts and osteoclasts thereby improving bone mineral density. The antioxidant activity of melatonin also aids in decreasing free radicals which improves overall health. A study of 81 women, ages 56 to 73, found that a one year treatment with melatonin at 1 mg increased bone mineral density in the femur by 1.4% and a 3 mg dose increased bone mineral density in the spine by 2.3% (Amstrup et al., 2015).

Useful Supplements for Bone Health

Supplements are NOT a replacement for a healthy diet and exercise program. By definition, a supplement is “something that completes or enhances something else when added to it.” Supplements are useful and are often needed due to the lack of nutrients now missing in our food supply, but they are only to be used as an enhancement to a healthy diet and bone health program, not a replacement.

Calcium. Calcium supplementation is often discussed in conjunction with osteoporosis. We have been led to believe that calcium is the savior of our bones, but calcium as a supplement should be used in limited cases. Since calcium is the most abundant mineral in our bones, it seems logical that calcium supplementation will strengthen bones, but this is inaccurate. A study in Germany discovered that not only were there no benefits with calcium supplementation, but there was also a 139% increased risk for heart attacks over an eleven year period (Kuanrong et al., 2012).

When it is necessary, the most absorbable form of calcium is eggshell calcium from organic pastured chickens. Eggshell calcium is a form of calcium carbonate and is more bioavailable and contains additional trace minerals and micronutrients not found in other supplement forms. Other products made of calcium carbonate include Tums, chalk and limestone rock, but the natural form found in eggshells seems to work best for a calcium supplement.

Generally, the dose should be no greater than 500-600 mg per day. Calcium citrate is another well-absorbed form of calcium to consider but generally will not have the additional trace minerals and micronutrients found in eggshell calcium.

Magnesium. Oral magnesium supplements are available in many salt forms and dosages. Magnesium glycinate, magnesium orotate and magnesium L-threonate are some of the most absorbable forms, but magnesium oxide is more commonly found because it is cheap to manufacture. The problem with magnesium oxide is that it is not well absorbed and tends to bring water into the intestines making it work more as a laxative. Because it is poorly absorbed, it does not help bones or muscles nor does it help much in maintaining good blood levels. In addition to oral forms, magnesium oil can be applied topically on skin to the affected area, or it can be used as a soak in the form of epsom salt.

Since most of the body's magnesium is stored in bones and muscle tissue, only 1% of the body's magnesium is found in the bloodstream. The body closely monitors its blood levels, so if magnesium gets too low, the body will pull magnesium from bones or muscles to keep blood levels stable. As a result, nearly all blood tests which measure magnesium in the serum will read normal, but this only applies to 1% of your magnesium storage. To measure your true magnesium levels, you will need to do a red blood cell (RBC) magnesium test or a magnesium load test which provide a more accurate measurement of your body's true magnesium stores.

Vitamin D. Supplemental forms of Vitamin D are available as Vitamin D2 and Vitamin D3. Vitamin D2 must be converted in the body to Vitamin D3, which is the active form of Vitamin D3 that is utilized by the body. In some people this conversion does not happen efficiently and an adequate dose is not absorbed. It is always best to use the active form of vitamin D, so the body does not have to convert it. Vitamin D is an oil-soluble (or fat-soluble) substance, so to achieve optimal absorption, the best dosage form is a liquid drop in an oil base, such as olive oil. Placing drops under the tongue will achieve maximum absorption. Vitamin D3 is also available in tablet or capsule form.

It's best to have a Vitamin D blood test done before starting therapy. This will allow you to know your baseline value to give your practitioner an idea of where to start your initial therapy. If you are already taking Vitamin D, I suggest getting the blood test done once or twice a year to monitor your level. The best vitamin D blood test is called 25-hydroxyvitamin D. The optimal range is between 50-80ng/ml and normal range between 30-100ng/ml.

Vitamin K2. Vitamin K2 has many subtypes, called MKs, ranging from MK-4 to MK-13. Vitamin K2 subtype MK-7 has the highest bioavailability, is easiest to absorb and is the most effective. When purchasing a Vitamin K2 product, purchase subtype MK-7. It will be listed on the label ingredients in fine print. Always notify your prescriber if you are taking any kind of blood thinner and you make any changes in food routines or if beginning or stopping any type of Vitamin K therapy.

Vitamin B12. There are two common forms of vitamin B12. The first, methylcobalamin, is the superior form. It is more absorbable and bioavailable since this is its natural state. It also stays in the body longer than the other form of vitamin B12, cyanocobalamin. Cyanocobalamin is a synthetic form of vitamin B12 and must be converted to methylcobalamin before it can be utilized. Methylcobalamin is found in higher quality products although cyanocobalamin tends to be more common because it is cheaper and less expensive to manufacture. When purchasing Vitamin B12, find a product in sublingual form, a form that can be administered under the tongue. Products in tablet or capsule form will not work as well since they will undergo degradation when they pass through the stomach.

Other Useful Products For Bone Health

Herbs. Herbal products often found in supplements include red clover, black cohosh, isoflavones, horsetail and green tea. These can be useful supplements but are unlikely to be of much value without a proper diet, a healthy GI tract and exercise.

Estrogen. Estrogen is a hormone vital to bone health but is only available as a prescription. The primary effect of estrogen is to inhibit the activity of osteoclasts. It also increases bone elasticity and hardness. It can decrease the risk of hip fracture by up to 50%; however, women who use hormone replacement therapy longer than approximately nine years after menopause can be at an increased risk of heart attack. This means there is a short window of time in which hormone replacement therapy can be beneficial, so be sure to discuss taking estrogen with your practitioner.

Prescription Drugs Used to Treat Osteoporosis

Bisphosphonates. Bisphosphonates are the most common group of prescription products used to treat osteoporosis including Fosamax (alendronate), Actonel (risedronate) and Boniva (ibandronate). They work by inhibiting the breakdown of bone by the osteoclasts. While it may seem advantageous to prevent bones from breaking down, it is important to remove old, non-functioning, dead bone cells and replace them with new ones for optimal bone health. When we inhibit the removal of aged or dead bone cells, bones get harder but also more brittle causing fractures to occur more easily. A study in Denmark reported that bisphosphonate use for longer than five years increases the risk of femur fracture (Bauer et al., 2020). The good news is that this risk is reversible once therapy is discontinued.

Bisphosphonates also come with strict warnings about their administration, and side effects are common, especially gastric and esophageal irritation, which makes compliance difficult. Jaw bone necrosis, a condition in which the jaw bone deteriorates, can occur making dental checkups a necessity when taking these medications.

Forteo. Forteo (teriparatide) is a parathyroid hormone prescription product. Parathyroid hormone is used by the body to control calcium and phosphorus. It is given daily as an injection and is used in those who are considered high risk for fractures or who have not responded well to other therapies.

Others. Some other medications have their own selective niches and can be helpful in their respective area. These include Prolia, calcitonin and the selective-estrogen receptor modulators (SERMs) Evista and Osphena.

Prescription and Over-The-Counter Drugs Interfering with Bone Health

Diuretics. There are two classes of common pharmaceutical drugs that can be harmful to bone health. The first group is a prescription-only category called diuretics. These are commonly known as “water pills” as they cause the body to excrete fluid by increasing urination. These products are generally used in people with high blood pressure or heart failure problems. There are many types of diuretics, but their main goal is to remove water from the body. When water is removed from the body, important electrolytes like potassium, magnesium, sodium and calcium are removed as well. Over a period of time, these minerals will become deficient.

According to Seelig (1990), 80% of people who take a diuretic in the thiazide category for six months or more become deficient in magnesium. Magnesium causes blood vessels to relax, lowers blood pressure and controls heart rhythm, so it does not make sense to prescribe diuretics to treat one problem while creating another.

Acid Blockers. Acid blockers are primarily used to treat reflux disease, heartburn and ulcers. There are two types: proton-pump inhibitors and H₂-receptor blockers. They are the third-most commonly prescribed class of drugs in the U.S. behind statins and antidepressants. Common brand names include Nexium, Prilosec, Protonix, Dexilant, Prevacid, Pepcid and Aciphex. When these products were introduced, they were available only with a physician's prescription and were to be used for no longer than six weeks. Today, many of these products are available over the counter and are often taken indefinitely.

If acid blockers are taken incorrectly or unnecessarily, it can create significant health problems. Our body NEEDS stomach acid (known as hydrochloric acid or HCl) to digest and breakdown food, so we can absorb nutrients. It also helps kill organisms on food that might be harmful and cause infection or illness. When stomach acid levels are insufficient, serious medical problems can occur. For example, failure to absorb magnesium can lead to bone fractures, heart arrhythmias, muscle spasms, high blood pressure and even seizures. Depleted Vitamin B12 can lead to symptoms such as dementia, loss of appetite, fatigue, weakness, nerve damage, mood changes, depression, irritability and dizziness.

Because acid blockers can have severe long term consequences, they should only be taken if medically necessary. In most cases, the long-term problems they create are worse than the original symptoms. Anyone taking acid blockers should consider discontinuing them and in conjunction with the help of a medical professional because stopping them abruptly can cause rebound acid hypersecretion.

Others. Other medications which commonly cause bone loss include corticosteroids (e.g. prednisone), antidepressants in the selective serotonin reuptake inhibitor (SSRI) family and anti-seizure medications like phenytoin, phenobarbital, carbamazepine, valproic acid and primidone. Anticoagulant drugs, such as heparin, have been shown to increase fracture risk (Nelson-Piercy, 1998). The newer anticoagulants such as apixaban (Eliquis) do not seem to have this issue.

Diagnostic Tests for Bone Health Evaluation

Dual Energy X-ray Absorptiometry (DEXA). DEXA is the current gold standard test used by conventional medicine to diagnose osteoporosis. It uses very low level X-rays to determine bone mineral density. The concern with using DEXA is that it beams X-rays or gamma rays, forms of high frequency electromagnetic radiation, through bone. Even though the amount of radiation used is low, it is still a form of radiation exposure. It also is not an accurate measurement of bone strength since it only measures cortical bone not the bone's elasticity. Bone can be hard but brittle with little elasticity.

Computerized Tomography (CT) Scan. A CT scan is generally used to diagnose specific bone conditions such as bone cancer or Paget's disease, fractures and osteoporosis. Like DEXA, it uses X-rays or gamma rays, but CT scans are at a higher resolution than DEXA scans.

Quantitative Ultrasound. This test is very popular in clinical settings because it is cheap, easy to administer and radiation-free while still being very versatile. To administer the test, a patient's foot is placed on the machine which measures bone mineral density at the heel using sound waves. It is a good pre-screening tool to use in place of DEXA to lessen radiation exposures.

Bone Resorption Assessment (also called N-telopeptide or NTx). NTx is useful because it evaluates the rate of bone turnover. It measures a urinary hormone called N-telopeptide or NTx which can be used to identify the rate of bone loss and evaluate therapeutic interventions. Practitioners can use this test to determine if osteoporosis is developing and to monitor current osteoporosis therapy. It is available as a urine or blood test.

Undercarboxylated Osteocalcin Test. The undercarboxylated osteocalcin test provides information regarding bone mineral density, bone turnover markers and the amount of osteocalcin, a protein hormone used to build bone, in blood (Xu et al., 2022). The amount of osteocalcin found in blood is a reflection of bone turnover. It can also serve as a biomarker for functional Vitamin K nutritional status.

Conclusion

Poor bone health, like osteoporosis, is a consequence not a coincidence. It is a signal from our body telling us that something is wrong or out of balance. Something bigger causes osteoporosis to occur. Our body is interconnected and treating symptoms does not address the source of the problem. While we need to work on reversing poor bone health, we also need to find out why the condition developed and how to prevent future recurrences. Osteoporosis is usually caused by poor diet, an unhealthy gut, inflammation or lack of exercise.

Listen to your body. Pay attention to the signals. Ask questions. Change the "pill for an ill" mentality. Seek a practitioner who will help you identify the underlying cause. If yours cannot or will not, find someone who will. Remember preventing osteoporosis is much easier than trying to reverse it. Begin making changes NOW to avoid a fracture. You are in charge of your health and you now have the information you need. Take action!

And remember...Live long...but don't get old.

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Have a question or want to learn more? Send your questions or comments to support@TheRoguePharmacist.com or schedule a free chat with me at www.TheRoguePharmacist.com/book.

Disclaimer

This document is only a guide and does not contain nor does it address all possible issues contributing to bone health.



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