

## Lupus and Bone Health

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Your bones may feel rock hard, but they are living tissue. Bone-building cells (osteoblasts) and cells that break down bone (osteoclasts) are always at work. During your teenage years, tremendous bone growth takes place with bone building outpacing bone breakdown. Most adults reach their peak bone mass by age 20, with only a small amount more of bone mass added by the time you reach age 28. Hormones—estrogens in females and testosterone in males—play a major role in this rapid bone growth during the first 25-30 years of life. Around age 28, the same amount of bone that is removed is replaced. However, bone loss is a normal part of aging in both men and women. In women, the hormone estrogen decreases sharply after menopause, which causes bone breakdown to speed up. Men start out with more bone mass than women but as they age, their testosterone levels slowly go down. This leads to a gradual loss of bone. Men are at a greater risk of developing osteoporosis than they are of getting prostate cancer.

Bones need Vitamin D and calcium as well as protein and other nutrients to grow and become strong, but genes play a big part in how thick your bones are. If one of your parents had thin bones, you are more likely to have them. Other things, like diet, exercise and medications, also influence the thickness of your bones.

**Osteopenia** is the term used to describe mild thinning of the bones. In osteopenia, bone build up is not enough to keep up with bone breakdown. People with osteopenia are at risk for developing osteoporosis as well as fractures (broken bones). Osteopenia is more common in women than in men. By age 80, many women have lost 30% of their bone mass. Men usually begin to have bone loss due to aging after age 60.

**Osteoporosis**, which means “porous bones,” is a loss of bone thickness to the point that applying very low forces can cause bones to break. These breaks, called fragility fractures, occur without any obvious injury, often by something as simple as sneezing. One in two women by age 75 have osteoporosis, which places them at a high risk for breaking their bones. Osteoporosis also can increase your chances of dying. About 20% of people who break a hip die within a year because of the problems caused by limited movement. People who break spinal bones (vertebrae) are at an even higher risk of death. When spinal bones near the ribs break, the chest becomes squeezed. This prevents the lungs from filling completely causing pneumonia or a collapsed lung. Breaks in the spinal bones of the lower back can affect the abdominal area causing constipation, abdominal pain, distention and poor appetite. Spinal fractures may also weaken muscles, cause pain, and upset balance, all of which increase your chances of falling and breaking other bones.

**Osteonecrosis** is death of bone tissue caused by a poor blood supply to the bones. This loss of blood supply can be temporary or permanent. Without blood, the bone tissue dies and eventually the bone may collapse. Osteonecrosis is also known as *avascular necrosis*, *aseptic necrosis*, and *ischemic necrosis*. Osteonecrosis is an unfortunate complication of lupus and/or steroid use. The most common places that osteonecrosis occurs are the hip, shoulder and spinal bones of the lower back. At this time, there is no known treatment for osteonecrosis. Frequently, patients have hip pain that worsens with walking. Pain medications and crutches to reduce weight on the joint

may help lessen the pain. One small study found that bisphosphonates (see page 7) also might help. Surgery that smooths out the joint surface or joint replacement may decrease joint pain and improve quality of life.

### **Lupus and Osteoporosis**

Some conditions besides menopause and aging are associated with high levels of bone breakdown. Lupus is one of those. Having lupus increases your risk of osteoporosis for a number of reasons in both men and women. Some of these can be changed by medication or changing your lifestyle. Others, like a family history, body build, and race, cannot be changed.

### **Traditional risk factors**

People with lupus may have some of the same risk factors for osteoporosis that affect people in general. These include Caucasian or Asian race, being thin or having a small frame, having a blood relative with osteoporosis, drinking too much alcohol, smoking, and not enough calcium in the diet. Once you have a fragility fracture, that is a bone that breaks without obvious injury, you are at risk for having another one.

### **Inflammation**

Inflammation increases bone breakdown and decreases new bone formation in all people. Lupus, like other autoimmune disorders, causes inflammation. This probably is the major reason why people with lupus have increased bone loss.

### **Decreased Physical Activity**

Weight-bearing physical activities, such as walking and jogging, exert force on our bones. Your bones respond by increasing their mass in order to spread the load over a larger amount of bone. Physical activity also improves balance and coordination, which reduces the risk of falling that can cause broken bones. The pain and fatigue that accompany lupus can make it difficult to be physically active, adding to the risk for osteoporosis.

### **Hormonal changes**

Estrogen and testosterone play important roles in keeping your bones thick. Women with autoimmune disorders often go through menopause a few years earlier than those women without such conditions. This earlier loss of estrogen can trigger osteoporosis.

### **Low Vitamin D level**

Vitamin D is needed to absorb calcium. Vitamin D is formed in the skin when the skin is exposed to sunlight. Some people with lupus avoid sunlight since it can trigger flares. This may explain in part why some people with lupus have low Vitamin D levels but not completely. Scientists are just discovering the importance of Vitamin D to the immune system and have found that many people with autoimmune diseases have low Vitamin D levels.

### **Kidney disease**

The kidney is one of the major places in the body where vitamin D is changed to its active form. Kidney diseases can affect the kidney's ability to change vitamin D to its active form. Some people with lupus develop lupus nephritis, a form of kidney disease. When lupus nephritis becomes chronic, it increases the risk for osteoporosis.

## **Medications**

- **Steroids** are powerful anti-inflammatory medications that suppress the immune system in high doses. However, they also have an effect on bone. They increase bone breakdown by upsetting the calcium balance. Steroids also reduce the activity and life span of the bone-building cells.
- **Cyclophosphamide** (Cytosan) and methotrexate are chemotherapy drugs used to suppress the immune system in some lupus patients. They can cause a woman's ovaries to shutdown. This causes less estrogen, which indirectly increases the risk for osteoporosis.

## **Prevention and Treatment**

Even though your genes mostly determine how strong your skeleton will become, your lifestyle also plays a big part in your bone health. Ways to prevent and treat osteoporosis in people with lupus are not very different from those for people without lupus.

## **Bone Density Screening**

Bone mineral density tests measure bone thickness at different places in the body. The "gold standard" for measuring bone thickness is the dual energy x-ray absorptiometry scan or DEXA scan. These tests can detect osteoporosis before a fracture occurs as well as predict the chances that you will break a bone. Bone loss in people with lupus is most common in the spinal bones of the lower back, therefore, the best place for measuring bone density is the lower back spine. There are no guidelines for bone density screening in people with lupus, but there are some general recommendations. Postmenopausal women with lupus and a previous fragility fracture, women age 60 years or older with a risk factor for osteoporosis (such as lupus), and any woman older than 65 years, should have routine bone density screening, like a DEXA scan. There are no guidelines for premenopausal women or postmenopausal women younger than 65 years without risk factors for osteoporosis. A DEXA scan every two years is a good idea for both men and women with lupus under the age of 50 if they have other risk factors for osteoporosis, if they have had high levels of disease activity, or if they are or have taken steroids. If you receive treatment for osteoporosis, it is usually not useful to have another bone scan done to see if it is working until after 2 years of treatment.

## **Diet and Supplements**

### **Calcium**

Calcium is the most abundant mineral in the body. About 99% of the body's calcium is stored in the skeleton. Calcium needs change as you age. People in their teens and early 20s need more calcium because of the rapid bone growth that occurs during this time. For women, calcium requirements remain stable until menopause when estrogen decreases and bone breakdown increases. Research shows that calcium plus vitamin D can reduce bone loss in postmenopausal women, especially those who take at least 1,200 mg of calcium per day and take part in weight bearing activities. Besides helping to prevent osteoporosis, calcium also has a beneficial effect on colorectal cancer, kidney stones, high blood pressure and obesity.

Calcium is absorbed in the small intestines but you absorb less as you get older. By the time you are 65, you absorb only 50% of the calcium that you did when you were a teenager. It has been estimated that only about half of American women get enough calcium in their diets. A blood

test will not tell you if you have enough calcium in your body since the body manages to keep calcium levels near normal even when there is not enough in your diet.

It is recommended that both adult men and women with lupus have a total daily calcium intake of 1500 mg. It is usually safe to take up to 2,500 mg/day of calcium from foods and/or supplements, but you should check with your health care provider if you are going to take more than the recommended dose. You can develop unhealthy blood levels of calcium that could lead to kidney problems.

## **Sources of Calcium**

### **Food**

The best way to get your calcium is through food because it is more easily absorbed and used by the body, and calcium-rich foods contain other important nutrients as well. Dairy products have the advantage of a high amount of calcium that is easily absorbed at a reasonable cost. The US Department of Agriculture says that two or three cups of milk or milk products per day will meet the daily requirements for most adults. Low-fat dairy products contain as much calcium as high-fat dairy products if you are concerned about weight gain or cholesterol levels. The table to the right shows the calcium content of common foods. Contrary to popular belief, research shows that soy isoflavones do NOT increase bone mass. Remember to shake all calcium-fortified liquids to mix the calcium that settles at the bottom of the containers.

### **Supplements**

Calcium supplements are available without a prescription, but not all calcium supplements are equal. Think about the following when choosing your supplement:

- **Purity**

When picking a calcium supplement, look on the label for “purified” or the USP (United States Pharmacopeia) symbol.

- **Dose**

When buying calcium supplements, check the label for the elemental calcium content, not the total content. Elemental calcium is the amount of calcium your body actually can use. For example, a tablet containing 500 mg of calcium carbonate provides 200 mg of elemental calcium. Therefore, one tablet provides only 200 mg of calcium, not 500 mg.

- **Type**

Calcium supplements are available alone or combined with other vitamins, such as vitamin D. Since vitamin D must be changed before it becomes active, you do NOT need to take vitamin D with your calcium in order to absorb the calcium.

**Calcium carbonate** (Tums or Caltrate) is the most common type of calcium tablets and the least expensive on the market. Calcium carbonate requires extra stomach acid for best absorption, so it should be taken with meals.

**Calcium citrate** (Citracal or Solgar) Calcium citrate does not require extra stomach acid for absorption, so you can take it anytime, even on an empty stomach. Calcium citrate, however, usually provides less elemental calcium per pill, so you may need to take more tablets per day depending on your needs. Calcium citrate is also more expensive than some other types of calcium supplements.

**Calcium gluconate** and **calcium lactate** have a low amount of elemental calcium. Therefore, you may end up taking several tablets to meet your calcium needs.

***Dolomite, bone meal or oyster shell.*** At this time, these calcium supplements are not tested by any regulatory agency for lead content or other heavy metals. They do not have any advantages over other types of calcium supplements.

***Coral calcium.*** Companies that make this type of calcium market it for more than bone health and claim it can cure hundreds of diseases. In fact, coral calcium is just calcium carbonate and offers no advantage over other brands of calcium carbonate.

***Aluminum-containing antacids.*** Calcium is a major ingredient in most antacids. However, antacids that contain aluminum may increase the amount of calcium you lose in your urine.

- ***Absorbability***

Contrary to popular belief, calcium carbonate and calcium citrate are equally absorbed if taken with food, the normal way of absorbing any nutrient. Taken without food, calcium citrate is better absorbed. The better a supplement dissolves, the better it is absorbed. You can tell how well your supplement dissolves by placing it in 1/2 cup of warm water and 1/2 cup of vinegar for 30 minutes and stirring it occasionally. It should dissolve within that time. If not, choose another type or brand. To get the best absorption, take calcium in doses of 500 mg or less throughout the day with meals. The body cannot absorb much more than 500 mg of calcium at one time.

- ***Tolerance***

Calcium supplements may cause side effects such as indigestion, gas or constipation in some people. People with acid reflux or GERD may have difficulty, especially with calcium citrate. When you begin taking calcium, start with 500 mg/day for a week and then gradually add more calcium. Taking calcium with meals can decrease the chance it will upset your stomach.

- ***Drug interactions***

Let your health care provider know you are taking calcium since it can interact with other medications or interfere with their absorption. For example, calcium can lower the absorption of iron unless it is calcium citrate. If you are using a calcium supplement other than calcium citrate, take the iron at a different time.

- ***Consult your health care provider***

Whenever you decide to take a medication, even an over-the-counter supplement like calcium, you should consult your health care provider. There are many conditions and drugs that can interact.

- ***Food interactions***

Some foods should NOT be eaten with calcium supplements.

***Oxalic acid*** in some foods binds to calcium and prevents the calcium from being absorbed.

Foods that contain large amounts of oxalic starting with the highest amount are: star fruit, black pepper, parsley, poppy seed, rhubarb, amaranth, spinach, chard, beets, cocoa, chocolate, most nuts, most berries, and beans. You may eat these foods but not with your calcium supplement.

***Phytates*** are another substance found in foods that bind to calcium as well as other minerals.

Foods containing phytates are: refined wheat bran, soy protein, legumes, and cereal grains such as whole wheat, oats, rye and barley. You may eat these foods but do not eat them with your calcium supplements.

***Tea*** may interfere with calcium absorption. You may drink tea but not with your calcium supplement.

## **Vitamin D**

It is currently recommended that adults with lupus have a total daily vitamin D3 intake of 800 – 1,000 IU. Vitamin D is a fat-soluble vitamin. This means that any Vitamin D your body does not need immediately can be stored for later use in your fat tissue. Vitamin D is found in some foods but it is mainly produced in your skin after your skin is exposed to ultraviolet rays from the sun. The average white person living in the northeastern United States can form enough vitamin D with 5-15 minutes of sunlight on their arms and legs between 10 AM and 3 PM two to three times per week. People of color need 5-10 times that amount because their darker pigmentation interferes with vitamin D production. When you wear a bathing suit without sunscreen and you get a slight redness of your skin, this is about the same as taking between 10,000 – 25,000 IU of Vitamin D by mouth. Wearing a sunscreen with an SPF of 8 or higher decreases the skin's ability to produce vitamin D by 95%. People with low vitamin D levels do not absorb calcium well. Without enough vitamin D, only 10-15% of calcium in your diet is absorbed.

Unlike calcium, there is a blood test to see if you are producing enough vitamin D. There are actually two vitamin D tests—one measures 25(OH)D levels and the other 1,25-dihydroxy vitamin D. The latter one is not useful, so be sure you are having 25(OH)D measured if your health care provider orders a vitamin D level. Although there is no worldwide accepted normal vitamin D level, the general consensus is that your 25(OH)D level should be at least 32ng/mL to reduce your risk of fracture. At a level of 32ng/mL, calcium absorption is at its maximum. An even higher 25(OH)D level may benefit people with autoimmune diseases. Ideally, your 25(OH)D levels should guide your vitamin D dose.

### **Food sources**

Vitamin D occurs naturally in only a few foods. The best sources are fatty fish, such as mackerel, salmon, sardines, cod liver oil, and eggs from hens that have been fed vitamin D. Milk fortified with vitamin D contains 100 IU per 8 oz. cup. Orange juice fortified with vitamin D is now available as is vitamin D-fortified cereals and breads.

### **Supplements**

Not all vitamin D supplements are alike. Vitamin D in the form of D2 (ergocalciferol), is one-third to one-tenth as effective as vitamin D3 (cholecalciferol) in raising blood levels of vitamin D. If the vitamin D in your multivitamin or supplement contains 400 IU of vitamin D2, it is the same as taking 130 IU of vitamin D3. It is okay to take D2 but you will need to increase the amount you take. As mentioned before, it is currently recommended that adults with lupus have a total daily vitamin D3 intake of 800 – 1,000 IU. Higher doses can be taken under the guidance of your health care provider.

### **Magnesium**

Magnesium is just as important as calcium for your bones. It helps your body metabolize calcium and change Vitamin D to its active form. Magnesium also helps form less brittle bones. Good sources of magnesium are dark green vegetables, apples, seeds, nuts, figs and lemons. If you take magnesium as a supplement, it is generally recommended to take 300-400 mg/day.

### **Folic acid**

Many people with lupus have high homocysteine levels. High homocysteine levels are associated with inflammation, which may increase bone loss. Folic acid 1 mg/day can help reduce

homocysteine levels. A vitamin B complex supplement that contains folic acid should be enough, and it will also give you vitamin B6, which also is important for bones.

### **Limit soft drinks**

Soft drinks contain high levels of phosphorous. Phosphorus is an important mineral in the body, but too much phosphorus can actually cause calcium to be drawn from your bones and teeth. Phosphorous is contained in fizzy soft drinks. You do not need to give up soft drinks completely, but limit how much you drink.

### **Medications**

Treatment with *anti-inflammatory drugs* is often needed to control lupus symptoms. While the use of steroids is a risk factor for bone loss, if these drugs are used for short periods of time and drugs that can reduce steroid doses (Cellcept, Plaquenil, DHEA) are started along with them, the bone loss might be minimized. If you are taking steroids, it is important to start treatment to prevent bone loss immediately since bone loss occurs in the first 3-6 months of steroid treatment.

Research has shown that *estrogen therapy* reduces bone loss in postmenopausal women. However, estrogen medications in women with lupus may increase the number of flares. Women should discuss the advantages and disadvantages of estrogen with their healthcare provider before they decide to take it.

If you have signs of osteoporosis, drugs that decrease bone breakdown called *bisphosphonates*, such as alendronate (Fosamax), risedronate (Actonel) and ibandronate (Boniva), should be considered. Bisphosphonates are recommended for any postmenopausal woman who is treated with prednisone 5 mg daily or greater. There are side effects and precautions you need to take when using bisphosphonates that you should discuss with your health care provider.

*Calcitonin* and *parathyroid hormone* are two other drugs that reduce your chances of fracture and may be considered options by your health care provider.

Although much more research needs to be done, some studies suggest that low doses of statins, which are cholesterol lowering drugs like Lipitor and Zocor, may increase bone formation. This could be very good news for people with lupus since lupus often increases unhealthy blood fats. Statins are not FDA approved for the prevention of osteoporosis.

### **Exercise**

Like muscle, bone is living tissue that responds to exercise by becoming stronger. The best exercise for your bones is weight-bearing exercise that forces you to work against gravity. These include walking, climbing stairs, weight lifting, and dancing. Exercise alone will not make your bones thick but it can stop you from losing bone. To prevent bone loss in adults, the American College of Sports Medicine recommends weight-bearing endurance activities, such as tennis, stair climbing and walking with occasional short periods of jogging. Jumping activities like volleyball and basketball are helpful also. These exercises should be done 3-5 times/week. You should also do some weightlifting 2-3 times/week. Weight-bearing, jumping and weight-lifting activities should be done in combination for 30-60 minutes at a time. This seems like a big order when you have fatigue or pain. Start out slow and work your way up. Exercise has anti-

inflammatory effects and once you start, you might notice a gradual improvement in how you feel. Researchers found that having school children do just one minute of jumping (10-20 jumps) three times a day, three to five times a week caused the children to gain more bone mass. If your joints can tolerate jumping, start out with 2-5 jumps and work your way up to 20. You can do this while watching TV. Keep in mind that it is important to find a careful balance of exercise and rest.

### **Stop smoking**

Smoking reduces the amount of calcium you absorb from the foods you eat and increases inflammation. If you use tobacco, quit. Your health care provider can suggest treatments that may help if you are having difficulty giving up cigarettes.

### **Limit alcohol intake**

Long-term heavy alcohol use can cause low hormone levels in both men and women as well as upset calcium balance. Both of these can lead to bone loss. If you drink alcoholic beverages, do so in moderation.

Osteoporosis is a silent disease that can often be prevented. However, if undetected, it can progress for many years without symptoms until a fracture occurs. Be sure to know your risk factors for osteoporosis and work with your health care provider to protect your skeleton.

*References are available from the BC Lupus Society office*

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