CALCIUM & BONE HEALTH

WHAT IS CALCIUM?
Calcium is a mineral that is essential to maintaining strong bones. Calcium is also needed by the body’s muscles and nerves to function properly.

Adequate calcium intake during childhood and adolescence is critical for bone health. These are the years when bone is forming rapidly. 85-90% of adult bone mass is acquired by the late teens. After bone mass peaks around age 30, it will start to decrease gradually.

Most of your body’s calcium is stored in the bones. If you are not getting enough calcium in your diet, your body will start taking calcium from your bones, which can weaken the bones and lead to osteoporosis.

A calcium-rich diet, along with vitamin D and weight-bearing exercise, are the keys to building and maintaining strong bones throughout life.

WHAT IS OSTEOPOROSIS?
Osteoporosis is a bone disease that results from a mixture of genetics and too little calcium in the diet. It leads to weak, brittle bones that are more likely to break, even from minor trauma. Fractures can result in loss of function, pain, deformity, and life-threatening blood clots. Hip fractures in older adults can cause permanent disability and even death. Fractures in the spine can lead to a hunched-back appearance.

WHO IS AT RISK FOR OSTEOPOROSIS?
80% of adults with osteoporosis are women. While osteoporosis is most commonly seen in older women, it can affect young women with eating disorders and those who menstruate infrequently. Other risk factors include:

- Caucasian or Asian race.
- Low body weight or small frame (BMI<19).
- Family history of osteoporosis.
- Lack of regular weight-bearing exercise.
- Smoking.
- High alcohol intake (>2 drinks daily).
- Low testosterone levels in men.
- Hyperthyroidism.
- Long-term use of oral steroid medications, some anticonvulsants, proton pump inhibitors, and some cancer therapies.

To prevent osteoporosis, it is important to manage controllable risk factors (eg. nutrition, exercise, smoking, alcohol use, etc.) and ensure adequate calcium and vitamin D intake.

HOW MUCH CALCIUM DO I NEED?
The recommended calcium intake for adults is 1000 mg a day. Older adults (women over age 50 and men over age 70) require a higher intake of 1200 mg a day. Calcium intake over 2000 mg a day should be avoided due to the risk of side effects.

The total daily calcium goal can be achieved with a combination of diet plus supplements. However, at least half of your calcium intake should come from dietary sources.

DIETARY SOURCES OF CALCIUM
Calcium is best absorbed through a calcium-rich diet. However, the average American consumes only 500mg of calcium in their daily diet.

- 3-4 servings of high-calcium foods are required to meet daily calcium needs. Dairy products are great sources of calcium. One serving is equal to 8 oz of milk or yogurt or 1 oz of hard cheese. A rough way to estimate calcium intake is to multiply the number of dairy servings per day by 300 mg.
- If you cannot eat dairy products, collard greens/kale/broccoli, tofu, beans, almonds, and fortified cereals and soy products are good alternative sources of calcium. If you are lactose intolerant, try Fairlife Milk, Lactaid Milk, or lactase enzyme tablets.
- Use the Nutrition Facts label to figure out how many milligrams of calcium a particular serving of food contains. Locate the %DV (percent daily value) for calcium on the food label, drop the % sign, and add a zero.
CALCIUM SUPPLEMENTS
If you are not able to get enough calcium from your diet, talk to your healthcare provider about adding a calcium supplement. **Do not rely on a multivitamin** for your calcium needs. Most multivitamins contain minimal amounts of calcium.

❖ WHICH CALCIUM SUPPLEMENTS ARE PREFERRED?
When choosing a calcium supplement, look for the amount of elemental calcium listed on the bottle. Elemental calcium is the actual amount of calcium in the supplement and is the number used to calculate your intake.

Common calcium supplements include the following:
- **Calcium carbonate** (Tums, Os-Cal, Caltrate, Viactiv) contains the most elemental calcium per tablet and is the least expensive. Calcium carbonate should be **taken with food** since it requires stomach acid for absorption. It is not well-absorbed in people taking an acid blocker (eg. Pepcid, Prilosec, Nexium, etc.).
- **Calcium citrate** (Citracal) and calcium gluconate are more easily absorbed and can be **taken with or without food**. They are preferred in people taking acid-blocking medications (eg. Pepcid, Prilosec, Nexium, etc.) or in those with malabsorption disorders (eg. inflammatory bowel disease, etc.).
- Avoid “natural source” calcium supplements, such as oyster shells or bone meal, since they may be contaminated with low levels of lead.
- If you do not like to take pills, consider supplements that come in chewable or gummy forms.

❖ HOW DO I TAKE MY CALCIUM SUPPLEMENT?
In addition to knowing whether you can take your calcium supplement with food (as noted above), it is important to remember the following:
- Calcium is best absorbed by the body when no more than 500 mg of elemental calcium is taken at one time. Therefore, if large doses of supplements are needed, they should be taken in divided doses (eg. morning and evening).
- Calcium interferes with the absorption of iron, thyroid hormones, and the fluoroquinolone or tetracycline classes of antibiotics (eg. ciprofloxacin, levofloxacin, doxycycline, minocycline). Therefore, these medications should be taken at different times of the day.

❖ IS IT POSSIBLE TO TAKE TOO MUCH CALCIUM?
Do not exceed a total calcium intake of 2000 mg a day (diet plus supplements). Getting too much calcium from food is rare. Excess intake is usually due to overuse of calcium supplements.
- Excessive use of calcium supplements may increase the risk of kidney stones and cardiovascular disease.
- Consult your medical provider prior to adding a calcium supplement if your family has a history of calcium-containing kidney stones.

VITAMIN D
❖ Your body needs vitamin D to absorb calcium. In addition to improving bone health, Vitamin D also helps your immune system function effectively and reduces inflammation.
- Vitamin D is made naturally by the skin after exposure to sunlight.
  - You can get enough Vitamin D just by being out in the sun for 10-15 minutes a day without sunscreen (except during winter months in northern parts of the US).
  - People with darker skin need more sun to make adequate amounts of vitamin D.
  - Vitamin D production by the skin also decreases with age.
- The best dietary source of vitamin D is fortified cow’s milk, which contains approximately 100 IU (international units) per 8 oz cup. Vitamin D is also found in egg yolks, salmon, tuna, and fortified cereals/juices/dairy products.
- The recommended daily intake of vitamin D is 600 IU for people ages 1-70 and 800 IU for people over age 70.
  - The most commonly used supplements are vitamin D3 (cholecalciferol) and vitamin D2 (ergocalciferol). Vitamin D3 is preferred because it is more effective in raising levels. However, vitamin D2 is preferred by vegetarians because it is derived from plant sources.
  - Vitamin D can be taken in one dose with or without food.
  - Most multivitamins contain 400 IU of vitamin D per dose.
Calories: 4 oz Sardines (canned), ¼ cup milk powder, Nonfat dry milk, ½ cup skim milk, Evaporated milk (low-fat, nonfat, plain, nonfat), 1 cup Yogurt (frozen, cooked), 1 cup Collard greens (frozen, cooked), 1 cup Spinach, ½ cup Kale, mustard greens (frozen, cooked), ½ cup English muffin, 1 English muffin
Calories: 4 oz Sardines (canned), ¼ cup milk powder, Nonfat dry milk, ½ cup skim milk, Evaporated milk (low-fat, nonfat, plain, nonfat), 1 cup Yogurt (frozen, cooked), 1 cup Collard greens (frozen, cooked), 1 cup Spinach, ½ cup Kale, mustard greens (frozen, cooked), ½ cup English muffin, 1 English muffin

Healthy Habits for Strong Bones
In addition to getting enough calcium and vitamin D, the following lifestyle habits are important for building and maintaining strong bones throughout life:

- Engage in regular weight-bearing exercises. This means exercises that involve gravity and muscle tension on the bone. Examples include running, walking, stair climbing, jump roping, and other impact-producing activities. Resistance training (eg. weight lifting) is also great for bone health. Swimming, biking, and exercising on machines (eg. elliptical trainers) are great cardiovascular workouts but have less impact on bone health.
- Avoid smoking. Research shows that smoking is associated with decreased bone density and an increased risk of fractures. Smoking may also decrease estrogen levels needed to maintain healthy bones.
- Limit alcohol consumption to 2 drinks or less per day. One drink is equivalent to 12 oz of beer, 5 oz of wine, or 1.5 oz of liquor. Excess alcohol intake can interfere with the absorption of calcium and other nutrients needed for strong bones. Alcohol can also adversely affect the hormones that regulate calcium levels and reduce the formation of new bone.
- Avoid consuming large amounts of sodium. High levels of salt intake can lead to a greater loss of calcium through the urine. Therefore, limit your sodium intake to no more than 2300 mg per day.
- See your medical provider if you are premenopausal and having infrequent menstrual periods. Your estrogen levels may be low, which can increase your risk of developing osteoporosis.

Calcium Content of Foods

<table>
<thead>
<tr>
<th>400 MG CALCIUM</th>
<th>300 MG CALCIUM</th>
<th>200 MG CALCIUM</th>
<th>150 MG CALCIUM</th>
<th>100 MG CALCIUM</th>
<th>50 MG CALCIUM</th>
<th>25 MG CALCIUM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yogurt (plain, nonfat, low-fat), 1 cup</td>
<td>Milk (nonfat, low-fat, lactose-reduced, whole, goat’s milk), 1 cup</td>
<td>Cheddar, gruyere, mozzarella (part skim), muenster, swiss cheeses, 1 oz</td>
<td>Oatmeal (instant), 1 packet</td>
<td>Ice cream, ice milk, frozen yogurt, ½ cup</td>
<td>Cottage cheese, ½ cup</td>
<td>Whole wheat or white bread, 1 slice</td>
</tr>
<tr>
<td>Evaporated skim milk, ½ cup</td>
<td>Fortified soy and rice milks, 1 cup</td>
<td>Burrito (chicken/beef with cheese &amp; beans), 1</td>
<td>Cheese pizza, 1 slice</td>
<td>Nachos with cheese and beans, 4</td>
<td>Hummus, ½ cup</td>
<td>Tortilla (flour), 6”</td>
</tr>
<tr>
<td>Nonfat dry milk powder, ¼ cup</td>
<td>Fortified orange juice, 1 cup</td>
<td>Enchilada with cheese &amp; beans, 1</td>
<td>Bok choy, 1 cup</td>
<td>Almonds, 1.5 oz (36 nuts)</td>
<td>Baked beans, ½ cup</td>
<td>Tortilla chips, 10</td>
</tr>
<tr>
<td>Mackerel (canned), 5 oz</td>
<td>Macaroni and Cheese, ¾ cup</td>
<td>Lasagna, 2.5” x 4” piece</td>
<td>Rhubarb (frozen, cooked), ½ cup</td>
<td>Spinach, ½ cup</td>
<td>Kale, mustard greens (frozen, cooked), ½ cup</td>
<td>Egg (hard boiled), 1</td>
</tr>
<tr>
<td>Sardines in oil, 4 oz</td>
<td>Grated parmesan cheese, 1 oz</td>
<td>Tofu, 1 cup</td>
<td>Turnip greens (frozen, cooked), ½ cup</td>
<td>Crab, 3 oz</td>
<td>Orange, 1 medium</td>
<td>Refried beans, ½ cup</td>
</tr>
<tr>
<td></td>
<td>Ricotta cheese (part-skim, nonfat), ½ cup</td>
<td>Soybeans (cooked), 1 cup</td>
<td>Clams, 3 oz</td>
<td></td>
<td>Tortilla (corn), 6”</td>
<td>Broccoli, ½ cup</td>
</tr>
<tr>
<td></td>
<td>Collard greens (frozen, cooked), 1 cup</td>
<td>Figs (dried), 10</td>
<td></td>
<td></td>
<td>English muffin, 1</td>
<td>Raisins, ½ cup</td>
</tr>
</tbody>
</table>

Published by VCU DSAES & University Student Health Services (health.students.vcu.edu) 6/2021