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Prevent Osteoporosis: Catch the Silent Thief[1]

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Why the concern?

Osteoporosis has been called the "silent thief." It robs bone from women (and some men) with no outward signs. Eventually, even a minor stumble might fracture a hip. Spine fractures can result in the stooped posture known as "dowager's hump."

Osteoporosis means porous bones -- bones that have so many opening (pores) that they can crush or break without warning.

By age 65, about 18 percent of all white women have had a bone fracture caused by osteoporosis. Many of these fractures, especially in the spine and hip, cause pain, disability, and loss of independence. Between 12 and 20 percent of patients die as a result of complications of a major fracture or its corrective surgery.

In the United States osteoporosis causes approximately 1.5 million fractures, mostly in the hip, spine, and wrist. Estimates of the medical cost range from $10 billion to $15 billion. To that figure we must add these impacts:

- loss of income
- loss of services and productivity
- nursing home care
- other health care costs

Of patients who fracture their hips, fewer than 50 percent recover "normal" function.

Osteoporosis is similar to high blood pressure in that it displays no symptoms until a complication occurs. There is no cure, so prevention is essential to combat this disease.

Bone – a mineral warehouse

Bone is often thought of as static and unchanging. Actually it is in a constant state of turnover, with new bone being formed and old bone being broken down. Usually bone formation and break down are in balance, so that the amount of bone mass is maintained. During growth, more bone is formed than is lost. From

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the mid-thirties on, break down tends to exceed formation, and there is a slow, gradual loss of bone throughout life.

Since bone loss is certain, the more you have to begin with, the more you will have as you get older. You can make choices early in life to help build your bone mass before the loss begins. Diet and exercise are two things you can control to prevent osteoporosis.

Who will get osteoporosis?

The exact cause of osteoporosis is not known. It is known as a "multifactorial" disease. In other words, many factors contribute to the disease. Some of these risk factors are beyond our control, or “innate.” Others are a part of our lifestyle, which we can control. We make decisions every day that can reduce our risk for developing osteoporosis.

Risk factors we cannot control are sex, race, family history, menstrual status, body build, and certain medical conditions. Women are much more likely to get osteoporosis than men. Black people are less likely to develop osteoporosis than whites or Asians. Those with a family history of the disease, and people with a thin body build have a higher risk. Obesity seems to protect individuals against osteoporosis. This is partly due to estrogen production in fat tissue, and to increased load on the bone.

In women, the rate of bone loss speeds up during menopause. After about age 65, the rate of loss slows down. Women who stop menstruating due to excessive exercise or from eating disorders also lose bone.

Several medical conditions increase the risk of osteoporosis. Persons with diabetes and thyroid disease, and those taking certain medications are at high risk for this bone-robbing disease. (See Table 1.)

Table 1

Risk Factors for Osteoporosis	
Innate	**Lifestyle-related**
Female	Too little calcium
Caucasian or Asian	Too little exercise
Family history	Nicotine use
Menopause	Excessive alcohol consumption
Hysterectomy	Too little vitamin D
Amenorrhea*	Medications (steroids, anti-convulsants, antacids with aluminum, thyroid extract)
Petite	
Hormone or chemical imbalance (e.g., diabetes or thyroid disease)	
*Absence of menstrual period	

Even people who have many risk factors can decrease their risk with lifestyle choices. These include increasing calcium intake and exercise, not smoking, avoiding excess alcohol, and getting adequate vitamin D.

Calcium for building bones

Bone is constantly breaking down and rebuilding. When rebuilding bone, we need adequate calcium and other minerals. For this reason, we must always include foods rich in **calcium** and other minerals such as magnesium and phosphorus in our diets.

Bones and teeth contain 99 percent of the calcium in the body. The other one percent is found in the blood and other body fluids where it helps in blood clotting and nerve transmission. Calcium is stored in the bones and drawn upon when the daily intake is too low to meet the body's needs.

The current daily recommendation for calcium intake is 1,000 milligrams (mg) for adult women age 19 to 50 and 1,200 mg for women 51 and older. Teens 18 and younger need 1,300 mg of calcium a day.

The best way to get enough calcium is through the foods you eat. Dairy foods are excellent sources of calcium. To keep your fat and cholesterol intake low, choose low-fat or fat free milk, yogurt, and cheese.

Other foods can provide calcium in the diet. Leafy green vegetables are good sources. Choose broccoli, collards, turnip greens, mustard greens, cabbage and kale. Canned salmon (including the mashed bones) and sardines are high in calcium too. Table 2 shows the calcium content of some common foods.

Oxalic acid in some green vegetables and phytic acid in grains interfere with calcium absorption. Therefore, the calcium in whole grains and spinach, chard, and beet greens is less available than calcium from other food sources.

Getting calcium from foods

Certain foods are good to excellent sources of calcium. You can include them in meals and snacks to get all or most of the daily calcium that you need. Below are examples of how to include good and excellent food sources of calcium in meals and snacks. You will get additional calcium, in small amounts, from other foods that you eat. If your calcium needs are higher, or you do not eat dairy products, you may need to take a supplement.

Meal/Snack	Food	mg Ca
Day 1		
Breakfast	Milk, 1%, ¾ cup	225
	Fortified cereal, 1 cup	50
Lunch	Whole milk in coffee, 3 tablespoons	55
Snack	Vanilla low-fat yogurt, 8 fluid ounces	400
Dinner	Cooked greens, ¾ cup	175
	TOTAL	905
Day 2		
Breakfast	Waffles, frozen, 2	225
	Orange juice, fortified, ¾ cup	300
Lunch	Swiss cheese, 1 ounce (on sandwich)	270
Dinner	Broccoli spears, 1 cup	100
	TOTAL	895

Table 2.

Calcium in Selected Foods

Food	Mg Calcium	Food	Mg Calcium
Whole milk, 1 cup	290	Parmesan, grated, 1 ounce	390
Low-fat milk (1%), 1 cup	300	American cheese, (processed), 1 ounce	175
Fat free milk, 1 cup	300	Creamed cottage cheese (1%), 1 cup	140
Nonfat dry milk, 1 Tbsp.	60	Ice cream (light), 1 cup	180
Chocolate milk (1%), 1 cup	250	Ice cream, soft-serve, 1 cup	275
Buttermilk (1%), 1 cup	285	Pink salmon, 3 ounces, canned with bones	180
Yogurt (low-fat), 1 cup plain	450	Sardines with bones (drained), 3 ounces	325
Yogurt (low-fat), 1 cup fruit flavored	340	Kale (cooked), 1 cup	180
Yogurt (low-fat), 1 cup coffee or vanilla flavored	350	Broccoli (cooked), 1 cup	100
Swiss cheese, 1 ounce	270	Collard greens (cooked), 1 cup	225
Cheddar cheese, 1 ounce	200	Turnip greens (cooked), 1 cup	250
Mozzarella cheese, part skim, 1 ounce	180	Tofu (calcium fortified), 2 ounces	280

Source: Food Processor Nutrition & Fitness Software, Version 7.9. ESHA Research, Inc., 2002

What about supplements?

For those who choose not to eat foods with calcium, supplements are available. Not all calcium tablets are alike, however. Calcium carbonate, for example, provides 40 percent calcium, while calcium gluconate provides only 9 percent. Calcium citrate is a well-absorbed form. Many fortified food products also contain calcium citrate.

It is a good idea to check with your doctor before taking any supplements. There are risks for some people who take high levels of calcium. Also, speak to your pharmacist about the type of calcium supplement to take.

It is best to take calcium supplements with meals. Calcium is better absorbed when there is food in the stomach. It is also a good idea to consume calcium from food or from supplements throughout the day rather than at one time.

Some brands of calcium tablets are more bioavailable than others. To be absorbed, the tablets must dissolve in the stomach. You can test your calcium supplements at home. Place one tablet into 8 ounces of vinegar at room temperature. Stir vigorously every 2 to 3 minutes. If the tablet dissolves in 30 minutes, it

probably would be adequately absorbed. If it does not dissolve, try another brand.

Some foods naturally low in calcium, like orange juice, are available with added calcium. They provide an alternative for people who limit their intake of other calcium sources. Nutrition labels provide information on the amount of calcium contained in the food. Note that the percentage given is based on 1000 mg. (See Table 3.)

Table 3. Foods Supplemented with Calcium

Label Information		
	Percent Daily Value per serving	**Supplemented with**
"Total" Brand Cereal	20	Tricalcium and dicalcium phosphate
. . . with milk	35	
"Minute Maid" Orange Juice	30	Triacalcium phosphate and calcium lactate
"Citrus Hill" Plus Calcium Orange Juice	20	Calcium hydrate

Vitamin D

Vitamin D promotes calcium absorption. This vitamin is made in the skin in response to sunlight, and it is added to dairy foods. Too much vitamin D may be harmful. Excess intake of vitamin D can lead to increased urinary excretion of calcium, and loss of bone. The recommended intake is 5 micrograms (µg) (200 IU) for those 19 to 50 years old, 10 µg (400 IU) for those 51 to 70 and 15 µg (600 IU) for persons over 70. Children and adolescents should have 5 µg of vitamin D per day. If you spend 10 to 15 minutes in the sun each day (without sunscreen) and eat fortified dairy foods, you probably get enough vitamin D.

Getting enough calcium and vitamin D helps build bone and decrease risk for osteoporosis. But for your body to make the best use of the calcium for bone building, you need to be physically active. Exercise is the next lifestyle factor that promotes bone health.

Move it or lose it

Exercise is important in preventing osteoporosis. The expression, "Move it or lose it," can apply to our bones.

When we move, our muscles pull against our bones. The resulting stress on the bone causes minerals (chiefly calcium) to be deposited in the bone. This makes the bone more dense and stronger.

The best type of exercise for building bones is weight-bearing exercise. The exercise most often recommended is brisk walking. Strength training with free weights or machines also helps to build bones.

Sticking to an exercise program for the long term can be a challenge for some people. Be sure the exercise plan you choose is one that fits your lifestyle and is one you will enjoy. Plan to walk with a friend, or walk in a pleasant park, for example, if this will help you with your plan.

If you work away from home, plan exercise into your work day. Here are some ideas:

- Take a walk on your lunch hour.
- Park your car a fifteen minute walk away from the workplace.
- Arrange to exercise a few evenings during the week.
- Do errands on foot.
- Relax with your favorite sport instead of in front of the television.

Whatever exercise you choose, be sure it will not increase your risk of fracture from a fall or other injury. Start slowly if you have not been active for awhile. As with any change in your exercise habits, check with your doctor before you begin.

Advice for your teenage daughter

Age is another significant factor in bone formation. Bone mass increases during growing periods, and peaks at about age 30. It is especially important for teen and preteen girls to live a lifestyle that promotes bone health. This will help them build their bones for the predictable postmenopausal bone loss.

Because bone building requires calcium "building blocks," teens and preteens need to have an adequate calcium intake. This age group is prone to be diet conscious, and may avoid dairy foods thinking that they are "fattening." Teen and preteen girls should be encouraged to include a variety of low-fat or fat free calcium-containing foods in their diets. They also should have opportunities for vigorous exercise every day. Weight-bearing exercise will help them build strong bones.

Estrogen therapy

During a woman's childbearing years, her body produces the hormone estrogen. At menopause, the production drops. This drop in estrogen is believed to contribute to bone loss. Hormone replacement therapy (HRT) provides relief for women going through menopause. Recent studies report conflicting results in the effectiveness of HRT in reducing risk of bone fractures.

Estrogen is not recommended for all women, since it has several side effects. Estrogen therapy is linked with increased risk for endometrial cancer. To reduce the risk, estrogen often is combined with progestin. When the two hormones are used together, however, menstrual bleeding resumes. Many women do not want to deal with continued menstruation. Estrogen/progestin therapy causes other side effects including swelling, cramping, and breast tenderness. Health risks include increased risk of breast cancer, stroke, blood clots, and heart disease.

If you are considering estrogen or estrogen/progestin therapy, discuss the risks and benefits with your doctor. This will help you decide whether or not to take hormones to reduce your risk of osteoporosis.

Debating a Dietary Dilemma

As we learn more about osteoporosis, there are more questions that need to be answered. Scientists still don't agree on appropriate treatments for osteoporosis. Getting enough exercise, regulating alcohol intake, and not smoking, are wise practices for general health, and can help prevent osteoporosis. Hormone therapy is still controversial, due to negative side effects and recent studies that show no positive effect on risk of osteoporosis.

Some nutritionists ask the questions, "Why is osteoporosis not a problem in less developed countries, where calcium intakes are lower than in more affluent nations?" and "Does the body use calcium more efficiently when intakes are low?" These questions keep some health professionals from agreeing with current dietary calcium recommendations.

Another aspect of the dilemma is that dairy foods, the main sources of calcium in the American diet are not consumed by many ethnic groups. This may be due to cultural preferences or to lactose intolerance. Nutrition education that is sensitive to cultural differences can help people make food selections that meet nutritional needs.

Summary

Osteoporosis is a serious and common disease that has many causes. Enjoying a healthy lifestyle that includes healthful food choices and physical activity can help people keep their bones strong for a lifetime.

The use of trade names is for educational purposes only, and does not constitute an endorsement of any product to the exclusion of another.

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Calcium-Containing Recipes

Old-Fashioned Baked Rice Pudding[a]

1 quart fat free milk
3 tablespoons uncooked rice (not converted)
¼ cup sugar
½ teaspoon salt
¼ cup raisins (softened in hot water if needed)
Ground nutmeg

Preheat oven to 300 degrees. Combine milk, rice, sugar and salt in a lightly buttered 2-quart casserole. Bake, uncovered, for 2 hours, stirring every 30 minutes. Add raisins during the last 30 minutes of baking. Stir in the surface crust. Upon standing the rice will absorb the rest of the milk. Sprinkle with nutmeg. Serve warm or chilled with additional milk, if desired. Makes four servings.

Each serving provides approximately:
Calories: 200
Fat: Less than 1 gram
Calcium: 300 milligrams

[a]Reprinted with permission, National Dairy Board

Morning Shake

1 cup 1% milk (or use fat free)
1 cup sliced frozen banana
3 tablespoons frozen orange juice concentrate
½ teaspoon pure vanilla extract

In the container of an electric blender, place milk, banana, orange juice and vanilla. Cover and blend until smooth. Serve at once. Makes two servings.

Each serving provides approximately:
Calories: 150
Fat: 1.4 grams
Calcium: 160 milligrams

Fresh Fruits with Orange Custard Sauce

1½ cup 1% milk (or use fat free)
2 tablespoons sugar
1 tablespoon cornstarch
1½ teaspoons grated orange peel
1 egg yolk
2 cups mixed fresh fruits cut in bite-sized pieces (e.g., pears, peaches, apples, grapes, pineapple, etc).

In a small saucepan combine milk, sugar, cornstarch, orange peel, and egg yolk. Cook and stir over medium heat until mixture comes to a boil. Boil for one minute, stirring constantly. Serve warm or cold over cut fruits. Makes two servings.

Each serving provides approximately:
Calories: 270
Fat: 5 grams
Calcium: 250 milligrams

Italian Rice Bake[b]

⅔ cup uncooked rice (or 2 cups cooked rice)
1⅓ cups water (if using uncooked rice)
1 onion, chopped
1 tablespoon margarine
1 6-ounce can tomato paste (no salt added) and 1 can water
½ teaspoon garlic powder
1 teaspoon sugar
dash pepper
½ teaspoon whole thyme
½ teaspoon dried oregano, crushed
1 teaspoon parsley flakes
1½ cups low-fat cottage cheese
½ cup grated part-skim mozzarella cheese

Cook rice in water. In a skillet, sauté onion in the margarine. Add tomato paste, water, garlic powder, sugar, pepper, thyme, oregano, and parsley to onion mixture.

Combine cottage cheese and rice.

Put ⅓ of rice mixture in non-stick sprayed casserole dish. Top with ⅓ of tomato sauce. Continue to alternate layers, ending with tomato sauce. Top with grated cheese. Bake at 325 degrees for 30 minutes, until hot and bubbly. Makes six servings.

Each serving provides approximately:
Calories: 200
Fat: 5 grams
Calcium: 130 milligrams

[b] Reprinted with permission from *Cooking ala Heart* by Linda Hachfeld, MPH, RD and B. Eykyn, MS; ©1992. Published by Appletree Press, available by calling (800) 322-5679.

Cauliflower Walnut Casserole[b]

Because of the cheese and nuts, this is more a vegetable entrée than a side dish. Serve with a salad, French bread and a fruit dessert. For variety, substitute broccoli or cabbage for the cauliflower.

1 medium head cauliflower, broken into florets
1 cup plain low-fat yogurt
1 cup shredded reduced fat Cheddar cheese
1 tablespoon flour
2 teaspoons low-sodium, chicken flavored bouillon granules
1 teaspoon dry mustard
⅓ cup chopped walnuts
1 tablespoon margarine
⅓ cup fine dry bread crumbs
1 teaspoon dried marjoram, crushed

In a medium sauce pan, bring water to a boil. Add cauliflower, reduce heat and simmer 15 minutes. Drain.

Mix yogurt, cheese, flour, bouillon granules and mustard. Place cauliflower in 10 x 6" baking dish and spoon yogurt mixture over cauliflower.

Mix together walnuts, bread crumbs, margarine, and marjoram; sprinkle over cauliflower and sauce. Bake at 400 degrees about 20 minutes, until casserole is bubbly. Makes four entrée servings.

Each serving provides approximately:
Calories: 240
Fat: 12 grams
Calcium: 300 milligrams

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Key Lime Yogurt Pie

A variation of the Key West specialty. The filling is sweetened with apple juice concentrate and flavored with Key limes.

1¼ cups graham cracker crumbs
2 tablespoons margarine, melted
½ cup frozen apple juice concentrate, thawed
1 envelope unflavored gelatin
⅓ cup granulated sugar
⅓ cup fresh Key lime juice*
2 teaspoons Key lime rind, freshly grated
¼ teaspoon vanilla extract
1½ cups low-fat plain yogurt

*Can use lime juice if Key limes not available.

In a small bowl combine crumbs and margarine; mix well. Press the crumb mixture over bottom and side of a pie plate. Freeze.

Pour apple juice into a saucepan and sprinkle with gelatin. Let stand several minutes or until gelatin is softened. Add sugar. Cook over low heat until gelatin and sugar dissolve, stirring constantly. Pour the gelatin mixture into a mixer bowl. Add lime juice, lime rind, and vanilla. Chill until the mixture resembles raw egg whites. Beat until fluffy. Add yogurt; beat until fluffy.

Pour the yogurt mixture into the chilled crust. Chill until firm. Makes eight servings.

Each serving provides approximately:
Calories: 210
Fat: 4.8 grams
Calcium: 85 milligrams

Broccoli Quiche

1 pound fresh broccoli, cut into florets (or use frozen)
2 eggs, beaten
¼ cup unbleached flour
2 cups low-fat (1%) cottage cheese
2 ounces part-skim mozzarella cheese, grated
¼ cup fresh parsley, finely chopped
1 tablespoon lemon juice (fresh is best)
½ teaspoon dried basil
¼ teaspoon dried oregano
¼ teaspoon salt (optional)
¼ teaspoon pepper

Preheat oven to 350 degrees. Cut fresh broccoli into florets; peel and slice stems. In a saucepan or steamer cook broccoli with a small amount of water over medium heat until tender-crisp; drain and chop coarsely.

In a bowl beat eggs. Add flour and mix until well blended. Add remaining ingredients; mix well. Spray a 9 x 9-inch baking pan with vegetable cooking spray and pour in the broccoli mixture. Bake 35 to 40 minutes at 350 degrees. Cool for 2 to 3 minutes. Cut into squares. Makes four servings.

Each serving provides approximately:
Calories: 250
Fat: 7 grams
Calcium: 250 milligrams

Tomato Raita

1 medium cucumber, peeled
1 teaspoon salt (optional)
2 medium tomatoes, cored, cut into ½-inch cubes and drained
1 tablespoon onion, finely chopped
1 cup low-fat plain yogurt
¼ cup fresh parsley, chopped
2 tablespoons fresh cilantro (coriander), chopped
1 teaspoon cumin

Cut cucumber in half lengthwise; remove seed. Cut into thin slices and place in a bowl. Sprinkle with salt. Let stand for 40 minutes. Drain, squeezing cucumber slightly to remove excess moisture. Add tomatoes and onion. In a bowl combine yogurt, parsley, cilantro, and cumin; mix well. Pour over vegetables; mix well. Cover. Chill until serving time.

Makes 4 (¾-cup) servings.

Each serving provides approximately:
Calories: 60
Fat: 1 gram
Calcium: 130 milligrams