

Prevent Osteoporosis: Catch the Silent Thief¹

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Why is osteoporosis a concern?

Osteoporosis has been called the “silent thief.” It robs women (and sometimes men) of bone with no outward symptoms. Eventually, even a minor stumble might cause a wrist or hip fracture. Spine fractures can result in the stooped posture known as “dowager’s hump.”

Osteoporosis means porous bones, or bones that have so many openings (pores) that they can easily break or be crushed. In the United States, 54 million people either have osteoporosis (10 million) or are at high risk (44 million) because they have low bone mass. By 2020, one in two Americans over the age of 50 is expected to have osteoporosis of the hip or be at high risk of developing the condition.

About half of women and one-quarter of men over the age of 50 will have a bone fracture caused by osteoporosis in their lifetime. Many of these fractures, especially in the spine and hip, cause pain, disability, and loss of independence. Fewer than 50 percent of patients who fracture their hips ever recover “normal” function, and about one-fifth of people aged 50 and over who have a hip fracture will die within a year.

In the United States, osteoporosis causes about 2 million fractures each year, mostly in the hip, spine, and wrist. The total cost to Medicare alone of fall injuries due to any cause was over \$31 billion in 2015. Medical costs of fractures due to osteoporosis total \$19 billion and are expected to rise to \$25 billion by the year 2025. Other impacts of osteoporosis include:

- Loss of income
- Temporary or permanent loss of independence
- Loss of productivity
- Stress on family or caregivers
- Reduced quality of life

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

Bone—A Mineral Warehouse

Bone is often considered unchanging. In actuality, it constantly turns over, forming new bone and breaking down existing bone. When bone formation and breakdown are balanced, the amount of bone mass stays roughly the same.

During growth, more bone is formed than lost. When people reach their mid-30s, bone breakdown tends to exceed formation and they start to have a gradual loss of bone at that point. In women, the rate of bone loss increases during menopause. After about age 65, the rate of loss decreases. Women who stop menstruating due to excessive exercise or eating disorders also lose bone. Bone loss in men tends to start at a later age, around age 65 or 70, and is often related to decreased levels of the hormone testosterone.

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Figure 1. Osteoporosis increases risk of falls and fractures, which affect quality of life for many older adults.

Credits: Lisa F. Young/iStockphoto.com

Bone loss is inevitable. That said, people who begin with more bone mass will retain more as they age. Everyone can make choices early in life to help build bone mass before bone loss begins. As we age, we can slow down bone loss with positive lifestyle choices. We can reduce the risk of osteoporosis throughout our lives by controlling our diets and levels of exercise.

Who will get osteoporosis?

Osteoporosis is known as a multifactorial disease, which means that many factors contribute to a person's risk of getting the disease. Certain osteoporosis risk factors are innate and are therefore beyond a person's control. Risk factors that cannot be controlled are related to gender, age, ethnicity, family history, menstrual status, body build, and certain medical conditions.

Other risk factors are lifestyle-related and can be controlled. Although genetics plays a large part in susceptibility to osteoporosis, 10 to 50 percent of risk can be traced to lifestyle factors such as smoking, low calcium intake, and lack of exercise. People make decisions every day that can reduce or increase their risk for developing osteoporosis.

Although women are much more likely to get osteoporosis than men, men account for about 20 percent of cases. Black and Hispanic individuals 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 are at higher risk. Higher body weight protects individuals against osteoporosis. However, intentional weight gain is **not** recommended as a preventive measure against osteoporosis due to its increased risk for other conditions such as diabetes and heart disease.

Several medical conditions increase the risk of osteoporosis. People with diabetes and thyroid disease and those taking certain medications are at high risk of developing this bone-robbing disease. Men who have undergone treatment for prostate cancer are at greater risk as well (see Table 1).

Table 1. Risk Factors for Osteoporosis.

Innate	Lifestyle-related
Older age	Lack of adequate vitamin D (from the diet or sun exposure)
Gender (female)	Lack of adequate calcium in diet
Race (Caucasian or Asian)	Low intake of fruits and vegetables
Family history	Excess consumption of protein, sodium, and caffeine
Menopause	Excessive alcohol use
Hysterectomy	Inactive lifestyle
Amenorrhea*	Medications (steroids, anticonvulsants, antacids with aluminum, excess thyroid extract)
Petite body build (weight under 127 pounds)	Smoking
Hormone or chemical imbalance (such as diabetes or thyroid disease)	
* Absence of regular menstrual period for three months (Klein & Poth, 2013)	

People with many risk factors can still decrease their risk of osteoporosis by making positive lifestyle choices. These include getting enough calcium, vitamin D, fruits, vegetables, and weight-bearing exercise, as well as not smoking and avoiding excessive alcohol consumption. Weight-bearing exercises include strength training with free weights or machines, walking, jogging, stair climbing, tennis, soccer and other similar team sports, and dancing.

Calcium for Bone Building

We need enough calcium and vitamin D in our diets to rebuild our bones, since they are constantly breaking down and rebuilding themselves.

Bones and teeth contain 99 percent of the calcium in the body. The other one percent is found in the blood and other bodily fluids, where calcium is needed for blood clotting

and nerve transmission. Calcium is stored in the bones and extracted when the daily calcium intake is too low to meet the body's needs.

The current daily recommendation for calcium intake is 1,300 milligrams (mg) for children between the ages of 9 and 18, 1,000 mg for women between the ages of 19 and 50 and men aged 19 to 70, and 1,200 mg for women 51 and older and men over 70 years. During pregnancy, the daily recommendation is 1,000 mg for women aged 19 to 50 and 1,300 mg for teens between the ages of 14 and 18.

Getting Calcium from Foods

The best way to get enough calcium is to eat a variety of calcium-rich foods. Including these foods in meals and snacks can help you meet your calcium needs. Table 2 shows the calcium content of several common foods.

Table 2. Calcium in selected foods.

Food	Calcium (mg)
Collard greens (cooked and drained), 1 cup	350
Mozzarella cheese (part skim), 1 ounce	220
Sardines with bones (drained), 3 ounces	325
Yogurt (low-fat, fruit-flavored), 1 cup	200
Parmesan cheese (grated), 1 ounce	310
Cheddar cheese (50% less fat), 1 ounce	200
Low-fat milk (1%), 1 cup	300
Pink salmon (canned with bones), 3 ounces	180
Fat-free milk, 1 cup	300
American cheese (processed), 1 ounce	160
Yogurt (low-fat, plain), 1 cup	300
Orange juice (fortified), $\frac{3}{4}$ cup	260
Chocolate milk (1%), 1 cup	290
Creamed cottage cheese (1%), 1 cup	140
Whole milk, 1 cup	275
Tofu, firm (calcium-fortified), 2 ounces	110
Buttermilk (1%), 1 cup	250
Ice cream (low-fat vanilla), $\frac{1}{2}$ cup	100
Yogurt (low-fat, vanilla-flavored), 1 cup	250
Kale (cooked and drained), 1 cup	95
Swiss cheese (25% less fat), 1 ounce	250
Nonfat dry milk, 1 tablespoon	60
Turnip greens (cooked and drained), 1 cup	250
Broccoli (cooked and drained), 1 cup	60
Soy milk (calcium-fortified, low-fat, plain) 1 cup	200

Source: Food Processor SQL, Version 10.7. ESHA Research, Inc., 2010



Figure 2. Dairy foods, such as milk, yogurt, and cheese are good sources of calcium. Choose low-fat or fat-free dairy products to limit the intake of fat in your diet.

Credits: Greschoj, <http://bit.ly/AqigsZ>

Dairy foods are excellent sources of calcium. To reduce intake of saturated fat and cholesterol, choose low-fat (1%) or fat-free milk, yogurt, and cheese.

Plant foods, such as leafy green vegetables, also are good sources of calcium. Choose broccoli, collards, turnip greens, mustard greens, cabbage, and kale. Canned salmon (including the mashed bones) and sardines are high in calcium as well.

Oxalic acid in certain green vegetables and phytic acid in whole-grain foods 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.

Table 3 provides examples of how to include calcium-rich foods in meals and snacks. People who have high calcium needs as well as those who do not consume dairy products may need to take a calcium supplement.

Table 3. Calcium-rich foods in meals and snacks.

Meal	Food	Calcium (mg)
DAY 1		
Breakfast	1% milk (for cereal), $\frac{3}{4}$ cup	225
	Whole milk (added to coffee), 3 tablespoons	50
Lunch	Canned salmon, 2 ounces	120
Snack	Low-fat vanilla yogurt, 1 cup	250
Dinner	Cooked turnip greens, $\frac{3}{4}$ cup	190
	Fat-free milk, $\frac{3}{4}$ cup	225
TOTAL		1060
DAY 2		
Breakfast	Waffles (fortified), 2 waffles	225
	Orange juice (fortified), $\frac{3}{4}$ cup	150
Lunch	Swiss cheese (on sandwich), 1 ounce	250
Dinner	Broccoli spears, 1 cup	60
	Fat-free milk, $\frac{3}{4}$ cup	225
TOTAL		910

Calcium Supplements

Calcium supplements are available for those who do not get enough calcium from foods. The two main forms of calcium supplements are calcium citrate and calcium carbonate. The absorption of the calcium in these two supplements is similar. However, calcium carbonate needs to be taken with food for best absorption. Calcium citrate is equally well absorbed on an empty or full stomach. Also, calcium citrate is better absorbed by people who have decreased stomach acid, such as older adults or people who take antacids. No more than 500 mg of calcium should be consumed at any given time, since the body can only absorb about that much calcium at one time. It is a good idea to check with your doctor or pharmacist before taking any supplement. There are risks for certain people who have high levels of calcium. Your doctor or pharmacist can also help you choose the right type of calcium supplement for you.

Calcium tablets must dissolve in the stomach to be absorbed. It is best to purchase your supplements from a reliable manufacturer to ensure you are getting a quality supplement that will be properly absorbed. A USP (United States Pharmacopeia) symbol on the bottle means the supplement will dissolve and will also be free from lead.

Certain foods that are naturally low in calcium, like orange juice, are available with added calcium. These fortified foods are an alternative for people who do not include other calcium sources in their diets. See examples in Tables 2, 3, and 4.

Nutrition labels list the calcium content of food. Note that the percent Daily Value on the label is based on a Daily Value of 1,000 mg (see Table 4).

Table 4. Foods supplemented with calcium.

	% Daily Value	Calcium (mg)
Cereal, calcium-fortified, 1 cup	10–100%	100–1000
Orange juice, calcium-fortified, $\frac{3}{4}$ cup	26–45%	260–450
Soy milk (calcium-fortified), 1 cup	8–50%	80–500

Vitamin D

Vitamin D promotes calcium absorption and is important for bone growth and maintenance. This vitamin is made in the skin after exposure to sunlight and is added to fortified milk, cereals, and several other foods. Few foods naturally contain vitamin D.



Figure 3. Vitamin D promotes calcium absorption and is important for bone growth and maintenance.

Credits: GlobalStock/iStockphoto.com

The recommended daily intake for vitamin D is 15 micrograms (mcg) (600 International Units, or IU) for children one year and older and for all adults up to 70 years of age. Men and women over 70 should get 20 mcg (800 IU) a day. Women who are pregnant or lactating should get 15 mcg (600 IU). For persons with light skin and those living in warm climates, spending 10 to 15 minutes in the sun each day (without sunscreen) can help meet vitamin D needs. Persons with darker skin including those with suntans require a longer exposure, and older adults are less able to count on sun exposure for their vitamin D needs.

The dietary recommendations provided here were updated by the Institute of Medicine in 2011. Older adults who obtain less vitamin D from sun exposure, are living in institutions, or have dark skin pigmentation may be at greater risk of developing vitamin D deficiency and need to receive the recommended intake from their diets. Discuss any concerns about vitamin D levels with your doctor. Blood tests can show if you are getting enough vitamin D.

Adequate calcium and vitamin D intake helps build bone and decrease risk for osteoporosis. Consumption of a wide variety of foods from all food groups in recommended amounts will also ensure adequate intake of all nutrients needed for good health. More information about nutrition and diet recommendations can be found at <http://ChooseMyPlate.gov>.

Physical activity, including weight-bearing exercise, is the next lifestyle factor that promotes bone health.

Move It or Lose It

Exercise is important in osteoporosis prevention. The expression “Move it or lose it” can apply to bones. During body movement, muscles pull against bones. The resulting stress on the bone causes minerals (chiefly calcium) to be deposited, making the bone denser and stronger.

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



Figure 4. Following a healthy diet and getting regular exercise are two keys to building strong bones in order to prevent osteoporosis.
Credits: kali9/iStockphoto.com

Sticking to an exercise program for the long term can be a challenge. Choosing an enjoyable exercise plan is important. For example, walking with a friend in a pleasant park or joining a gym may help encourage an active lifestyle.

Make exercise a priority. You can even mark it on a calendar and program a reminder on your computer, mobile phone, or other device.

Ways to incorporate physical activity into your day include the following:

- Walk during lunch and other breaks at work.
- Park your car at the far end of the parking lot at work and the store.
- Take the stairs instead of the elevator or escalator when possible.
- Do errands on foot.
- Walk to a co-worker's office instead of using e-mail or texting to communicate.
- Relax with a favorite workout or sport instead of a television program.
- When watching television, walk, jog, dance, or do stretches during commercials. Keep a light free weight or a filled water bottle next to the chair or sofa and do some weightlifting while watching TV.

Choose activities that will not increase the risk of fracture from a fall or other injury. People who have not been active for a while should start slowly and check with a doctor before beginning a new exercise program.

Advice for Teens and Preteens

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 in order to help build bones for the predictable age-related bone loss.

Bone building requires calcium “building blocks.” Therefore, teens and preteens need to have an adequate calcium intake. This age group is likely to be diet-conscious and may replace dairy foods with diet drinks. Teen and preteen girls should be encouraged to consume a variety of low-fat or fat-free foods that are high in calcium and vitamin D. Eating a variety of fruits and vegetables will provide other needed minerals, such as magnesium, that also support bone health.

Teens and preteens should also have opportunities for vigorous exercise every day at school, in after-school programs, and during weekend activities. Weight-bearing exercise will help build strong bones.

Hormone Therapy

During the childbearing years, a woman's body produces the hormones estrogen and progesterone. At menopause, production of these hormones drops. The drop in estrogen contributes to bone loss as well as the hot flashes and other symptoms associated with menopause. Hormone therapy provides relief for women who experience severe symptoms when going through menopause.

Hormone therapy can involve use of estrogen alone or in combination with either progesterone or the synthetic progestin. Estrogen therapy alone may increase the risk of endometrial cancer. Estrogen combined with progestin lowers the risk of endometrial cancer, but allows menstrual bleeding to resume.

Estrogen/progestin therapy causes other side effects, including swelling, cramping, nausea, and breast tenderness. Long-term health risks include increased risk of breast cancer, stroke, blood clots, and heart disease.

When considering estrogen or estrogen/progestin therapy, discuss the risks and benefits with a doctor.

Debating a Dietary Dilemma

As we learn more about osteoporosis, we find more questions that need to be answered. Scientists still do not agree on appropriate treatments for osteoporosis. Prevention seems to be the best approach.

Following a healthy diet that includes enough calcium, vitamin D, and other nutrients, exercising regularly, limiting alcohol intake, and not smoking are wise practices for general health that can help prevent osteoporosis. Hormone therapy for menopausal women is still controversial because the risks may outweigh the benefits for certain women.

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 because of cultural preferences and/or 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. A healthy lifestyle that includes nutritious food choices and physical activity can help people build and keep strong bones for a lifetime.

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Calcium-Rich Recipes

Creamy Banana Walnut Oatmeal



Figure 5. Creamy banana walnut oatmeal.
Credits: Mizina/iStockphoto.com

2 cups fat-free or 1% low-fat milk
1 cup old-fashioned rolled oats
1 ripe banana, sliced
1 tablespoon chopped walnuts

PREPARATION

Mix the milk and oats together in a large bowl. Microwave on high for four minutes or until oats are cooked through. Stir in the sliced banana and chopped walnuts. Serve immediately. Makes two servings.

NUTRIENTS PER SERVING

Calories: 240
Carbohydrates: 38 grams
Fat: 6 grams
Calcium: 315 milligrams
Sodium: 110 milligrams
Recipe modified from the Dairy Council of California.

Pumpkin Pancakes



Figure 6. Pumpkin pancakes can be a quick and easy solution to a chilly winter day.
Credits: vm2002/iStockphoto.com

2 cups flour (whole wheat flour will add fiber to this recipe)
2 tablespoons brown sugar
1 tablespoon baking powder
1¼ teaspoons pumpkin pie spice
1 teaspoon salt
1 egg
½ cup pumpkin (canned)
1¾ cups milk, low-fat (1%)
2 tablespoons vegetable oil

PREPARATION

Combine flour, brown sugar, baking powder, pumpkin pie spice, and salt in a large mixing bowl. In a medium bowl, combine egg, canned pumpkin, milk, and vegetable oil and mix well.

Add wet ingredients to the flour mixture, stirring until moist. Batter may be slightly lumpy. For thinner batter, add more milk.

Lightly coat a griddle or skillet with cooking spray and heat on medium. Using a ¼-cup measure, pour batter onto hot griddle. Cook until bubbles begin to burst, then flip pancakes and cook until golden brown (1½ to 2½ minutes). Repeat with remaining batter. Makes about one dozen 3½-inch pancakes.

Note: If you do not have pumpkin spice on hand, substitute $\frac{3}{4}$ teaspoon cinnamon, $\frac{1}{4}$ teaspoon nutmeg, and $\frac{1}{8}$ teaspoon each of ginger and cloves for the pumpkin pie spice. Makes six servings.

NUTRIENTS PER SERVING

Calories: 260
Carbohydrates: 42 grams
Fat: 6 grams
Calcium: 250 milligrams
Sodium: 320 milligrams
Recipe from the USDA Food and Nutrition Program.

White Chili



Figure 7. White bean chicken chili.
Credits: bhofack2/iStockphoto.com

4 cups cooked white beans (if using canned, use low-sodium and rinse before using)
1 tablespoon olive oil (or other vegetable oil)
2 red bell peppers, chopped
1 large onion, chopped
1 chopped green chili (can adjust to taste)
3 garlic cloves, minced
1 tablespoon chili powder
1 teaspoon cumin powder
1 teaspoon oregano
2 cups chicken broth (low-sodium)
2 cups milk, low-fat (1%)
 $\frac{1}{4}$ cup fresh chopped cilantro
 $\frac{3}{4}$ pound chicken (cooked and cubed)
6 corn tortillas (toasted and cut into 1-inch squares)

PREPARATION

Heat a large pot with olive oil and sauté the peppers and onion. Next, add the green chili, garlic, spices, and chicken broth and let simmer for 20 minutes. Add milk, cooked beans, and cooked chicken. Allow the soup to thicken before adding the cilantro. Heat to a simmer. Top chili with crisp tortilla pieces before serving. Makes eight servings.

NUTRIENTS PER SERVING

Calories: 280
Carbohydrates: 35 grams
Fat: 5 grams
Calcium: 190 milligrams
Sodium: 260 milligrams
Recipe from the USDA Food and Nutrition Program.

Zucchini Rice Casserole



Figure 8. Zucchini rice casserole.
Credits: nata_vkusidey/iStockphoto.com

1½ cups long grain brown rice
3 cups reduced-sodium chicken broth
4 cups diced zucchini and/or yellow squash (about 1 pound)
2 red or green bell peppers, chopped
1 large onion, diced
 $\frac{3}{4}$ teaspoon salt
1½ cups low-fat (1%) milk
3 tablespoons all-purpose flour
2 cups shredded pepper jack cheese
1 cup fresh or frozen (thawed) corn kernels
2 teaspoons extra-virgin olive oil (or other vegetable oil)
8 ounces turkey sausage, casings removed
4 ounces reduced-fat cream cheese
 $\frac{1}{4}$ cup chopped pickled jalapeños

PREPARATION

Preheat oven to 375°F.

Pour rice into a 9-by-13-inch baking dish. Bring broth to a simmer in a small saucepan. Stir hot broth into the rice along with zucchini (and/or squash), bell peppers, onion, and salt. Cover with foil. Bake 45 minutes. Remove foil and continue baking for roughly 35 to 45 minutes more until the rice is tender and most of the liquid is absorbed.

Meanwhile, whisk milk and flour in a small saucepan. Cook for three to four minutes over medium heat until the

mixture is bubbling and thickened. Reduce heat to low. Add 1½ cups of the pepper jack cheese as well as the corn and cook, stirring, until the cheese is melted. Set aside.

Heat oil in a large skillet over medium heat and add sausage. Cook for about four minutes, stirring and breaking the sausage into small pieces with a spoon, until the sausage is lightly browned and no longer pink. When the rice is done, stir in the sausage and cheese sauce. Sprinkle the remaining ½ cup of pepper jack cheese on top and dollop cream cheese by the teaspoonful over the casserole. Top with jalapeños.

Return the casserole to the oven and bake for about ten minutes until the cheese is melted. Let stand for ten minutes before serving. Makes ten servings.

NUTRIENTS PER SERVING

Calories: 250

Carbohydrates: 29 grams

Fat: 9 grams

Calcium: 240 milligrams

Sodium: 490 milligrams

Recipe from the Dairy Council of California.

Tuscan Turkey Burgers



Figure 9. Tuscan turkey burgers can add a fun flair to a busy work week.

Credits: Elena_Danileiko/iStockphoto.com

1 (20-ounce) package 99% fat-free ground turkey

¼ cup chopped sun-dried tomatoes

¼ cup minced red onion

¼ cup snipped fresh basil

2 tablespoons shredded parmesan cheese

1 teaspoon minced garlic

¼ teaspoon crushed red pepper flakes

4 slices rustic whole grain bread

¾ cup warmed marinara sauce, plus additional for table

2 ounces thinly sliced mozzarella cheese

1 cup baby arugula or leafy salad greens

1 teaspoon olive oil

1 teaspoon balsamic vinegar

Sea salt and freshly ground pepper to taste

PREPARATION

Mix turkey, sun-dried tomatoes, onion, basil, parmesan cheese, garlic, and red pepper in a medium bowl until well-blended. Shape into four flat patties. Cook on a well-oiled grill over medium heat for five minutes. Turn and top each burger with equal amounts of marinara sauce and mozzarella cheese. Cook for five minutes more or until cheese is melted and burgers are cooked through.

Grill bread slices for about one minute on each side or until lightly crisped. Toss arugula with olive oil and vinegar and season with salt and pepper. Place arugula onto toasted bread and top with burgers. Serve with additional warmed marinara sauce if you like.

Makes four servings.

NUTRIENTS PER SERVING

Calories: 310

Carbohydrates: 19 grams

Fat: 9 grams

Calcium: 200 milligrams

Sodium: 200 milligrams

Recipe from the Dairy Council of California.

Chicken Ratatouille



Figure 10. Chicken ratatouille.

Credits: SVETLANA KOLPAKOVA/iStockphoto.com

1 tablespoon vegetable oil

2 boneless, skinless chicken breasts (cut into 1-inch pieces)

2 zucchini (7 inches long), unpeeled and thinly sliced

1 small eggplant (peeled and cut into 1-inch cubes)
 1 medium onion, thinly sliced
 1 medium green pepper (cut into 1-inch pieces)
 ½ pound fresh mushrooms, sliced
 1 can whole tomatoes (16 ounces, cut up)
 1 garlic clove, minced
 1½ teaspoons dried basil, crushed
 1 tablespoon fresh parsley, minced
 Black pepper to taste

PREPARATION

Heat the vegetable oil in a large skillet. When hot, add the chicken and sauté for about three minutes or until lightly browned. Add zucchini, eggplant, onion, green pepper, and mushrooms. Cook for about 15 minutes, stirring occasionally. Add tomatoes, garlic, basil, and parsley. Stir and continue cooking for about five minutes or until chicken is tender. Makes four servings.

NUTRIENTS PER SERVING

Calories: 290
 Carbohydrates: 20 grams
 Fat: 1 gram
 Calcium: 105 milligrams
 Sodium: 370 milligrams
 Recipe from the USDA Food and Nutrition Program.

Fresh Fruit and Cinnamon Yogurt Dip



Figure 11. Fresh fruit and cinnamon yogurt dip.
 Credits: shellystuart/iStockphoto.com

1 apple
 1 orange
 1 banana
 ¼ cup orange juice
 1 cup vanilla low-fat yogurt
 ½ teaspoon cinnamon

PREPARATION

Core and slice the apple. Slice the banana into rounds. Peel the orange and break it into sections.

Pour the orange juice into a small bowl. Dip the fruit pieces into the orange juice to prevent browning. Arrange the fruit on a plate.

Mix the yogurt and cinnamon in a small bowl. Put the bowl of yogurt and cinnamon next to the fruit. Use it as a dip. Makes four servings.

NUTRIENTS PER SERVING

Calories: 95
 Carbohydrates: 20 grams
 Fat: 1 gram
 Calcium: 125 milligrams
 Sodium: 40 milligrams
 Recipe from the USDA Food and Nutrition Program.

Apple Oatmeal Muffins



Figure 12. Apple oatmeal muffins are a great after-school snack for kids!

Credits: modesigns58/iStockphoto.com

½ cup fat-free milk
 ⅓ cup applesauce
 ½ cup all-purpose flour
 ½ cup quick-cooking oats (uncooked)
 ¼ cup sugar
 ½ tablespoon baking powder
 ½ teaspoon ground cinnamon
 1 tart apple, cored and chopped

PREPARATION

Preheat oven to 400°F. Place six cupcake holders in a baking tin. In a mixing bowl, add milk and applesauce. Stir until blended. Stir in flour, oats, sugar, baking powder, and

cinnamon. Mix until moistened (do not overmix). Gently stir in the chopped apples.

Spoon into cupcake holders. Bake for 15 to 20 minutes or until an inserted toothpick comes out clean.

Cool in pan for five minutes before serving. Store unused portions in an airtight container. Makes six servings.

NUTRIENTS PER SERVING

Calories: 120

Carbohydrates: 26 grams

Fat: 1 gram

Calcium: 105 milligrams

Sodium: 135 milligrams

Recipe from the USDA Food and Nutrition Program.