Grade 3: Nutrition

Lesson 5: Eating Right to Support Your Skeletal System

Objectives:

- ✓ Students will identify the different food groups and the food group that provides them with the most calcium.
- ✓ Students will explore real product bags/boxes to find out how much a serving is and how much calcium is contained in one serving.
- ✓ Students will identify the need for calcium, especially for growing children and adolescents, in supporting a strong Skeletal System.
- ✓ Students will learn about osteoporosis and the risks of not getting enough calcium.

Materials:

- Food bags/boxes
- Three different grain foods (cereal, bread,)
- Labels from the three grain foods copied onto overhead projector paper.
- CalMag Counter (copied onto card stock or laminated)
- Menu Planner sheets
- "Choose Your Consequences Game" Grids—One per group of students (or one large one on the floor or board)
- "Choose Your Consequences Game" Decks—One per group of students or one for the class
- Kitchen measuring cups 1 cup, ½ cup, ¼ cup
- Bowl (cereal size), plate (paper/plastic)
- Crayons/markers
- Dollar bill (or other object that weighs one gram)
- Osteoporosis Take-Home Paper
- Poster- or Banner-sized piece of paper

NOTE: Before the lessons students will need to bring in empty food boxes/bags and will need to interview grandparents or an elderly neighbor/friend.

Activity Summary:

In this lesson students will explore foods that support growing a strong and healthy Skeletal System, in particular those foods that contain high levels of calcium.

Background information for the teacher: Many nutrients present in a healthy and balanced diet contribute to the growth of a strong Skeletal System. The most vital are **calcium and magnesium**. Children ages 8-10 should consume from **800-1300 mg of calcium** and from **130-240 mg of magnesium** daily. The recommended amount of these minerals increases at age nine; while 800 mg of calcium and 130 mg of magnesium is recommended at age eight, these amounts increase to 1300 mg calcium and 240 mg magnesium at age nine.

For purposes of this lesson, we will use the greater amounts in the exercises that follow. Even if students are only eight years old, they will soon need the higher levels so we will focus on those recommended amounts.

Calcium and magnesium may often be found together in foods. Dairy foods are the most common sources of calcium and magnesium, but other foods such as peanuts, tofu, figs, whole grains, and green leafy vegetables are also good sources. If children are lactose intolerant, they may need help finding good sources of calcium that are not dairy products. Because foods found in nature have many compounds that work together to support each other, it is usually better to satisfy the daily requirements for nutrients through a balanced diet rather than taking supplements. This is especially true for children, who need all the micronutrients found in whole and fresh foods. For this reason, this lesson focuses on helping students select foods that will contribute to strong healthy bones. Foods such as orange juice or dry cereals supplemented with calcium may be of some assistance, but the emphasis here is on fresh and whole foods rather than foods to which vitamins and minerals have been added. (One exception is Vitamin D, which is added to milk to help with calcium absorption.)

A daily diet that includes two cups of milk, a whole grain English muffin, two slices of American cheese, ½ cup spinach, and ¼ cup of peanuts satisfies the minimum requirement for both calcium and magnesium. A table with common foods and their calcium and magnesium values is included with this unit.

Another mineral that contributes to healthy bones is **phosphorus**. This mineral is generally found in the same foods that contain significant quantities of calcium and magnesium. Children should consume approximately the same amount of phosphorus as calcium for healthy bone development. **Unfortunately, many carbonated beverages and "sports drinks" have high quantities of phosphorus, which can send the calcium/phosphorus ratio in the body out of balance.** If children consume foods that are naturally high in calcium, they should get enough phosphorus also. However, too much phosphorus is thought to inhibit the absorption of calcium. **Steering children away from carbonated beverages and sports drinks and towards milk, water, and 100% natural juices will definitely help their bone growth.** (When you help children choose juices, be sure to point out that many drinks that look like juice are really artificial flavoring and sugar. Help children read labels and choose 100% natural juice.)

In the human body, calcium, magnesium and phosphorus all help build strong bones. The bones are reservoirs for these minerals and release them into the blood stream where they assist with functions such as blood clotting, muscle contraction and relaxation, transmission of nerve impulses, and other functions. It is important to understand that vitamins and minerals work together in the body, and they all need to be present in a certain ratio for the system to work. For example, Vitamin D is necessary for the absorption of calcium in the body. A

deficiency of Vitamin D can keep calcium from being used properly in the body and can lead to softening of the bones, a condition known as rickets. Rickets is not seen much in our society today, as milk is supplemented with Vitamin D. Another good source of Vitamin D is sunlight. Magnesium is necessary for calcium to function properly in the body. A deficiency of magnesium can lead to muscle cramping and stiffness. The body pulls calcium, magnesium and phosphorus out of the bones and sends them into the bloodstream to accomplish certain tasks. If there are insufficient or inappropriate quantities of these minerals in the diet, the bones won't be replenished quickly enough problems can occur.

Vocabulary:

skeletal system bones joints calcium dairy osteoporosis

Engage (10 minutes):

Have the students bring in a food box, bag, etc. Ask students to bring in more than one, and encourage them to try to find **healthy** foods.

- 1. **Note to Teacher**: Be sure to bring in empty bags of cheese, milk containers (chocolate and regular), ice cream, yogurt, broccoli, and other foods that are good sources of calcium.
- Ask students to name the different food groups.
- 2. List the food groups on the board.
- 3. As a class, group the food boxes/bags according to the appropriate food group.
- 4. Hold up a food box/bag and ask students which food group it belongs under. Place the box/bag on the floor under the appropriate food group that was previously written on the board.

Graphic of new dietary Choose My Plate and link to url for new dietary guidelines. www.choosemyplate.gov

Explore: (25 minutes)

- 1. Explain: "Before we begin our next activity we need to understand what a serving size is. Let's look at the grain food group as an example. We need THREE servings of grains EACH day. How much is one serving? When we look at the nutritional information on the bread bag, how much is one serving?" (Allow students time to predict.) "Is it the whole bag of bread, one slice, three slices?"
- 2. To give students an idea of just what constitutes one serving, bring in a box of cereal. Cut out the food label and copy it onto overhead projector film so students can follow along. Explain to students that all of the information on the food label refers to one serving. Show the students where the serving size is listed on the label, then measure out one serving into a cereal bowl for the students to see.
- 3. Next, use a bread bag and again, copy the nutrition label onto the overhead. Place one serving on a plate. Ask: "How many servings of grain do we have so far?" (Two.) "How many more do we need?" (One.)
- 4. Using a box of whole wheat crackers, put one serving onto a plate and ask, "How many servings of grains do we have now?" (Three.)
- 5. Be sure to talk about ounces. Explain that four ounces is about the size of a bar of soap. Therefore, if you know that one serving of meat is four ounces, that would be about the size of a bar of soap or a deck of cards.
- 6. Ask: "When we need to find how much a serving is where do we look?" (At the top of the nutritional information label.) "After we know how much is in one serving, we need to MEASURE."
- 7. Ask: "We know from the previous lesson, the chicken bone experiment, what the mineral is called that makes our bones strong. Does anyone remember what that mineral is?" (Calcium.) "What kinds of foods give us calcium?" (Let students predict.)
- 8. Showing the cereal or bread nutritional label on the overhead, ask students to find CALCIUM on the label and to raise their hand when they know how much calcium is in ONE serving of bread. Hold up one slice of bread and say: "This is ONE SERVING and the label says one serving of this bread has 50 MILLIGRAMS of CALCIUM. Does anyone know how much a milligram is?"

- 9. Explain that a milligram (mg) is a tiny measure of how much the mineral weighs in the serving. If you have access to something that weighs a gram, explain that a milligram is one-thousandth of that weight (you can use a 1000 mg vitamin capsule, for example). If possible, weigh something that is a gram, or use the following example: "A dollar bill weighs about a gram. A milligram would be if we cut the dollar bill into 1000 pieces. Just ONE piece of the dollar bill would equal the weight of one milligram. Although this is a very small amount, it is VERY important for your body. Even though it doesn't weigh much, your body needs it."
- 2. **Teachers**: Be sure to participate in the following activity and write down the information on the overhead so that at the end you can show the students what they should have written down on their papers.
 - 10. Ask: "Remind me again what MINERAL we are looking for on the nutrition labels to build a strong Skeletal System?" (Calcium.)
 - 11. Print out **Figure 1** OR have students take out a notebook. In the notebook have the students list the different food groups (from the board). Next, break the page into two parts: left side (name of food) and right side (amount of calcium.) Have each student come up to the front of the classroom and take an item. Give students about 20 seconds to write down what the food is and how much calcium is in one serving, adjusting the amount of time according to what is needed.) When you say "**pass**," the students need to pass their food box/bag to the next person. Continue in an orderly fashion.
 - 12. At the end, have each student circle in RED any foods that have more than 100 milligrams of calcium per serving. In GREEN, circle foods that have 75-100 milligrams of calcium. Finally, in PURPLE, circle foods with 50-75 milligrams of calcium.
 - 13. Ask: "Which food group do we get the most calcium from?" (Dairy.) If students can't figure it out, ask which color shows the most calcium (red) and which food group has the most foods circled in red (dairy.) (If this is difficult have the students work with a partner.)

Explain: (5-10 minutes)

Explain that the recommended amount of calcium for a nine-year-old is 1300 mg per day. (Write this in large numbers on the board.) Between the ages of nine and thirteen years of age is when you need to get the most calcium. When you are an adult the recommended amount goes down to 1000 mg.

Ask: "Why do you think you need more than I do?" (Allow time to predict.) "Are you growing?" (Yes.) "Am I still growing?" (No.)

Explain: "It is always very important to get enough calcium. I need to make sure I get enough calcium. The reason you need more calcium is because your bones are growing right now. To make sure your bones grow strong for later in life you need to be sure to get more calcium right now WHILE YOU ARE STILL GROWING. Look at your charts. In order to get enough calcium each day, what are some good foods to eat?" (Milk, cheese, etc.)

Tell students about foods that help produce **healthy bone growth**. Explain that **whole grain foods** are important to good health, including strong bones. Point out that **milk**, **cheese**, **yogurt and other dairy foods** are great for building strong bones and emphasize that other foods such as **whole grains** (whole wheat bread, not white bread) and **whole grain cereals** (such as oatmeal and brown rice, not processed dry cereals or white rice) as well as nuts, beans, and other green vegetables are very good for building healthy bones, too.

Explain that foods work together like a team to create a strong, healthy body. For example, on a baseball team you wouldn't want to have the entire team on first base. You need to have *different* members of the team doing different things and working together. In the same way, you don't want to eat just one kind of food—you need all types working together to make your body strong.

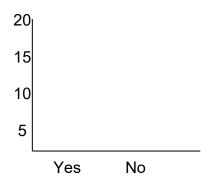
Explain that food contains vitamins and minerals that are good for us and that calcium is a mineral that is found in many foods. These minerals are very important for strong bones.

Extension (20 minutes):

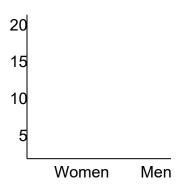
- 1. Ask: "Why do we need CALCIUM? What does CALCIUM do for our bodies?" (Calcium builds strong, hard bones.) "What happens if we don't have enough calcium?" (Our bones become weak and brittle.)
- 2. Introduce the word OSTEOPOROSIS. Explain: "Osteoporosis is a condition where bones get brittle and weak because they did not get enough calcium. It is VERY IMPORTANT to get calcium when you are young and your bones are growing. As you get older, if you didn't get enough calcium when you were young you can develop osteoporosis. If having osteoporosis means having weak and brittle bones, what do you think could happen?" (You're more susceptible to having broken bones and fractures.)
- 3. Home Activity: Have students conduct a survey, asking two grandparents if they have osteoporosis (one grandmother and one grandfather.) Send home the parent/student letter (See Figure 2) and suggest the student ask an elderly neighbor. If they do not have

anyone to ask they may ask their parents, but they must ask two people (preferably elderly people) and one must be a **man** and one must be a **woman**. Mark the box "yes" or the box "no" and bring the information back to school.

- 4. In school, have students graph the information: Tell the students to hold up one hand if they only had one "yes," and hold BOTH arms in the air if they had two "yes's." Next, have them raise one arm for one "no" and two arms for two "no's."
- 5. Graph the information on the board, using a BAR GRAPH:



- 6. Discuss the results. Ask: "Do a lot of elderly people have osteoporosis (weak bones)? Why? What do we need to do to protect ourselves from getting this disorder?" (We need to get a lot of calcium in our diet.)
- 7. Next make another graph. Ask: "Who gets osteoporosis more often, girls or boys? Or is it equal?" (Allow students to make predictions.) Raise your hand if the WOMAN you asked answered YES. Now, raise your hand if the MAN you asked answered YES.



- 8. Graph the information and ask, "What does this show us?" (Hopefully it will show us that more women had osteoporosis than men.)
- 9. Explain: "As we can see, BOTH men and women get osteoporosis. However, women tend to get it more often than men. Does anyone have any ideas why women get osteoporosis more often than men?" (Their bone structure is smaller.) "We can ALL prevent osteoporosis by doing what?" (Getting lots of calcium in our diet.)
- 10. Repeat information for emphasis: "Remind me: why it is so important for you to get a lot of calcium RIGHT NOW?" (Because we are growing the most right now.)

Evaluate:

Before collecting the papers from the activity where the students listed foods under the appropriate food groups and circled foods with a lot of calcium, have them also CIRCLE THE FOOD GROUP WHERE THEY GET THE MOST CALCIUM with a BLUE crayon. Check for appropriate colored circles around the correlating food.

If you choose to do the Station Activity (where students make a meal) you may want to make this a mandatory activity and collect their work at the end in order to assess for understanding.

Optional Enrichment Activity: "Choose Your Consequences" Game (See Figures 3 & 4) Note: Play in small groups of two-four students.

Rules of the game:

- 1. Use the game grid (**See Figure 3**) provided or a sheet of graph paper.
- 2. Each student places a marker on one side of the grid (all players on the same side—this is like a race across the field.)
- 3. Play moves forward across the board (no diagonal or side to side movements, only forward or back.)
- 4. Select a card from the deck. (See Figure 4)
- 5. Answer the question on the card.
- 6. For each CORRECT answer, move forward the number indicated on the card.
- 7. For each INCORRECT answer, move backward the number indicated.
- 8. First player to reach the opposite side wins.

Note: The game may also be played outside using a grid that has been marked out on the ground. Alternatively, you can place a large grid on the board and divide students into teams. Team members take turns answering and marking their progress on the board. The first team to reach the opposite side wins.

(Optional) Station Activity:

- 1. Using the Menu Planner, set up a station. (See Figure 5)
- 2. Have students construct a day of SAMPLE MEALS—breakfast, lunch, dinner, and one or more snacks.
- 3. Have students add up the total value of calcium for the meal. (The magic number is **1300 mg of calcium**.)
- 4. Daily meals and snacks together should include **at least** 1300 mg of calcium. (Remind students that the meal should include items from the various food groups.)
- 5. Have students use the CalMag Counter (See Figure 6) and the Menu Planner to calculate their totals.
- 6. If the daily total is less than 1300 for calcium have the students include additional foods to make up the difference.

Optional Station Activity:

Create a class picture by setting up a station with a large piece of poster paper. Write in large letters "Drink Milk" on the top. When students have time they may go back and draw themselves on the poster.

Show students a picture of a person with a "milk mustache," then let students add one to their drawings. You may want to exhibit this in the lunch room to encourage other students to drink milk.

Science Standards: Grade Level Expectations Strand 7: Scientific Inquiry

- 1. Science Understanding is developed through the use of science process skills, scientific knowledge, investigation, reasoning, and critical thinking.
 - A. Scientific inquiry includes the ability of students to formulate a testable question and explanation, and to select appropriate investigation methods in order to obtain evidence relevant to the explanation.
 - a. Pose a question about objects, materials, organisms, and events in the environment.
 - b. Plan and conduct a fair test to answer a question.
 - B. Scientific inquiry relies upon gathering evidence from qualitative and quantitative observations.
 - a. Make qualitative observations, using the five senses.

- C. Evidence is used to formulate explanations
 - a. Use qualitative and quantitative data as support for reasonable explanations.
- D. Scientific Inquiry includes evaluation of explanations in light of scientific principles.
 - a. Evaluate the reasonableness of an explanation.
- E. The nature of science relies upon communication of results and justification of explanations.
 - a. Communicate simple procedures and results of investigations and explanations through: oral presentations, drawings and maps, data tables, graphs, writing.

Health: Frameworks

- II. Health Maintenance and Enhancement
- **B. Nutrition Principles and Practices**

What all students should know:

1. Basic principles of nutrition are necessary for an understanding of how nutrition and health are interrelated.

What all students should be able to do:

b. categorize foods into the appropriate groups on the Choose My Plate visual, based on primary nutrient content.

What all students should know:

2. Balance, variety, and moderation in the diet will enhance and promote health.

What all students should be able to do:

 make informed decisions regarding food choices based on an understanding of balance, moderation, and variety.

C. Consumer Health

What all students should know:

2. Reading labels can help consumers make decisions about product selections.

What all students should be able to do:

a. Interpret labels in order to make decisions about product selections.

Figure 1 Food Group	Name of Food	Amount of Calcium
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Dear Parent/Guardian:

Many nutrients in a balanced and healthy diet contribute to the growth of a strong Skeletal System. Children ages nine and over should consume 1300 mg of calcium. Dairy foods are the most commonly known sources of calcium. Because foods found in nature have many compounds that work together to support each other, it is usually better to satisfy the daily requirements for nutrients through a balanced diet rather than taking a handful of supplements. Osteoporosis occurs when your bones get brittle and weak because of a lack of calcium. It is very important to get calcium when you are young and when your bones are still growing. Not getting enough calcium when you are young can increase the risk of getting osteoporosis as an adult.

The students in our classroom are conducting an experiment to discover:

- 1. How common osteoporosis is; and
- 2. If one gender typically gets osteoporosis more often than the other.

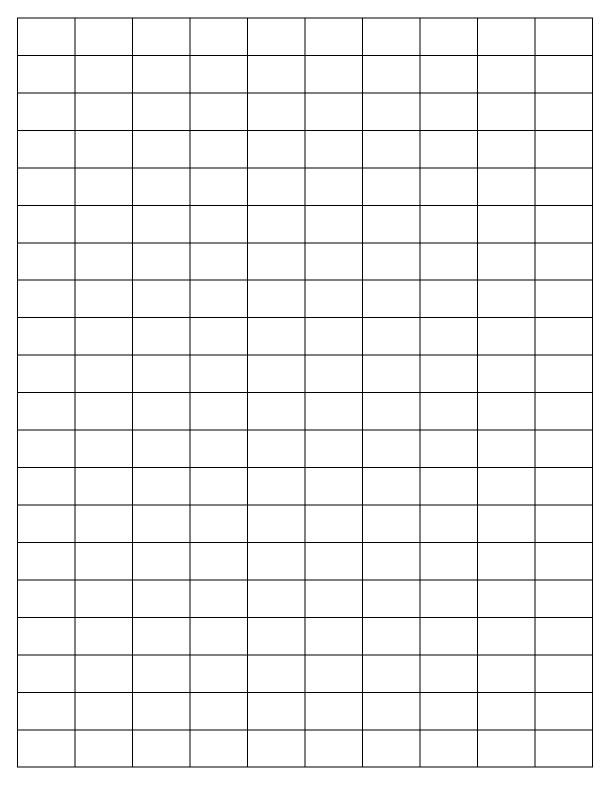
Students will need to interview **two elderly people** for this experiment. **One must be a woman and one must be a man.** Students may interview a grandparent, neighbor, friend, or even visit a nursing home.

	Below, have the students record their information and return it to class by
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QUESTION: Do you have Osteoporosis? Yes No Interview one: Man's name _____ Yes No Relationship to you_____ Yes No Interview two: Woman's name _____ Yes No Relationship to you_____

Figure 3

Choose Your Consequence Game Grid FINISH



START

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You want an afternoon snack that is good for your bones. You choose: a) a candy bar b) a flavored drink c) a piece of celery with cheese	 a) Candy is not good for your bones. Go back 2 squares. b) Flavored drinks are not good for your bones. Go back 2 squares. c) Cheese and celery is a great choice. Move forward 2 squares.
For breakfast you want a balanced meal that is good for your bones. You choose whole wheat toast, peanut butter and a glass of a) grape juice b) milk c) soda	 a) Grape juice is a good drink, but it isn't high in calcium for your bones. Stay where you are. b) Milk is high in calcium and a great choice. Go forward 3 squares. c) Soda is terrible for your bones. Go back 3 squares.
For lunch you have a tuna sandwich and carrot sticks. You can buy one thing to go with it. You buy a) a cup of strawberry yogurt b) a piece of cake c) a bag of chips	 a) Good choice! Yogurt is high in calcium and good for your bones. Go forward 3 squares. b) Cake might taste good, but it isn't very good for you. Go back 2 squares. c) Chips might taste good, but they don't have anything good for your bones. Go back 2 squares.
For dinner you have a chicken drumstick, ½ a potato, and some vegetables. What vegetable would be a good choice for calcium? a) spinach b) corn c) eggplant	 a) Correct! ½ cup cooked spinach has over 100 mg calcium. Go forward 1 square. b) Corn is a good vegetable, but it doesn't have as much calcium as spinach. Stay where you are. c) Eggplant is a good vegetable, but it doesn't have as much calcium as spinach. Stay where you are.
You want a dessert that is good for your bones. What do you choose? a) a piece of apple pie b) a candy bar c) a small dish of ice cream	 a) Apple pie tastes great but it doesn't have a lot of calcium. Stay where you are. b) Candy bars don't have much good nutrition. Go back 1 square. c) Ice cream is made from milk so it has calcium. Go forward 1 square.

You're at your friend's house after school and she offers you something to drink. You choose a) a glass of milk b) a soda c) a flavored fruit drink	 a) Milk has lots of calcium. Good choice! Move forward 3 squares. b) Soda has lots of sugar and carbonation that is not good for your bones. Move back 3 squares. c) Flavored fruit drinks have lots of sugar and not a lot of calcium. Move back 2 squares.
You want to eat a breakfast that is good for your bones. You've chosen oatmeal and raisins. What should you have with it? a) milk b) toast c) yogurt	 a) Milk is a good choice. Move forward 3 squares. b) Toast is fine, but doesn't have much calcium. Stay where you are. c) Yogurt is a good choice. Move forward 3 squares.
You want a snack that is high in both calcium and magnesium. What would you choose? a) grapes b) an apple c) figs	 a) Grapes are a good food, but not really high in calcium or magnesium. Stay where you are. b) Apples are good food, but not really high in calcium or magnesium. Stay where you are. c) Figs are a great choice. They're high in both calcium and magnesium. Go forward 2 squares.
You had a cheese sandwich with two slices of cheese, celery and carrot sticks, and an apple for lunch. Do you need more calcium at this meal? a) Yes b) No	 a) Two slices of cheese gives you a lot of calcium. You don't really need any more at this meal. Stay where you are. b) Correct! Two slices of cheese gives you a lot of calcium. You don't really need any more at this meal. Move forward 2 squares.
You're having dinner at a friend's house. His mother made tofu and broccoli for dinner. How much calcium is in this meal? a) None b) A little c) A lot	 a) Think again. Both tofu and broccoli have calcium. Stay where you are. b) It has even more than that. Tofu and broccoli are both high in calcium. Stay where you are. c) You're right—there is almost as much calcium as a glass and a half of milk. Move forward 3 squares.

MENU PLANNER

Write down what you eat for each meal, then use the score sheet to discover the calcium value for each food. Next, add your calcium column for each meal. Finally, add the totals together.

Breakfast

Food	Serving Size (cup, oz)	Calcium mg
Total		

Lunch

Food	Serving Size (cup, oz)	Calcium mg
Total		

Dinner

Food	Serving Size (cup, oz)	Calcium mg
Total		

Snacks

Food	Serving Size (cup, oz)	Calcium mg
Total		

Daily

	Meal	Calcium mg
Breakfast		
Lunch		
Dinner		
Snacks		
Da	aily Total	

Figure 6:

CALMAG COUNTER:Calcium Values for Common Foods*

Dairy	Amount	Calcium mg
Milk	1 cup	300
Cheese	1 slice (1 oz)	200
Yogurt, flavored	1 cup	300
Cottage cheese	½ cup	70
Ice cream	½ cup	80
Meats	Amount	Calcium mg
Chicken drumstick	1 piece	10
Chicken breast	½ piece	20
Hamburger	1 patty, ¼ lb	10
Tuna	1 can	20
Egg	1	30
Fruits	Amount	Calcium mg
Apple	1	10
Banana	1	10
Orange	1	50
Grapes	1 cup	20
Raisins	¼ cup	10
Orange juice	1 cup	30
Grape juice	1 cup	20
Vegetables	Amount	Calcium mg
Broccoli	1 cup	90
Carrots	1 cup	30
Cauliflower	1 cup	30
Celery	1 cup	40
Green beans	1 cup	40
Lettuce	1 cup	20
Potato	1 cup	10
Spinach	½ cup, cooked	140
Grains, cereal,	Amount	Calcium mg
bread		
bread Whole wheat bread	1 slice	30
Whole wheat bread White bread	1 slice 1 slice	30 20
bread Whole wheat bread	1 slice	30
Whole wheat bread White bread English muffin,	1 slice 1 slice	30 20
Whole wheat bread White bread English muffin, wheat	1 slice 1 slice 1	30 20 60
Whole wheat bread White bread English muffin, wheat English muffin,	1 slice 1 slice 1	30 20 60

White rice	½ cup	10
Oatmeal	1 cup	80
Nuts, seeds,	Amount	Calcium mg
legumes		
Almonds	1/4 cup	80
Sunflower seeds	1/4 cup	40
Peanuts	1/4 cup	20
Beans	½ cup	60