

## HEALTHY TO THE BONE

An Elementary School Based Osteoporosis Education and Prevention Program

Kathleen DeMolli Shirley PT, OCS, GCS

Osteoporosis is the most common of the metabolic bone diseases. It is a disease that causes the bones to become weak and thin increasing the risk of fracture. Osteoporosis does not effect the joints or cause joint pain and inflammation. The pain from Osteoporosis often occurs after a fracture has occurred, therefore Osteoporosis is called the "Silent Disease". This disease is costly in both terms of lives and dollars. It is estimated that each year in the United States 15 million osteoporosis related fractures occur a year at a cost of \$14billion dollars per year. This disease is typically considered by the general population to be a disease of older adults (specifically women), however in the medical community it is often described as a pediatric disease which manifests in old age and effects men as well as women.

Childhood is a critical time in bone development. Peak bone mass is achieved by the age of 30. Approximately 45% of peak bone mass is laid down from birth to age 10 and another 45% before the age of 18. The number one prevention against Osteoporosis is building maximum bone density during childhood and adolescence. Achieving appropriate daily dietary calcium levels and participating in a variety of weightbearing and muscle strengthening exercises will allow out children to build strong bones.

An Osteoporosis education and prevention program entitled "HEALTHY TO THE BONE" was developed for presentation to Fifth grade children. This program involved training high school and middle school children to assist the health professional in teaching the program. The program design included input form

the fifth grade and physical education teachers, which built upon the Science and Health curriculum already in use. The posture component of the program was instructed in the music and chorus classes. The program involved visual aides (slides, skeleton T-shirts, bone models, nutrition labels, calcium rich food sources, a refrigerator magnet, and handouts for the children and their families).

Following the one-hour instructional program which took place October 29, 1997 and involved 100 Fifth grade children, a TAKE HOME PROJECT (with an incentive prize of winning the opportunity to help teach a modified program to 120 kindergarten children) was distributed. The Take Home Project allowed the students to accumulate points by teaching their parents, family, and friends what they had learned. The students also received points for reading nutrition labels, exercising for 30 minutes and eating 4-5 calcium rich foods in one day.

Pre and Post test score comparisons were able to show significant improvement in the students' ability to identify the role of calcium and exercise in building strong bones. Pre and post test behavioral score comparisons were also able to show significant improvement in identifying and eating calcium rich food sources along with increasing daily activity levels.

The Take Home Project was found to be highly effective in spreading basic information about Osteoporosis. Fifty children completed the Take Home Project as instructed. Those 50 children documented (by signature of the person instructed) sharing the information (handouts) with 500 people.

Feedback from the teachers, students, parents and school administrators was very positive. The Fifth grade teachers felt the program enhanced their skeletal health unit. The Physical

Education teachers were pleased to be involved in a program, which promoted the importance of daily physical activity. The parents reported significant motivation and enthusiasm in their children to follow through with the take home project and win the privilege to teach the younger children. The students enjoyed the presentation and the competition of the take home project. The use of high school and middle school children to teach the fifth grade students and fifth grade students to teach the kindergarten students was well received by the professional teaching staff and the children.

The "HEALTHY TO THE BONE" teaching model was found to be effective in teaching the number one prevention against Osteoporosis: building strong bones during childhood and adolescence

If you have any questions or are interested in bringing the "HEALTHY TO THE BONE" program to a school near you please contact me at the address below.

Kathleen DeMolli Shirley, PT, OCS, GCS  
9668 105 Terrace N  
Largo Fl 33773  
727-397-1580  
[www.healthytothebone.com](http://www.healthytothebone.com)  
Thebonelady@healthytothebone.com

References:

1. Anderson J, Metz J: Contributions of dietary calcium and physical activity to primary prevention of osteoporosis in females. J of the AM College of Nutrition, 12(4):378-383,1993

2. 2.Kanders B, Dempster D, Lindsey R: Interaction of calcium nutrition and physical activity on bone mass in young women. J Bone Miner Res 3:145-149,1988
3. Welton DC, Kemper HCG, Post GB, et al: Weightbearing activity during youth is a more important factor for peak bone mass than calcium intake. J Bone Miner Res 1089-1096, 1994
4. National Osteoporosis Foundation  
[www.nof.org](http://www.nof.org)

## **Healthy to the Bone : An Elementary School based Osteoporosis Education and Prevention Program**

Kathleen DeMolli Shirley PT,OCS,GCS 727-397-1580

**FIFTH GRADE:** This 1 hour lesson teaches children the purpose and function of the skeletal system. The importance of appropriate lifestyle choices,(i.e. nutrition, exercise and posture ) in building strong bones are stressed. The students are encouraged to “fill their bone bank to the top” reducing the risk of Osteoporosis as they age. The primary prevention of Osteoporosis is maximizing bone density during childhood and adolescence. This program was designed for fifth grade children entering the growth phase associated with building 90% of their bone density.

Slides, handouts, real and plastic bone models, nutrition labels and food examples are incorporated into a hands on learning environment. A “Take Home Project” with the incentive of winning the privilege of teaching the younger students what they have learned is given to the students at the end of the program.

This program integrates Science, Health, Language Arts and Math concepts. It is ideally presented following the completion of the Skeletal system Health and Science unit. The Physical Education Department is given information to allow the concept of the importance of bone loading exercises in building strong bones to be incorporated into PE classes for the fifth grade the week the program is presented. The Music Teacher is given information regarding the importance of maintaining good posture, to integrate into the music/chorus classes.

**KINDERGARTEN:** This lesson goes over the importance of bones and gives the children the chance to touch real and plastic bones. Calcium rich food sources and nutrition labels are brought into the classroom. Fifth grade students who scored the highest points in the “Take Home Project” will assist in teaching this lesson to the younger students.

Goals:

1. Students will understand the function of the skeletal system.
2. Students will understand the importance of Calcium rich foods and exercise in building strong bones.

3. Students will understand the health enhancing behaviors that will reduce their risk of Osteoporosis as they age.

Objectives:

1. Students will gain an improved understanding of the skeletal system through the slide presentation and handling of the real and plastic bone models.
2. Students will be able to describe the purpose of bones.

Healthy to the Bone : An Elementary School based Osteoporosis Education and Prevention Program (cont.)

3. Students will be able to explain the importance of calcium-rich foods and exercise in building strong bones
4. Students will be able to identify the healthy behaviors associated with maximizing bone health and decreasing the risk of Osteoporosis as they age.

BENCHMARKS: ( Florida Sunshine State Standards)

HE.A.1. The student comprehends concepts related to health promotion and disease prevention.

HE.B.1. The student knows health-enhancing behaviors and how to reduce health risks.

HE.B.2. The student analyzes the influence of culture, media, technology, and other factors on health.

HE.B.3. The student knows how to use effective interpersonal communication skills that enhance health.

HE.C.1. The student knows how to use goal-setting and decision-making skills that enhance health.

HE.C.2. The student knows how to advocate for personal, family, and community health.

LA.A.2. The student constructs meaning from a wide range of texts.

LA.C.1. The student uses listening strategies effectively.

LA.C.3. The student uses speaking strategies effectively.

S.F.1. The student describes patterns of structure and function in living things.

M.A.1. The student understands the different ways numbers are represented and used in the real world.

M.B.4. The student selects and uses appropriate units and instruments for measurement to achieve the degree of precision and accuracy required in real-world situations.

## LETTER TO PARENTS

Dear Parents,

Building strong bones during childhood will REDUCE the risk of OSTEOPOROSIS (bone becomes thin with increased risk of fracture) as we age. Ninety percent of peak bone mass (bone density) is achieved between birth and 18 years of age.

Bone is a complex living tissue. During the first 25-30 years of life our bones are constantly ADDING more bone and storing calcium. As we grow older, our bones begin to break down faster than new bone can be produced. This bone loss is more significant in women after menopause due to a decrease in estrogen production. If maximum bone density has not been achieved during childhood and adolescence our children have an increased risk of Osteoporosis as they age.

Help your children fill their "BONE BANK TO THE TOP". Review the information on the other side of this letter. Start looking at the calcium content of the foods you eat. Avoid pre-packaged, processed foods. Children between the ages of 10 - 18 need 1200 - 1500 mg of calcium daily (4 - 5 calcium-rich food sources). EXERCISE helps the body absorb the calcium we eat. Encourage your children to play hard everyday.

Fast food, diet drinks, video games and TV do not promote bone health. Adequate calcium intake and exercise at every age are necessary, but they become essential in childhood and adolescence by maximizing the future bone health of our children.

BE HEALTHY TO THE BONE

## TIME LINE

### Healthy to the Bone : An Elementary School based Osteoporosis Education and Prevention Program

Suggested time line for setting up this program .( Ideal format, you may need to modify based on the needs of the school and your schedule)

#### **2-3 months before the presentation**

1. Receive support and approval to bring the program to the school from the Principal and Fifth grade and kindergarten teachers. Send basic information regarding the program to the principal and teachers requesting they contact you. If they do not respond call and speak to the principal.
2. Meet in person with the Fifth grade teachers. Encourage the teachers to complete the skeletal health unit 1-2 weeks before you present the program. Give handouts of the vocabulary words and basic slide format to the teachers. Explain the Take-Home project and prizes.( 10 minutes)
3. Check with the Volunteer Coordinator informing her of the project and asking her support to find middle school or High School volunteers who are already active in the volunteer program to help be your teaching assistants.( 5 minutes)

#### **1 month before the presentation**

1. Touch base ( Call or meet) with the fifth grade teachers (team leader). Set a date and times for the presentations.( 10 minutes)
2. Set up date for training program for the student assistants(you will need about 1 hour to go over the program with your

student assistants). 2-4 helpers are all you will need. Usually you will have a lot of interest in students wanting to do this project. Confirm fieldtrip approval for student assistants. Send a letter to the principal of the students school informing them of the program and asking approval to let the students assist teaching. Call the principal if you do not hear from him/her.

## **2 Weeks before the program**

1. confirm the dates and time. Confirm PE involvement. Confirm skeletal lesson will be complete. Teach training session for student helpers. Go over the program with the slides and props. Give the test and choose the students with the best interaction skills and highest test scores. ( 1 hour) . Complete within 1 week of the program. Let student assistants know the time of the program for the Fifth graders.

## SUPPLY LIST FOR HEALTHY TO THE BONE

Magnets for fifth grade students (50 provided with the program) order more as needed

Handouts (masters provided with the program) use brightly colored paper to copy the handouts

25 – 30 nutrition labels cut from a variety of foods (both calcium rich and without calcium)

Examples of calcium rich food sources i.e. empty box of frozen broccoli, can of mixed greens, calcium fortified products like cereal and orange juice etc. milk products and soy product options for those children who have milk intolerance or allergies to dairy products.

Sea sponge and cleaning sponge to show density concepts

Bone models

Something with a bone theme for the kindergarten students (plastic skeletons)  
(I have always been able to find these items at the dollar store)

## HEALTHY TO THE BONE SLIDE SHOW FORMAT

- Slide 1: Title slide
- Slide 2: Introduction slide
- Slide 3: Why we have bones

At this point your student helpers should be walking through the group allowing the children to touch and hold whatever bone models plastic and or real you have been able to collect for demonstration.

- Slide 4: X-ray slide of an adolescent foot ( note the growth plates)
- Slide 5: basic explanation of bone metabolism
- Slide 6: a drawing of the stages of bone resorption and reformation showing osteoclast and osteoblast cell activity.
- Slide 7: explanation of the concept of “the bone bank”
- Slide 8: the role of calcium

At this point your student helpers should be handing out nutrition labels( labels can be from foods with or without calcium) and examples of calcium-rich food sources. Interaction with the students should insure that each student can identify where they can find the calcium content of the food item from the nutrition label.

- Slide 9: Building strong bones through good nutrition
- Slide 10: Building strong bones through exercise
- Slide 11: Explains the role of different types of exercise (forces) in building strong bones

Slide 12: An astronaut. The space program in the 60's brought us much information regarding the importance of exercise against gravity to build and maintain strong bones

Slide 13: An example of flexibility and strength

Slide 14: A game which incorporates flexibility, balance and strength. It is important to retain our ability to play as we age.

Slide 15: biking

Page 2

### Slide Format (continued)

Slide 16: the handstand

Slide 17: Skimming requires coordination and balance

Slide 18: The definition of Osteoporosis

Slide 19: Lumbar spine x-ray showing bone thinning and degenerative changes.

Slide 20: explains the imbalance that occurs in bone metabolism with Osteoporosis

Slide 21: drawing of 2 different types of sponges to help the children appreciate the concept and density and bone strength

Slide 22: the most common fracture sites

Slide 23: a child balancing on the balance beam. Focus on the importance of preventing falls by maintaining good balance throughout life.

At this point you and your student helpers can lead the class in a couple balance activities ( one leg stand or squatting down while balancing on your toes are just a couple examples)

Slide 24: Posture

Slide 25: An example of poor sitting posture in front of the computer. \*\*Allow the class to point out the mistakes and recommend changes.

Slide 26: An example of thoracic kyphosis.

Slide 27: An example of further postural changes due to Osteoporosis

Slide 28: Summary of the program

\* Please note the training manual goes into further detail regarding the suggested text for the slides.

.

### Healthy to the Bone Kindergarten Presentation Suggestions

1. Focus
  - A. Purpose of Bone – bring bone models for show and tell
    1. Protection
    2. Structure/Shape
    3. Factory for blood cells
    4. Stores nutrients (calcium)
  - B. Healthy foods help to build strong bones – bring some examples of good foods
    1. Give examples of calcium rich foods
    2. Talk about limiting sweets and sodas
  - C. Exercise builds strong bones – give examples of exercise, sports and play activities. Discuss the negatives of inactivity related to watching TV and being on the computer for hours a day.
    1. practice squatting to the floor 10x  
Talk about how this helps the legs stay strong. Have the children feel their heart beating and talk about how exercise helps the heart (a muscle) becomes stronger.

2. Practice balancing on one leg – discuss the importance of good balance to protect us from falling.
3. Talk about how it is important to stay active as we continue to grow and get older.

D. Good posture is important for the skeleton

1. Give examples of how to sit well in a chair and on the floor
2. Teach a standing back bend stretch to counteract the sitting posture strain on the spine.

Depending on how much time and the attention span of your audience you can expand on all these topics or even add in things like proper lifting posture.

HEALTHY TO THE BONE  
**TAKE HOME PROJECT**

**THIS IS HOW YOU CAN EARN POINTS**

1. You will be awarded 5 points for each adult or older brother or sister you teach what you learned in the program today. You must have them **SIGN** this paper in order to get your points.
2. You will be awarded 1 point for every nutrition label that you read. You must write the name of the food and how much calcium it contains.
3. You will be awarded 10 points if you eat 4 – 5 servings of calcium rich foods in one day. You must write the food name and serving size.
4. You will be awarded 10 points if you play hard for 30 minutes after school.

I taught the following people what I learned in the HEALTHY TO THE BONE program. Please have the people sign their own name here (5 points each) Use the back of the page if you need to.

I read these nutrition labels. Please write what kind of food and how much calcium it had. (1 point each) Use the back of the page if you need to.

I ate these 4 - 5 calcium rich foods in 1 day. (10 points) What did you eat?

I played hard for 30 minutes. (10 points) What did you play?

**I verify that \_\_\_\_\_ did accurately complete the HEALTHY TO THE BONE take home project.**

**Parent / Guardian signature \_\_\_\_\_**

## Letter to Physicians

### Understanding Osteoporosis

Osteoporosis is the most common of the metabolic bone diseases. It is a disease that causes the bones to become weak and thin increasing the risk of fracture. Osteoporosis does not affect the joints or cause joint pain and inflammation. The pain from Osteoporosis often appears after a fracture has occurred, therefore Osteoporosis is called the "Silent Disease". The most common fracture areas due to Osteoporosis are the hip, wrist and spine. Osteoporosis is costly both in terms of lives and dollars. It is estimated that in the United States 15 million osteoporosis related fractures occur each year at a cost of \$14 billion dollars.

This disease is typically considered by the general population to be a disease of older adults (specifically women), however in the medical community it is often described as a pediatric disease which manifests in old age and effects men as well as women. The number one prevention against Osteoporosis is building maximum bone density during childhood and adolescence. The greatest opportunity to maximize bone density occurs between the ages of 10 and 18. Ninety percent of the peak bone mass is achieved during this period of dramatic skeletal growth. Nutrition, specifically calcium intake, and exercise are integral components of bone health.

Calcium is a mineral which is essential for many systems within the body. It is found in the foods we eat and is what makes our bones hard. Ninety-nine percent of the calcium in our bodies is stored in our teeth and bones. The National Institute of Health recommends 1200-1500 mg. of calcium (4-5 servings of calcium rich foods) per day for children between the ages of 10 and 18.

Some examples of calcium rich foods are dark green leafy vegetables (collard greens, turnip greens, broccoli and kale), soy products, tofu, beans, almonds and molasses are also good sources of calcium. Many children are allergic to dairy products or have difficulty digesting dairy products. Milk products are protein based and are not as well absorbed as other calcium rich foods. Soy and rice milk are possible alternatives and are often fortified with calcium. Vitamin D is also important in helping the body absorb calcium. Start looking at the nutrition labels to assess the calcium content of the foods you and your children are eating. Seek out breads, cereals, orange juice and other food products fortified with calcium.

Foods which deplete calcium or interfere with calcium absorption should be avoided. Some examples include caffeinated beverages, soda, excessive alcohol, protein, salt and sugar. Smoking also depletes calcium and has been linked to a 50% increase in hip fracture risk. Focusing on a balanced diet including calcium rich foods and avoiding prepackaged over processed foods will significantly improve bone health in our children.

Exercise helps our bones absorb the calcium we eat. Greater bone growth and bone mineralization has been associated with early vigorous exercise, especially if it occurred in pre-adolescence and adolescence rather than in adulthood. Bone growth and strength responds to mechanical forces. Bone mass or strength has been found to be directly proportional to muscle mass or strength. Exercises which provide the mechanical forces to build strong bones in our children are too numerous to list but include walking, running, jump rope,

gymnastics, tumbling, yoga, bicycle riding and swimming. Our children need to “play hard everyday”.

The typical pre-teen and teenage lifestyle of fast food, diet soda, spending hours in front of the computer, video games or television, does not promote bone health and places our children at great risk for developing Osteoporosis as they age. Studies involving young women who had suffered from eating disorders during adolescence did not show the ability to “catch up” bone density as nutritional habits normalized. It has also been reported that moderate physical activity can compensate for a low calcium diet, however, a diet high in calcium will not compensate for an inactive lifestyle.

Adequate calcium intake and exercise activities at every stage of life are necessary; however they become essential in adolescence by maximizing the future bone health of our children.

For further information:

National Osteoporosis Foundation 1-800-223-9994

[WWW.NOF.ORG](http://WWW.NOF.ORG)

[www.healthytothebone.com](http://www.healthytothebone.com)

Kathleen DeMolli Shirley, PT, OCS, GCS

E-mail: [thebonelady@healthytothebone.com](mailto:thebonelady@healthytothebone.com)