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## Secondary Causes of Osteoporosis

(Much of this content has been adapted from materials provided by the National Osteoporosis Foundation: Strategies for Osteoporosis; Standing Tall for You; 2005, 2006).

Osteoporosis, or porous bone, is a disease characterized by low bone mass and structural deterioration of bone tissue, leading to bone fragility and an increased susceptibility to fractures, especially of the hip, spine, and wrist. While osteoporosis is often thought of as primarily an older women's disease, it can strike at any age and both sexes.

Certain people are more likely than others to develop osteoporosis. Factors that increase the likelihood of developing osteoporosis and fractures are called "risk factors." Risk factors do not cause a disease; they simply increase one's chance of having the disease. Although there are a number of risk factors for developing osteoporosis, some of the more common ones are:

- being female
- being thin and having a small frame
- a family history of osteoporosis
- estrogen deficiency as a result of menopause
- low testosterone levels in men
- being Caucasian or Asian (although other ethnic groups can also be at risk)
- advanced age

Certain medical conditions and medications, completely unrelated to osteoporosis, can nevertheless have the effect of causing osteoporosis. This is called **secondary osteoporosis**. Prior to treating the osteoporosis, it is essential to manage the underlying cause.

### Chronic Conditions

**Chronic digestive tract conditions** that interfere with the absorption of nutrients from food are called malabsorption syndromes. Examples include celiac disease and Crohn's disease. Both of these diseases result in damage to the intestinal lining caused by the body's

own immune system, making it difficult to absorb the nutrients necessary for bone-building. Additionally, both conditions are treated at certain points in their acute phase with steroid medication, known to be extremely damaging to bone cells.

The increased use of bariatric surgery (clamping off or removing a section of the stomach and/or small intestine to reduce the intake and absorption of food as a treatment for obesity) is just now starting to attract attention as a potential malabsorption syndrome. While there are many benefits resulting from this surgery, its recent development means that not enough research has been completed on the long-term impact on bone.

Inflammatory bowel disease or colitis, while not considered malabsorptive, can result in the loss of nutrients due to chronic diarrhea and requires steroid medication at times.

**The female athlete triad** is a 3-part problem consisting of amenorrhea (absence of menstrual cycles), eating disorders, and the resultant osteoporosis. Estrogen is essential to building and maintaining bone. Exercised-associated amenorrhea is often seen in marathon runners, gymnasts, fashion models, and ballet dancers. Working and competing in a society that disdains even normal weight puts tremendous pressure on girls/young women to diet rigorously and exercise strenuously. It is thought that this combination in some way interferes with the hormonal balance needed for estrogen secretion to produce regular menstrual cycles. Decreased levels of estrogen over time result in decreased bone mineral density (the equivalent of menopause in the older woman).

Amenorrhea can certainly occur in non-athletes due to pituitary or gynecologic conditions and extreme physical or psychological stress.

While the initial cause may be unrelated to exercise,

the effect is still the same, not enough estrogen secretion to produce menstrual periods and thus diminished bone density or osteoporosis.

The eating disorder known as anorexia is severe, self-imposed food restriction leading to a profound reduction in body weight, body image distortion, loss of menstrual cycles, and a number of other metabolic abnormalities typical of the malnourished state. Research studies have now documented that the bone loss associated with anorexia may not return to normal despite improved eating habits and that the long-term damage to the bones often results in osteoporosis-related fractures. Once again, eating disorders can certainly occur in non-athletes and, while the initial cause may be unrelated to exercise, the effect is still the same.

**Diabetes:** Type 1 diabetes can cause a decrease in bone mineral density (osteoporosis), leading to fractures. The reasons for this are unclear; it could be directly related to a lack of insulin or it could be the result of blood sugar levels. Type 2 diabetics also have an increased risk of fracture due to lower bone density. Research studies are underway to understand the exact mechanisms for fractures in both Type 1 and Type 2 diabetes. In diabetics fractures occur with less bone loss than in non-diabetics. Diabetics should ask their physician to measure their bone mass to estimate risk of fracture.

#### **Hyperthyroidism/Hypothyroidism:**

Hyperthyroidism is a disorder that results in overproduction of thyroid hormone by the thyroid gland. Thyroid hormone is necessary for the proper functioning of many bodily organs including the heart, eyes, gastrointestinal tract, and bones. However, an excess of thyroid hormone over time can cause bone thinning which leads to osteoporosis and possible fractures.

On the other hand, hypothyroidism, or inadequate thyroid hormone production, is generally treated by giving oral thyroid hormone; too much oral thyroid hormone can, in turn, cause hyperthyroidism. Treatment of either thyroid condition requires very precise doses of medication. It is essential that blood levels of thyroid medication be kept within acceptable limits (referred to as 'euthyroid') in order to avoid secondary osteoporosis. For this reason, persons taking thyroid medication should have both blood tests of T<sub>4</sub> and TSH done annually and the thyroid medication dose adjusted if necessary. The elderly may need to have their usual dose of thyroid adjusted downward.

Measurement of bone density can help define the risk of osteoporosis in patients with thyroid disorders.

**Cancer and cancer treatments:** Many forms of cancer such as breast and prostate can directly affect bone tissue. Other forms of cancer may simply spread (metastasize) to the bones, causing bone thinning. More commonly, it is the cancer treatment that causes bone thinning. Usually the physician will prescribe a medication specifically designed to prevent bone loss during cancer treatment.

**Chronic immune response and inflammatory process conditions,** such as multiple sclerosis, lupus, emphysema, asthma, and rheumatoid arthritis, do not have a direct relationship to the development of osteoporosis. However, they frequently require the use of corticosteroids (sometimes in large doses) at varying points in the course of treatment, which results in secondary osteoporosis. Refer to the discussion of steroid medication below.

## **Medications That Can Cause Secondary Osteoporosis**

Many chronic illnesses require long-term use of medications that are known to cause bone loss. These medications are beneficial and often essential to treatment, but have the unintended effect of causing secondary osteoporosis. While there are many such drugs, several of the more common are discussed here.

**Heparin/Coumadin®:** are brand-name blood-thinners that affect the bone. Heparin is an injectable medication that is used for a brief period of time so its adverse effect on the skeleton is minimal. However, if it is taken for a long time, it is known to reduce bone density. Coumadin® (or warfarin) is an oral blood thinner taken over the long-term to decrease the likelihood of blood clots. People taking blood-thinners should be aware of possible bone health effects.

**Anticonvulsant** medications taken for seizure disorders affect the bone by interfering with vitamin D metabolism. Vitamin D is required for adequate calcium absorption and for normal function of nearly all cells in the body. The precursor of vitamin D is converted in the body to a usable form when the skin is exposed to sunshine in the summer months. Most people simply are not out in the sun very much these days, and during

winter the skin cannot produce vitamin D from sun exposure. It is virtually impossible to get an adequate amount of vitamin D from foods (even fortified foods such as milk) and thus supplementation with vitamin D<sub>3</sub> pills is required.

**Depo-Provera®** is a brand-name product used as a method of birth control. It is taken in the form of an injection once every three months. It works by stopping menstrual cycles. (See discussion above of amenorrhea).

**Steroids** (corticosteroids or glucocorticoids) are used for treatment of many chronic immune response and inflammatory process conditions such as asthma, emphysema, rheumatoid arthritis, lupus, psoriasis, etc. Glucocorticoids are naturally produced by the body and serve a number of essential functions in body metabolism. It is the development of serious side effects (one of which is bone loss) that results from the use of synthetic glucocorticoids in doses greater than normally produced in the body that is the issue here. Bone loss occurs because glucocorticoids impair the body's ability to absorb and maintain calcium, interfere with vitamin D metabolism, and reduce the production of estrogen. Glucocorticoids also stimulate bone-destroying cells and inhibit the formation of bone rebuilding cells. Physicians are well aware of this risk and try to prescribe the lowest dose possible of steroids while still maintaining symptom control. Thus, as an example, a physician may allow only 3 steroid injections a year into the spine or hip joint. Many times a person who must take steroids over the long-term will also be given a prescription bone-rebuilding medication (in addition to extra calcium and vitamin D) in order to reduce the risk of bone thinning and fracture.

*Never discontinue or alter the dose of any of these medications without first consulting your health care professional.*

## Life-style Issues

Factors such as smoking, reduced physical activity, excessive alcohol consumption, and poor nutritional habits, though not generally classified as secondary causes of osteoporosis, are nevertheless major contributors to poor bone health and are thus mentioned here. Smoking is well known to have a very high correlation with osteoporosis. Research is currently underway to explore the exact mechanism for the bone loss. This is also true of excessive alcohol consumption. Increased sedentariness in our society has become

a major health concern, not only for its impact on cardiac health, but also for its impact on bones. Bones and muscles respond to exercise by becoming stronger. Weight-bearing exercise is any exercise in which the feet and legs are bearing the weight. Thus, even the simplest weight-bearing exercise (walking and/or stair climbing) can be extremely beneficial to bone health. In other words, it isn't necessary to get involved in rigorous, high-impact sports in order to gain the benefit.

## Osteoporosis Clinic

The Osteoporosis Research Center (ORC) is not only dedicated to researching causes of osteoporosis but we are also in the business of treating patients with the above listed conditions. The ORC offers several clinics for individuals who need to be seen by osteoporosis specialists. This clinic functions like a regular doctor's office (appointments, insurance billing, etc.) and is staffed by our medical director Dr. Robert Recker and Dr. Laura Armas who are experts in the diagnosis, prevention, and management of osteoporosis and conditions that can lead to secondary osteoporosis. Individuals who are concerned that they may have bone loss due to any of the conditions described above are encouraged to contact the clinic to set up an appointment. The clinic can be reached by calling 402-280-4470 or 1-800-368-5097.

**Additional information regarding any of these topics can be found on the National Osteoporosis Foundation website. [www.nof.org](http://www.nof.org)**

**The Dairy Council of the Nebraska provides related information as well. [www.nebmilk.org](http://www.nebmilk.org)**

# Opportunities to Participate

*The Creighton University Osteoporosis Research Center is conducting the following studies. If you have any questions, please call 402-280-BONE (280-2663) or Toll-free 1-800-368-5097.*

## RESEARCH STUDY FOR 13 AND 14 YEAR OLD GIRLS

This is a one year research study at the Osteoporosis Research Center evaluating the role of dairy consumption on weight management.

Requirements:

- 5 visits
- Painless evaluations
- Monetary stipend

Please contact our pediatric nurses at **280-4070** for more information.

## GENETIC DETERMINATIONS

The purpose of this study is to identify genes and proteins that may increase the risk of osteoporosis

- Seeking Caucasian women age 50-55
- Free bone density scan (DXA) with interpretation of results for eligible participants
- Stipend available; just 2 visits

## HAVE YOU OR SOMEONE YOU KNOW EXPERIENCED A BROKEN BONE? IT COULD BE OSTEOPOROSIS!

The Osteoporosis Research Center is currently conducting a research study investigating the underlying causes of osteoporosis in postmenopausal women.

Do you meet the following criteria?

- Age 45-70
- At least four years since last menstrual period
- Not currently on treatment for osteoporosis

The broken bone occurred during the last five years and was not a result of an auto accident.

## ARE YOU DIABETIC?

The Osteoporosis Research Center is currently conducting a study to determine the effects of diabetes on bone health.

Both men & women are eligible for this study.

To qualify for participation:

- You must be a type 1 diabetic for at least 3 years.
- You must be between 19 and 50 years of age.
- 3 visits to our center
- 1st visit involves a blood draw and bone density scans.
- Monetary compensation for study visits

## RESEARCH STUDY FOR WOMEN OVER THE AGE OF 65

The Creighton University Osteoporosis Research Center is currently conducting a study to test whether an investigational drug, given by injection, safely increases the bone mass of the hip when given in addition to the usual care for osteoporosis.

Do you meet the following criteria?

- At least 65 years old and post-menopausal
- Have either never received osteoporosis treatment or have taken a bisphosphonate (such as Actonel®, Fosamax®, or Boniva®) for the past 1-5 years.

Study staff will review additional study criteria with you at the clinic to determine if you are eligible. Study participation lasts 3 years, and volunteers can expect 10 visits to the study doctor for medical evaluations, which include regular bone density tests.

## DO YOU KNOW THAT YOUNG WOMEN CAN BE DIAGNOSED WITH OSTEOPOROSIS?

We are screening for a study involving an in-depth examination of the bone health of premenopausal women.

You might qualify for a bone density test to evaluate your bone health at no cost to you.

We are looking for women that are still having regular cycles between the ages of 20 and 48.

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Creighton  
UNIVERSITY  
Medical Center

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Spring 2009

Dear Friends,

Thank you for participating in Creighton University Osteoporosis Research Center projects and seeking care for osteoporosis in the center. Without your trust and volunteerism, the center would not be able to advance the care of osteoporosis. We announced the establishment of an endowment for the Osteoporosis Research Center in 2006. It was called the “Recker/Pappajohn Endowed Research Fund”. This endowment was created to ensure that the work of the Osteoporosis Research Center will continue into the future. The endowment needs broad support in order to sustain patient care and research in the center.

With this letter we announce that the name of the Endowment has been changed to the “Sister Anne Evers Endowed Research Fund”. We have done this to honor Sister Anne Evers, a 93 year old nun with severe osteoporosis. Sr. Anne taught grade school for many years in the midwest and is a strong supporter of the Osteoporosis Research Center.

You are invited to contribute to this endowment. You may contact Susan Recker at 402-280-4810 if you have questions. You may send a contribution to the: “Sister Anne Evers Endowed Research Fund”, and mail to the Osteoporosis Research Center, 601 N. 30<sup>th</sup> suite 5766, Omaha, NE 68131.

Sincerely,

*Robert R. Recker*



*Sister Anne Evers*



Osteoporosis Research Center

Creighton University  
2500 California Plaza  
Omaha, Nebraska 68178

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## THE GIFT OF GIVING

*Consider a donation in honor of a loved one to the Osteoporosis Research Center*

Just mail this form to:

Sister Anne Evers Endowed Research Fund  
Osteoporosis Research Center  
601 North 30<sup>th</sup> Suite 5766  
Omaha NE 68131

A Contribution is enclosed to the Sister Anne Evers Endowed Research Fund

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