

## Medications for Prevention and Treatment of Osteoporosis

Osteoporosis is a disease where the strength of bones is less than normal, making them more susceptible to fracture, or breaking, than normal bones. Anyone's bone will break if subjected to enough force, but a bone with osteoporosis may break with very little trauma, or sometimes with no trauma at all. Fractures can cause pain, loss of independence, and shorten your life. The best time to detect osteoporosis is before a fracture happens, and the best way to do that is with a bone density test. The "gold-standard" method of measuring bone density is by DXA (Dual X-ray Absorptiometry) of the spine and hip. If the "T-score" on the DXA test is less than or equal to  $-2.5$ , then a diagnosis of osteoporosis may be made.

If you have osteoporosis, or low bone density, there are medications that can strengthen your bones and reduce the future risk of fractures. Medications can help whether or not you have already had a fracture, whether you are male or female, and even if you are very old. Since there are many medications for osteoporosis, it is important that you have a good understanding of the risks and benefits with each of them. The more you know, the better you are able to select the one that is best for you.

Please remember that no medication will work well unless you take care of yourself in the first place. This means having a good nutritious diet, getting enough calcium and vitamin D every day, being physically active when possible, and avoiding smoking and excess alcohol. You can "fall-proof" your home to lower your risk of falling. If you fall frequently, wearing padded under-shorts called "hip protectors" can help to cushion your fall and reduce the risk of hip fracture.

To learn more about osteoporosis, consider attending the monthly meetings of the Osteoporosis Support Group, sponsored by the Osteoporosis Foundation of New Mexico. You can listen to free presentations by osteoporosis experts, and have all the time you need to ask questions and discuss your concerns about your bones.

Here is a summary of osteoporosis medications, divided into three sections-

1. Medications that are approved by the FDA (Federal Drug Administration) for prevention or treatment of osteoporosis;
2. Medications that are FDA approved for diseases other than osteoporosis, and sometimes used "off-label" for osteoporosis; and
3. Medications that are not approved by the FDA for any disease. These are only available through participation in clinical research studies.

## Medications Approved by the FDA for Prevention or Treatment of Osteoporosis

### Estrogen (many brands)

Estrogen is approved by the FDA for the prevention of postmenopausal osteoporosis. It comes in many forms, combinations, and brands. It should not be taken by women with a history of breast cancer, uterus cancer, or ovarian cancer, or by women with a history of blood clots, unless specifically approved by your doctor. Research has shown that estrogen can stabilize or increase bone density in postmenopausal women. A recent study called the Women's Health Initiative (WHI) showed that a combination of estrogen and progesterone reduced the risk of spine, hip, and nonvertebral fractures, and reduced the risk of colon cancer. Unfortunately, this study was abruptly stopped because of increased risk of heart attacks, strokes, breast cancer, and blood clots. The investigators felt that that risk of treatment outweighed the benefit, and that this treatment should not be given in the attempt to reduce the risk of cardiovascular disease. Estrogen remains the best treatment for menopausal symptoms, and may be helpful for some patients with osteoporosis. For most patients with established osteoporosis, other treatments are probably more effective with less risk.

### Raloxifene (Evista®)

This medication is classified as a Selective Estrogen Receptor Modulator (SERM). It is not a hormone, but it does some of the good things that estrogen does, without some of the bad things. It is approved by the FDA for the prevention and treatment of postmenopausal osteoporosis. Evista is given in a dose of one 60 mg tablet per day, and can be taken anytime of day, with or without a meal. It has been shown to increase bone density in the spine and hip, and to reduce the risk of fractures in the spine. It can also reduce cholesterol. It doubles the risk of blood clots, about the same as estrogen, and should not be taken by women with a past history of blood clots. It does not help with hot flashes that often occur in early menopause. Although it is not yet proven, there is evidence that suggests that it may reduce the risk of breast cancer and reduce the risk of cardiovascular disease in women at high risk.

### Alendronate (Fosamax®)

This medication is a type of bisphosphonate. It is approved by the FDA for the prevention of postmenopausal osteoporosis in women who are at risk, treatment of postmenopausal osteoporosis, treatment of osteoporosis in men, and treatment of glucocorticoid-induced osteoporosis in men and women who are taking the equivalent of at least 7.5 mg prednisone per day and have low BMD. The dose is 5 mg per day or 35 mg once a week for prevention, and 10 mg per day or 70 mg once a week for treatment. It must be taken in the morning on an empty stomach with a glass of water (not coffee, juice or other beverage), and you must wait at least one-half hour before the first food, beverage or medication of the day. This is because the absorption of the medicine is very poor, and it will simply not work if you don't follow this routine. In addition, you must remain upright (sitting or standing) for at least 30 min. after taking

it, or else you may develop heartburn or ingestion. It should not be taken by anyone with a blockage or ulceration in the esophagus, and is not recommended for anyone with severe kidney disease. It has been shown to increase bone density at the spine and hip, and reduce the risk of spine, hip and other nonvertebral fractures.

### **Risedronate (Actonel®)**

This medication is a bisphosphonate. It is approved by the FDA for the prevention and treatment of postmenopausal osteoporosis, and prevention and treatment of glucocorticoid-induced osteoporosis in men and women who are taking the equivalent of at least 7.5 mg prednisone per day and have low BMD. The dose is 5 mg per day or 35 mg once a week. It must be taken in the morning on an empty stomach with a glass of water (not coffee, juice or other beverage), and you must wait at least one-half hour before the first food, beverage or medication of the day. This is because the absorption of the medicine is very poor, and it will simply not work if you don't follow this routine. In addition, you must remain upright (sitting or standing) for at least 30 min. after taking it, or else you may develop heartburn or ingestion. It should not be taken by anyone with a blockage or ulceration in the esophagus, and is not recommended for anyone with severe kidney disease. It has been shown to increase bone density at the spine and hip, and reduce the risk of spine, hip and other nonvertebral fractures.

### **Nasal Salmon Calcitonin (Miacalcin® Nasal Spray)**

This medication is a daily nasal spray that is approved by the FDA for the treatment of postmenopausal osteoporosis in women more than five years postmenopausal who are unable or unwilling to take estrogen therapy. It is a synthetically manufactured form of a hormone that is naturally made by cells in the thyroid gland. It is given as one spray (200 IU) in the nose each day, alternating nostrils. It does not have any bad reactions with other medications, and can be taken lying down with disregard to meals. Some people develop mild irritation of the nose. It may have a pain relieving effect in patients with recent painful vertebral fractures. Although it causes very little change in bone density, it has been shown to reduce the risk of fractures in the spine.

### **Injectable Salmon Calcitonin (Miacalcin® Injectable)**

This is an infrequently used, and more expensive form of salmon calcitonin. It is approved by the FDA for the treatment of osteoporosis in women more than five years postmenopausal who are unable or unwilling to take estrogen therapy. It is given in a dose of 1/2 cc. (100 IU) subq or IM per day. Some experts use a more frequent dosing schedule, such as every 8 hours, in the initial treatment of painful vertebral compression fractures in hospitalized patients, then switch to the nasal preparation. Anti-nausea medication may be required.

## Teriparatide (Forteo™)

Teriparatide is a portion of a naturally occurring hormone called PTH (parathyroid hormone). It is manufactured in the laboratory using a type of bacteria called *Escherichia coli* by means of recombinant DNA technology. The only difference between teriparatide and PTH is that teriparatide has 34 amino acids (1-34 fragment of the molecule), while the entire PTH molecule has 84 amino acids (1-84). It is an “anabolic” agent, and works by a different mechanism than other available osteoporosis medications. It was FDA-approved in November 2002 for the treatment of postmenopausal women with osteoporosis who are at high risk for fracture, which includes women with previous fractures, women with multiple risk factors for fracture, and women who have failed or are intolerant to previous osteoporosis therapy. It is also FDA-approved for increasing bone density in men with primary or hypogonadal osteoporosis. Teriparatide has been shown to increase bone density and reduce the risk vertebral and non-vertebral fractures in women with postmenopausal osteoporosis, and to increase bone density in men with primary or hypogonadal osteoporosis. It is given as a daily subcutaneous injection into the thigh or abdominal wall with a “pen”, similar to the pens diabetics use to inject insulin. The dose is 20 mcg per day. It should not be given for longer than 2 years. In very large doses it has caused osteosarcoma in rats, and should not be given to patients at high risk for osteosarcoma, such as patients with Paget’s disease of bone, unexplained elevation of a blood test called alkaline phosphatase, bone cancer of any type or cancer that has spread to the bones, open epiphyses or prior radiation therapy to the skeleton.

## Combination Therapy

Many combinations of FDA approved medications, and some combinations of FDA approved medications with non-FDA approved medications, have been studied with small numbers of patients. These have often showed a small additive effect in terms of bone density increase, but it is not known whether any of these combinations reduce the risk of osteoporotic fractures more than single drug therapy. Combination therapy is not recommended except in unusual situations.

## Summary

<b>Summary of FDA Approved Medications for Osteoporosis</b>							
<b>Medication</b>		<b>Postmenopausal Osteoporosis</b>		<b>Glucocorticoid-Induced Osteoporosis</b>		<b>Osteoporosis</b>	
<b>Generic Name</b>	<b>Brand Name</b>	<b>Prevention</b>	<b>Treatment</b>	<b>Prevention</b>	<b>Treatment</b>	<b>Men</b>	<b>Weekly Dosing</b>
Estrogen	Various	✓					
Alendronate	Fosamax	✓	✓		✓	✓	✓
Risedronate	Actonel	✓	✓	✓	✓		✓
Raloxifene	Evista	✓	✓				
Calcitonin	Miacalcin		✓				
Teriparatide	Forteo		✓			✓	

## **Medications Approved by the FDA for Diseases Other than Osteoporosis and Sometimes Used “Off-Label” for Treatment of Osteoporosis**

### **Etidronate (Didronel®)**

This medication is FDA approved for the treatment of symptomatic Paget’s disease of bone, and for prevention and treatment of heterotopic ossification following total hip replacement or a spinal cord injury. In many other countries, it is commonly used for the treatment of osteoporosis. It is a bisphosphonate, and may have the same type of side effects as alendronate or risedronate. The usual dose used for the treatment of osteoporosis is a 400 mg tablet once per day for 2 weeks every 3 months (14 days of etidronate only, followed by 76 days of calcium only). Remember to hold calcium during the 2 weeks of taking etidronate. It should be taken at least 2 hours before or after food, vitamins, supplements, or other medications. It is acceptable to take it at bedtime. Research studies have shown that it can increase bone density in the spine and lower the risk of spine fractures.

### **Pamidronate (Aredia®)**

Pamidronate is approved by the FDA for the treatment of Paget’s disease of bone and hypercalcemia of malignancy. It is a bisphosphonate that is given as an intravenous (IV) infusion. Various doses have been used for the treatment of osteoporosis, but a commonly used dose is 30 mg IV over 2 hours every 3 months. It has been shown to increase bone density at the spine and hip, but it is not known whether it reduces the risk of osteoporotic fractures.

### **Zoledronic Acid (Zometa®)**

Zoledronic acid is a bisphosphonate that is FDA approved for the treatment of hypercalcemia of malignancy. It has been shown to increase bone density in women with postmenopausal osteoporosis when given as a 4 mg IV infusion over 15 minutes once a year. It increases bone density at the spine and hip, but it is not known whether it reduces the risk of osteoporotic fractures.

**Medications Not Approved by the FDA for Any Disease and  
Available Only Through Participation in Clinical Research Studies**

**Bisphosphonates**

Ibandronate

**SERMs**

Lasofloxifene

Bazedoxifene

**Regulators of Bone Metabolism**

Osteoprotegerin (OPG) analogues

**Anabolic Agents**

Recombinant Human PTH 1-84

**Synthetic Steroids**

Tibolone



**Information updated October 2003**

**To learn more, contact these web sites:**

**New Mexico Clinical Research & Osteoporosis Center** [www.nmbonecare.com](http://www.nmbonecare.com)

**Osteoporosis Foundation of New Mexico** [www.osteoporosisfoundationnm.org](http://www.osteoporosisfoundationnm.org)

**National Osteoporosis Foundation** [www.nof.org](http://www.nof.org)

**International Society for Clinical Densitometry** [www.iscd.org](http://www.iscd.org)

**North American Menopause Society** [www.menopause.org](http://www.menopause.org)