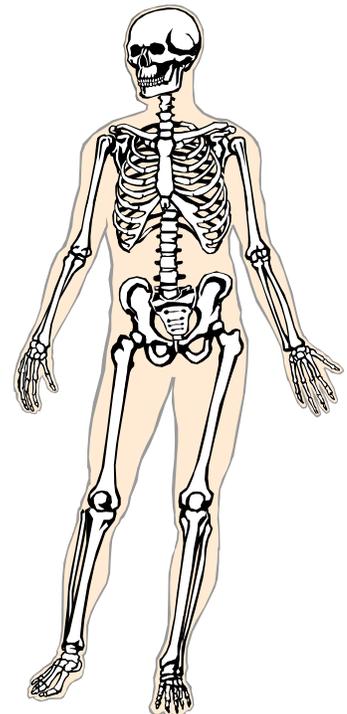


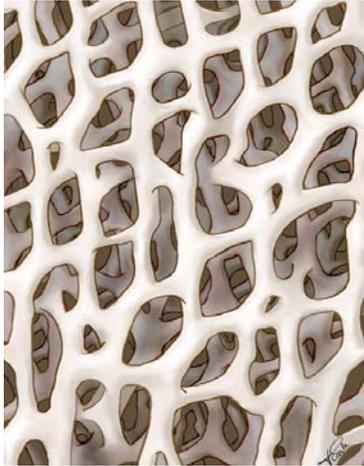
# Healthy Bones

## Preventing & Managing Osteoporosis

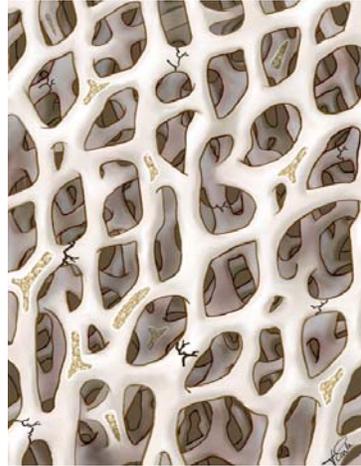


## What is osteoporosis?

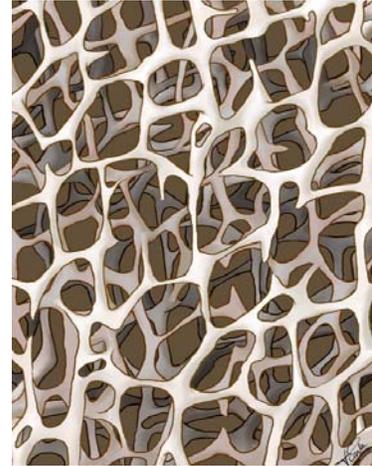
- a condition that causes a reduction in a person's bone density (amount of bone tissue). The bones become thinner, more porous and fragile which can lead to an increased risk of a broken bone or fracture.



Normal Bone



Low bone density



Osteoporosis

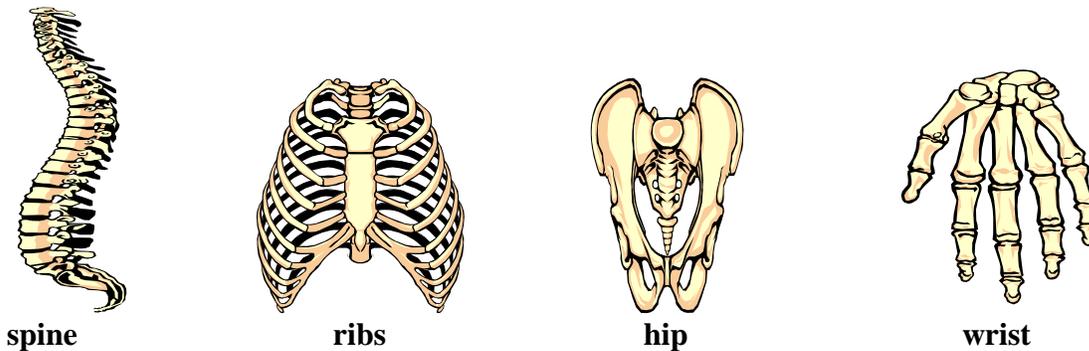
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## What's happening inside the body?

- Bone is living tissue that is continually being renewed through a process in which old bone is removed and replaced by new bone.
- From childhood, particularly during the rapid growth of the teen years, bone is formed at a greater rate than it is removed.
- Growing up with exercise and a healthy diet, rich in calcium, is necessary to ensure strong, dense bones in adulthood.
- By age 20, the growth in the length of the bones has stopped, but the increase in bone density may continue to the mid-thirties to reach a peak (maximum) bone mass.
- After reaching peak bone mass, formation of bone fails to keep up with bone removal and bone loss occurs. Then bone loss in women due to aging occurs at a rate of 1% per year.

- **Menopause:**  
For the first 5 to 6 years following menopause due to a decrease in estrogen levels, a woman can lose 3 – 5% of her bone density each year. This increases the risk of osteoporosis.  
About 25% women over the age of 50 have osteoporosis.  
Another 54% have low bone mass.
- **Andropause:**  
After age 50, approximately 19% of men over the age of 50 have osteoporosis. This may be related to the occurrence of a more rapid decline in testosterone levels.
- By age 65 to 70 men and women lose bone mass at the same rate, and the absorption of calcium decreases in both sexes.

### Areas most affected by fractures

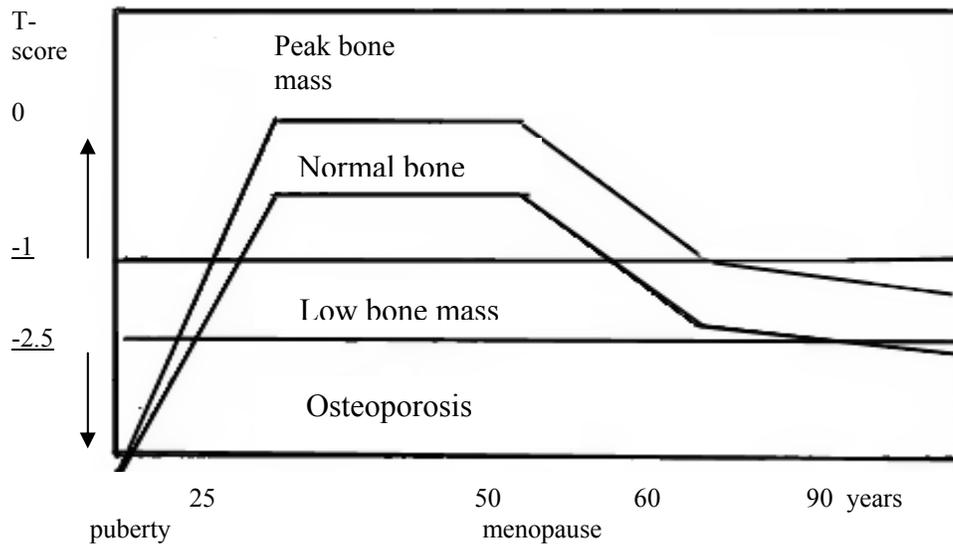


### How is osteoporosis diagnosed?

#### Bone mineral density test:

- Small x-ray detector scans your lumbar spine and one or both of your hips to measure bone thickness.
- The test is safe, painless and does not require an injection
- If you are at risk for osteoporosis or have osteoporosis, a bone mineral test should be done every 2 years.
- A broken bone due to a low force trauma or fall from standing weight may also indicate that you have osteoporosis





### T- Score

- Number of standard deviations from normal peak bone mass of a young adult

#### < -1 SD: (normal)

- Means 10% bone loss than average young adult

#### -1 SD to – 2.5 SD: (low bone mass - osteopenia)

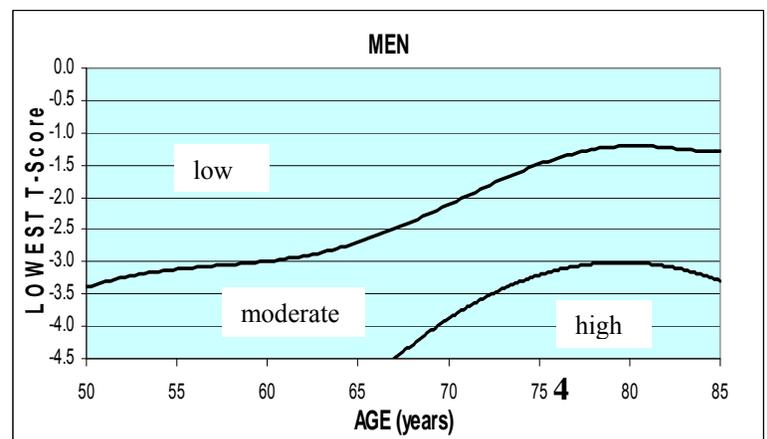
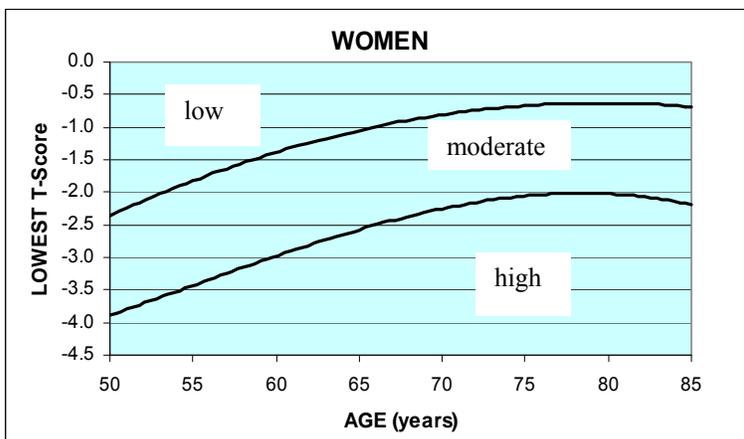
- Means 10 to 25% bone loss than average young adult

#### > -2.5 SD: (osteoporosis)

- means >25% bone loss than average young adult

### 10 Year Fracture Risk (CAROC ASSESSMENT TOOL)

- based on BMD, age, sex, cortisone usage, and history of fragility fracture
- low risk = < 10%
- moderate risk = 10 – 20%
- high risk = > 20%
- move up 1 category if had a fragility fracture after age 40 or have used cortisone 7.5 mg or more for > 3 months -
- if both above risks are present, move to high risk regardless of BMD



## Am I at risk?

The following may increase your risk of low bone mass or osteoporosis:

### Genetic factors:

- age 65 or greater
- weigh less than 125 lbs (57 kg)
- weight loss of > 10% of weight at age 25
- family history of osteoporotic fracture (especially maternal hip fracture)



### Lifestyle factors:

- do little or no exercise
- smoke cigarettes
- low calcium intake (< 400 mg/day)
- low vitamin D intake (< 400 IU/day) or less than 10 –15 minutes of sunshine per day
- drink more than 4 oz of alcohol per day
- drink more than 3 cups of coffee/tea per day
- a woman who has excessive physical or emotional stress that disrupts or stops monthly periods



### Medications:

- cortisone (prednisone  $\geq 7.5$  mg for 3 months)
- anticonvulsants (to prevent seizures) - long-term use
- thyroid medications - high doses
- anti-depression medications (SSRI – Celexa, Prozac, Paxil or Zoloft)
- stomach protection medications (Nexium, Prevacid, Losec)
- progesterone hormone (Depo-Provera) that lowers estrogen in the body



### Medical Conditions:

- rheumatoid arthritis
- low estrogen in women or low testosterone levels in men
- menopause before the age of 45
- low bone mass on x-ray (osteopenia)
- unexpected (fragility) fracture from a fall after age 40
- tendency to fall easily
- history of hyperthyroidism
- inflammatory bowel disease – Crohn's disease, Celiac disease (malabsorption of nutrients)
- liver or kidney disease



## What are some dietary considerations?

### Healthy, nutritious meals can help prevent & treat osteoporosis.

- Eat a variety of foods based on Canada's Food Guide.
- Eat 3 meals per day, starting with a balanced breakfast.
- Include healthy snacks between meals and/or at bedtime as needed.
- Adequate protein intake is essential in decreasing risk of hip fracture
- Choose calcium and vitamin D enriched foods in your diet to meet your daily requirements.

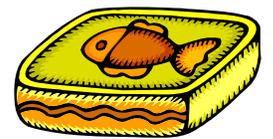
#### Foods rich in calcium

- milk (1 cup)	300 mg
- milk powder (1/3 cup)	270 mg
- cheese (1 ½ oz)	300 mg
- yogurt (3/4 cup)	295 mg
- fortified soy drink (1 cup)	180 mg
- salmon with bones (1/2 can)	240 mg
- sardines, with bones (1/2 can)	200 mg
- almonds (1/4 cup)	95 mg
- kale, cooked (1/2 cup)	100 mg
- broccoli (3/4 cup)	50 mg



#### Foods rich in vitamin D to enhance calcium absorption are:

- fortified milk (1 cup)	100 IU
- fortified rice or soy beverage (1 cup)	100 IU
- salmon, canned (3 oz)	530 IU
- mackerel (3.5 oz)	345 IU
- sardines in water (3.5 oz)	480 IU
- pickled herring (3.5 oz)	680 IU
- eastern oysters (3.5 oz)	642 IU
- shrimp, canned (3.5 oz)	172 IU
- liver (3.5 oz)	45 IU
- egg yolk (large)	27 IU



(Ref: USDA database)

Note: Unsweetened cultured foods such as yogurt, kefir or sour cream, products such as almond milk, rice milk, organic soy milk, almonds, and vegetables are better choices to help decrease acidity in the body.

<b>Total Daily Requirements:</b>		
<b>Calcium &amp; Vitamin D from Diet Plus Supplement of elemental calcium &amp; vitamin D3</b>		
	<b>Calcium (elemental)</b>	<b>Vitamin D3</b>
<b>19 – 50 years</b>	1000 mg	400 - 1000 IU
<b>&gt; 50 years</b>	1200 mg	800 - 2000 IU
Daily doses up to 2,000 IU (50 mcg) are safe & do not require monitoring		
<b>Women/Men on osteoporosis therapy:</b> measurement of serum 25-OH-D should follow 3 to 4 months of an adequate vitamin D supplementation dose. An optimal blood level of 25-OH-D is $\geq 75$ nmol.		
<b>Osteoporosis Guidelines, Osteoporosis Canada, 2010</b>		

## Supplements



### Calcium:

- Look at the amount of elemental calcium in the supplement
- Canadian supplements with an NPN number now list the exact amount of elemental calcium on the label
- The most calcium your body can absorb at one time is about 500 mg.
- Avoid supplements made from oyster shells, bone meal & dolomite as they may contain toxic metals.

### Calcium Carbonate:

- Least expensive
- Smallest tablet size
- Contains 40% elemental calcium
- Take with food to enhance absorption
- May constipate. If constipated try fluids, fibre, and magnesium
- Examples are Caltrate, Calcia, Oscal, Tums etc

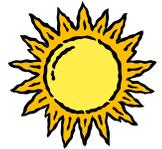
### Calcium Citrate:

- More expensive
- Larger tablets, therefore more difficult for some people to swallow
- Contains 21% elemental calcium
- Easier absorbed by the body
- May be a better choice if on a medication to protect your stomach such as a protein pump inhibitor (eg. Nexium, Prilosec or Prevacid).
- Helpful for people who may form kidney stones, or are elderly
- Take on an empty or full stomach
- Does not cause constipation
- Examples are Citrical

### **Vitamin D:**

Vitamin D3 is the preferred source

- Sunlight (at least 10 to 15 minutes/day) helps the skin to produce Vitamin D and will aid the absorption of calcium.
- Fat soluble vitamin



Risk factors for low vitamin D levels in your body

- Not including milk or fish in diet
- Regularly wearing clothing that covers most of the skin
- Being indoors most of the time
- Living in northern latitudes (Canada) during the winter months
- Use of sunscreens (SPF of 8 or higher)
- Having dark skin colour
- Aging process



### **Magnesium:**

- Plays a role in calcium absorption & building strong bones
- Helps maintain normal muscle & nerve function
- Recommended daily allowance:
  - women: 320 mg
  - men: 420 mg
- Canadian Osteoporosis Guidelines recommend that these nutrients be obtained from food sources & that supplementation is not necessary.
- If taken, supplements should not exceed 350 mg (National Institute of Health)

- Supplements may interact with blood pressure medications.
- Foods containing magnesium include:

- Almonds 1 oz 86 mg
- Peanuts, dry roasted 1 oz 50 mg
- Spinach cooked ½ cup 65 mg
- Avocado, ½ medium 35 mg
- Kiwi, medium 23 mg
- Bran flakes, ½ cup 60 mg
- Baked beans ½ 40 mg
- Chocolate bar 1.45 oz 45 mg



## Vitamin K2

- Works together with calcium & vitamin D to help build stronger bones.
- **Food sources** of Vitamin K2:
  - Natto: fermented soybeans
  - Dairy products, butter, egg yolks & organ meats of grass fed animals, goose liver and select fermented foods such as brie & gouda.
- **Supplement:**
  - 100 - 120 mcg/day.
  - With low bone mass or osteoporosis take 180 mcg/day.
  - Available as MK7 (natto- fermented soybeans) & MK4 (synthetic).
  - Note: if on warfarin – may interfere with K2 & INR should be monitored closely by your doctor when starting.

## Nutritional considerations that may interfere with calcium absorption & retention in the body, and enhance bone loss:



Limit caffeine to  $\leq 3$  cups/day. Caffeine increases the loss of calcium through the urine.

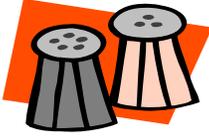


Foods high in fibre, such as raw grains & wheat bran contain phylates that bind with calcium.

Consider taking a calcium food source or supplement on its own or with light meals, snacks or at bedtime.



Foods such as rhubarb, spinach or strawberries contain oxalic acid that can bind with calcium



Limit dietary sodium intake to < 2100 mg /day (1 teaspoon of salt = 2325 mg of sodium).

Use sea salt, not table salt, if needed.  
Keep your intake of salty foods to a minimum.



Avoid drinking sodas. Most contain phosphoric acid that can leech calcium from your bones.

### Supplement considerations:



Take only 500 mg of elemental calcium supplementation at one time. The body can only absorb that amount of calcium at a time.



Limit intake of Vitamin A to < 5,000 IU, with no more than 3000 IU in the form of retinol.

Do not take cod liver oil as it is high in Vitamin A

Do not take calcium within 2 hours of taking iron supplements.

### Medication considerations:



Do not take calcium within 2 hours before or after taking :

- a bisphosphonate such as Fosamax, Actonel, or Didrocal
- a protein pump inhibitor (protects stomach) such as Losec, Nexium, or Pariet

Do not take calcium within 4 hours of taking thyroid medication.

# What is the role of exercise?

## Exercise increases bone strength.

- Research shows that weight-bearing exercise reduces the risk of getting osteoporosis & helps build strong bones.



## General considerations



- Check with your doctor or physiotherapist before starting or changing any exercise program.
- Problems with balance, arthritis (joints), heart or lungs may prevent you from doing certain exercises.



- People with arthritis may find weight-bearing exercises too difficult. Exercising in water (non-weight bearing) is usually much easier to do.



- Maintain good, upright posture when exercising.
- Reduce your risk of falls by:
  - \* pacing yourself (spreading out activities over the day)
  - \* wearing good supportive shoes
  - \* using safety strategies/aides (cane, bars, or furniture).
- If you have osteoporosis, consider taking an Osteofit class in your community by trained professionals.



## FITT Principle of Exercise



### Frequency (How often should I exercise?)

- Exercise at least 3 – 5 times per week in order to build bone and gain the many other benefits of exercise.

## Intensity (How hard should I exercise?)



- All exercise is helpful in building bone and improving muscle and cardiovascular health. But, short bursts of high intensity exercise (tennis, aerobics, skipping etc.) seem to be the most beneficial in building bone.

## Type (What kind of exercise should I do?)

- Weight bearing exercises are best.
- Vary the type of exercise you do.
- If nothing else, remember to walk!



- Aerobic exercises such as walking, biking etc, help build strong bones & muscles & also make your lungs & heart work better.
- Strength, balance, flexibility exercises are also of benefit if you have or are trying to prevent osteoporosis.
- Strengthening exercises increase the strength of the muscles that support your joints & bones.
- Stretching exercises help to loosen tight & shortened muscles.
- Range of motion exercises help to increase joint movement & flexibility and relieve stiffness.
- The type of exercise you choose will depend on your current health status.



## Time (How long should I exercise?)

- Try 10 to 15 minutes once or twice a day.



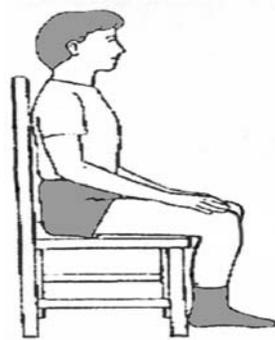
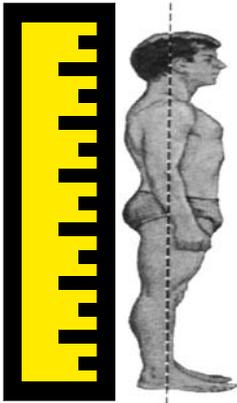
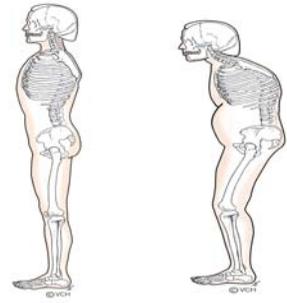
## How will I know if I have done too much exercise?

Look for signs such as:

- Pain after exercise that lasts more than 2 hours
- Increased tiredness
- Increased muscle weakness
- Increased swelling of joints
- Decreased range of movement of the joints

## Protect Your Spine

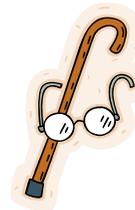
- Have your height measured regularly
- Be aware of your posture at all times
- Head back, chin in, shoulders back & stomach tucked in
- Check posture by leaning straight against a wall



## Prevent Falls

### Things you can do to prevent falls:

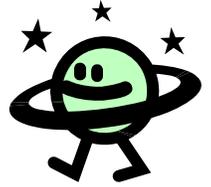
1. Exercise regularly
2. Avoid fast movements if unsteady on feet
3. Wear low-heeled shoes with firm, non-slip soles
4. Use safety aids (canes, walkers etc.) as recommended
5. Have regular vision checks & wear glasses if needed



6. Have the sensation if your feet checked by your doctor, especially if you have diabetes or any other condition that may decrease sensation.



7. Avoid medications which could make you dizzy & unsteady such as sleeping pills, tranquilizers & some pain medications



8. Avoid heavy alcohol use

9. Take safety measures to prevent falls in the home.

a. Remove loose rugs & objects from the floor

b. Use adequate lighting throughout the house & ensure use of night lights

c. Use bathtub bars, raised toilet seats etc



## Osteoporosis Medications

### Bisphosphonates



#### How do bisphosphonates work?

They bind permanently to the surfaces of the bones and slow down the bone removing cells, allowing the bone-building cells to work better. The result is an increase in bone mass and a reduced risk of fractures.

#### Who can take bisphosphonates?

Used to prevent osteoporosis or to treat osteoporosis in

- postmenopausal women with low bone mass or osteoporosis
- men with low bone mass or osteoporosis
- people on cortisone medication

#### How are bisphosphonates taken?

These medications are poorly absorbed from the stomach

- must be taken 30 to 60 minutes before breakfast
- take with a large glass of water (not juice or coffee)
- remain upright (sitting or standing) for 60 minutes
- do not take calcium or other vitamins for 2 hours before or after

### **Didrocal (Etidronate)**

- taken in cycles: 2 weeks of daily etidronate 400 mg (white tablets) followed by calcium carbonate 500 mg for 76 days.

### **Actonel (Risedronate)**

- 5 mg tablet daily or 35 mg tablet once weekly or 150 mg tablet once monthly (not covered under pharmacare)

### **Fosamax (Alendronate)**

- 10 mg tablets daily or 70 mg tablets once weekly

### **Fosavance**

- alendronate 70 mg plus Vitamin D<sub>3</sub> 5600 IU once weekly

### **What are the possible side effects?**

- stomach upset, diarrhea, constipation, stomach pain
- high blood pressure (hypertension)
- joint discomfort
- esophageal burning (rare).

## **Zoledronic Acid (Aclasta)**

### **How does zoledronic acid work?**

- It is bisphosphonate medication
- It has been shown to increase bone strength & reduce risk of fractures in areas of the body typically affected by osteoporosis including the hip, spine & non-spinal areas such as the wrist, arm etc.

### **Who can take zoledronic acid?**

- It is used to treat postmenopausal osteoporosis

### **How is zoledronic acid taken?**

- The dose is 5 mg
- It is given in a I.V. infusion over 15 minutes once a year
- It is important to drink 2 glasses of fluids prior to receiving the medication to prevent kidney problems.



## **What are the possible side effects?**

- Fever, pain in the muscles, bones or joints, flu-like symptoms & headache may occur within 3 days following the infusion & usually resolves within 3 to 4 days. Symptoms may last up to 2 weeks.
- Osteonecrosis (damage) of the jaw bone (rare)
- Hypocalcemia (low levels of calcium in the blood)
- Increased risk of atrial fibrillation (fast irregular heartbeats), that may increase the risk of stroke (1.3% versus .4%) in some elderly individuals.

## **Denosumab (Prolia)**

### **How does it work?**

- It is a bisphosphonate medication
- It decreases the formation of bone removing cells, thus preventing bone loss and increasing bone mass.

### **Who can take denosumab?**

- It is approved for postmenopausal women with osteoporosis who are at a high risk of fracture or who have tried other osteoporosis medications.

### **How is it taken?**

- The dose is 60 mg.
- It is taken by a self-injection into the fat (subcutaneous) tissue of your abdomen or thigh once every 6 months.

### **What are the possible side effects?**

- Pain in muscles, arms, legs or back
- Skin condition with itching, redness and/or dryness
- Osteonecrosis (damage) of the jaw bone (rare)

## **Teriparatide (Forteo)**

### **How does Forteo work?**

- Contains teriparatide which is the same as the active part of a natural hormone in your body called Parathyroid Hormone
- It increases your body's ability to form new bone faster than old bone is lost. Your bones become stronger and you are less likely to fracture.

### **Who can take Forteo?**

- Used in men & postmenopausal women for the treatment of
  - severe osteoporosis who are at high risk of fracture or
  - those who have tried or are unable to take other medications

### **How is Forteo taken?**

- It is taken in a dose of 20 ug once daily by self-injection (into fat tissue).
- It is supplied in a 3 ml (250 ug/ml) pen-filled delivery system that lasts 28 days and then should be discarded.

### **What are the possible side effects/risks?**

- dizziness & fast heart beat due to low blood pressure after the injection
- redness, swelling, pain or itching at injection site
- Watch for signs of too much calcium in the blood – nausea, vomiting constipation, low energy or muscle weakness
- The duration for the use of teriparatide is limited to 24 months as bone cancer has been associated with studies in rats but not in humans.

## **Selective Estrogen Receptor Modulators (SERMs) Raloxifene (Evista)**

### **How do SERMs work?**

It is a medication that is not estrogen, but binds to estrogen receptors and interacts with the body's tissues, sometimes acting like estrogen and at times has the effect of blocking estrogen.

- SERM's have a positive action on bone without the potential risks of breast or endometrial cancer associated with estrogen.
- Raloxifene (Evista) has been shown to help prevent spinal fractures in postmenopausal women and to increase bone mineral density at the spine & the neck of the femur bone in leg.
- Raloxifene may improve lipid profile by reducing LDL cholesterol (bad cholesterol) and total cholesterol.

### **Who can take Raloxifene (Evista)?**

- Used to prevent or treat postmenopausal women with low bone density or osteoporosis

### **How is Raloxifene (Evista) taken?**

- It is taken as a single tablet of 60 mg/day with or without food.

### **What are the possible side effects?**

- may increase hot flushes and leg cramps
- may increase risk of a blood clot (rare)

## **Hormone Replacement Therapy (HRT) (Estrogen & Progestin/Progesterone Therapy)**

### **How does HRT work?**

- HRT in postmenopausal women has been shown to
  - a) halt the accelerated phase of bone loss that begins with irregular flow in perimenopause and continues for 4 to 5 years and sometimes up to 10 years after menopause and
  - b) increase bone mineral density at all measured sites.
- In postmenopausal women with osteoporosis, it is effective in preventing spinal fractures and non-spinal fractures including hip fractures.

### **Who can take HRT?**

- Used as a first choice for preventative therapy in women who experience menopause before the age of 45 or post-menopausal women with low

bone density and other health concerns, as the risks of HRT may outweigh the benefits if used for osteoporosis alone.

- Used as a second choice of therapy for treatment in postmenopausal women with osteoporosis and other health concerns, as the risks may outweigh the benefits if used for treating osteoporosis alone

### **What are the possible side effects/risks?**

- HRT taken for more than 5 years after menopause increases the risk of
  - breast cancer by 26%
  - coronary artery disease by 29%
  - stroke by 41%.
- The use of estrogen without progesterone increases irregular vaginal bleeding and the risk of endometrial cancer.
- HRT increases the risk of venous blood clots.

### **Suggested Resources**

1. **The Osteoporosis Book**, 3rd edition, 2011. By Gwen Ellert RN, MEd, John Wade MD, Allan Low PharmD. Trelle Enterprises, Vancouver, BC
2. **Osteoporosis Canada** - website at [www.osteoporosis.ca](http://www.osteoporosis.ca) or telephone 1-800-463-6842 or contact the BC division for local information 1-800-363-1933
3. **2010 Clinical Practice Guidelines** for the diagnosis and management of osteoporosis in Canada, Osteoporosis Canada
4. National Osteoporosis Foundation – [www.nof.org](http://www.nof.org)
5. **WHO Fracture Risk Assessment Tool (FRAX)** - [www.shef.ac.uk/FRAX/index.htm](http://www.shef.ac.uk/FRAX/index.htm)
6. **Canada's Food Guide** – Health Canada [www.healthcanada.ca/foodguide](http://www.healthcanada.ca/foodguide)

7. **Health Link BC** - [www.HealthLinkBC.ca](http://www.HealthLinkBC.ca) or dial 811 (711 if hearing impaired) to speak to a nurse, dietitian or pharmacist
8. **Dietitians of Canada** – [www.dietitians.ca](http://www.dietitians.ca)
9. **Osteofit** information line: 604-875-2555
10. **Physical Activity Guide & Handbook - Health Canada**  
[www.healthcanada.ca/paguide](http://www.healthcanada.ca/paguide)
11. **The Arthritis Society** - [www.arthritis.ca](http://www.arthritis.ca)
12. **Arthritis Foundation** – [www.arthritis.org](http://www.arthritis.org)
13. **The North American Menopause Society** - [www.menopause.org](http://www.menopause.org)
14. **Nation Institute of Health** – [www.nih.gov](http://www.nih.gov)
15. **National Center for Complementary & Alternative Medicine** –  
[www.nccam.nih.gov](http://www.nccam.nih.gov)
16. **Office of Dietary Supplements, NIH** – [www.ods.od.nih.gov](http://www.ods.od.nih.gov)
17. **Cochrane Consumer Network** – [www.thecochranelibrary.com](http://www.thecochranelibrary.com)

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