

## Bone Health, Osteopenia & Osteoporosis

- **Bones are very much alive and are constantly remodeling** in response to the forces that are applied to them
  - Think of bone remodeling like repaving a road:
    - Cells go along and chew up the “old asphalt” (bone matrix)
    - Other cells follow behind them and lay down the “new asphalt”
    - As we age, the cells that lay down new bone slow down more than the ones that break down the old bone. This eventually leads to osteoporosis.
  - Remodeling is affected by other diseases, like diabetes, COPD or rheumatoid arthritis, and also by medications like steroids, chemotherapy or drugs that are used to block testosterone as part of prostate cancer treatments.
  - **Smoking and alcohol consumption are also major inhibitors of bone metabolism!** Stop smoking and limit alcohol to 2 drinks/day or less.
- **How do I know if I’m at risk for problems with my bones?**
  - If the women in your family have had osteoporosis or broken hips
  - If you smoke, drink alcohol or have any inflammatory diseases like rheumatoid arthritis, ulcerative colitis, lupus, crohn’s disease, COPD, diabetes, or obesity.
  - If you have had problems with low vitamin D.
  - If you have lost height, changing posture or have nagging pain in your back.
  - If you have had certain types of non-traumatic fractures in the past.
  - If you have had to take steroids (prednisone) in high doses or for long periods of time.
  - If you had an early menopause or have a condition resulting in low testosterone.
  - If you have been critically ill and/or bedridden.
- **How do we treat disorders of bone metabolism?**
  - Everyone should have adequate calcium and vitamin D in their diet or supplement, so the body has the right building blocks for healthy bone formation.
  - Because bones remodel in proportion to stress that’s applied to them, we recommend daily weight bearing exercise like you would do anyway for heart health.
  - We treat osteoporosis with drugs like Fosamax or Boniva. Their job is to slow down those cells that break down the old bone, so the “new asphalt-laying” cells can catch up. It takes months to years to see the effect.
  - There is another drug, Forteo, which boosts the activity of the cells that lay down new bone, and works to heal fractures quickly.
- **How much calcium and vitamin D do I need?**
  - That depends on your age and your general bone health.
  - We want to maintain a blood vitamin D level between 20-50.
  - Getting calcium from the diet is best, but supplement if needed.
    - The average American diet contains 600mg of calcium daily, and each serving of dairy confers about another 300mg.

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- There are many non-dairy sources of calcium as well (See Lists)

Age	Sex	Recommended dietary allowance (mg/d)
0-6 mo	M + F	200
6-12 mo	M + F	260
1-3 y	M + F	700
4-8 y	M + F	1,000
9-18 y	M + F	1,300
19-50 y	M + F	1,000
51-70 y	M	1,000
51-70 y	F	1,200
71+ y	M + F	1,200

From Ross et al (77 [EL 4; consensus NE]). Reproduced with permission.

Calcium Carbonate  
400-600mg/d  
Absorbs better with vitamin D  
& when taken with meals

Goal Vitamin D Level

- How does obesity affect bones?
  - If you have a pair of identical twins, who both weight 300 lbs, but one is a bodybuilder and one works at a desk all day. The body builder would have better bone density and health:
    - This is because his muscles are constantly pulling on his bones, applying stress, and the bones remodel in response.
    - The other twin has a lot of weight on his bones, but less traction. This combined with the inflammatory state of obesity actually **BLOCKS** bone remodeling!
- What medications are available?
  - Antiresorptives: Slow the breakdown of the old bone, so the new bone formation can catch up.
    - Fosamax (alendronate), Boniva (risedronate), Prolia (denosumab), Zometa (zoledronic acid), etc.
  - Anabolics: Work like a BIG boost to the cells that lay down new bone.
    - Forteo (Teriparatide), Tymlos (Abaloparatide)
  - Sclerostin inhibitors: works mostly to boost the cells that lay down new bone, but also slows the breakdown of old bone
    - Evenity (Romosozumab)
- What risks are associated with treatment?
  - Fosamax, Boniva, Prolia - these drugs are most famously associated with **osteonecrosis of the jaw**. This is **rare (1 in 40,000) at osteoporosis doses**, and **typically is only seen in the higher doses of drug that are used in cancer patients**. We screen everyone for risks (i.e., oral surgery, tooth extractions), and **I have only VERY rarely seen this complication**. However, if

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you DO develop problems with the jaw after an oral surgery, it would require immediate attention at an emergency room.

- The second famous risk with antiresorptives are called “**atypical femur fractures**” and are more likely to occur **when a patient has taken the drug for more than 5 years (1 in 20,000)**. Symptoms such as nagging pain in the groin/upper thigh are hallmarks of these fractures. We minimize risk of these fractures by re-evaluating the risks/benefits/alternatives to treatment when you approach year 5 of treatment.
- Anabolic agents - these are powerful drugs and are highly effective, but if you have had radiation therapy to the spine, or there is a history in the family of a bone cancer called osteosarcoma or when a patient is at risk for metastatic cancer, the risk outweighs the benefit of using these drugs.
  - The second problem with using these drugs is that after you finish the 2 years of treatment, you **MUST follow it** by taking an antiresorptive agent, or else we will LOSE the bone we built over the last 2 years.
  - Sclerostin inhibitor - the newest medication available, it is not good for people who have had heart attacks or strokes in the last year. Treatment is for 1 year and MUST be followed with antiresorptive medication.
- Resources
  - National Osteoporosis Foundation <https://www.nof.org/patients/>

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