ALPINE
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MINERAL METABOLISM AND OSTEOPOROSIS

Osteoporosis is a condition that affects the bones, causing them to become weak and fragile and more likely to break (fracture). These fractures most commonly occur in the spine, wrist and hips but can affect other bones such as the arm or pelvis. Hip and vertebral fractures are associated with increased morbidity (catastrophic injury) and mortality (contribute to a cause of death).

Osteoporosis is the most common bone disease in humans.

- For instance, over two million osteoporosis fractures occurred in the United States in the year 2005.
- Over 10,000,000 people in the United States have osteoporosis.
- An additional 34 million people in the United States have low bone density of the hip.
- Although commonly associated with post-menopausal women, osteoporosis can also affect men, younger women and children.
- One in 3 women older than 50 years will eventually experience osteoporotic fractures, as will 1 in 5 men.
- By 2050, the worldwide incidence of hip fracture is projected to increase by 240% in women and 310% in men.

Bone is made of a hard outer shell with a mesh of collagen (tough elastic fibers), minerals (including calcium), blood vessels and bone marrow inside.

- Healthy bones are very dense, and the spaces inside the bones are small.
- In bone affected by osteoporosis, the spaces are larger, and this makes the bones weaker, less elastic and more likely to break.

Bone is a living tissue that is constantly repairing itself. This process is called “bone turnover.”

- Osteoclasts are cells which break down old bone and prepare the way for new bone building, much like a demolition crew on a remodeling project in a house.
- Osteoblasts are cells which build new bone in areas that osteoclasts have prepared, much like the carpenters, masons and other contractors who install all the improvements in a remodeling project.
- This process requires a range of proteins and minerals, which are absorbed from the bloodstream, as well as “load-bearing” exercise to stimulate the process.

In childhood, bones grow and repair very quickly, but this process slows down as you grow older. Bones stop growing in length between the ages of 16 and 18, but continue to increase in density until you are in your late 20s. From about the age of 35, you gradually lose bone density. This is a normal part of aging, but for some people it can lead to osteoporosis and an increased risk of fractures.

Risk factors for bone loss include and are not limited to:

- Sedentary lifestyle
- Smoking or other nicotine use
- Taking corticosteroids like prednisone
- Renal dialysis
- Anti-seizure medications

We recommend a baseline bone density scan (DEXA) and lab work to determine your risk of bone loss and catastrophic fragility fracture.

TREATMENT OF OSTEOPOROSIS:

TIER 1 TREATMENT - THE NUTRITIONAL BUILDING BLOCKS

There are three vital nutrients that are needed every day for building healthy bone, and they all need to be there in sufficient amounts to do the job; much like a bricklayer needs good quality bricks and mortar to build a strong brick wall. Baseline blood testing is recommended to help guide effective treatment.

CALCIUM:

- Calcium is the main mineral, among others, that give bones their structure.
- The form of calcium that is most easily absorbed is "Calcium Citrate."
- Calcium IS NOT EASILY ABSORBED when Vitamin D levels are low, a problem for virtually anyone living in the Pacific Northwest. Typically, only about 10% of the calcium you get from food and supplements is absorbed from your gut in low Vitamin D states.

Recommended Daily Calcium (supplements should be divided into 2-3 doses)

- Birth to 6 months - 210 mg
- 6 months to 1 year - 270 mg
- 1-3 years – 500 mg
- 4-8 years - 800 mg
- 9-13 years - 1300 mg
- 14-18 years - 1300 mg
- 19-50 years - 1000 mg
- 51-70 years 1200 mg
- 71 or older 1200 mg
- Pregnant or lactating 14-18 years 1300 mg
- Pregnant or lactating 19-50 years 1000 mg

**Don't forget to count the amount of calcium in your diet

Vitamin D3:

- Blood levels routinely accepted are a reference range between 30 - 100.
- For bone building, we suggest a Vitamin D level between 75 – 100, with a minimum of 60.
- This optimum level of Vitamin D will drive up to 40 – 50% of your calcium intake from the gut into your bloodstream, help battle fatigue, and will support your immune system.
- Daily doses of Vitamin D3 are highly individual and are guided by blood level testing.

Vitamin K2:

- This important nutrient acts like a "traffic cop" and is necessary anytime you are increasing the amount of calcium in your bloodstream.
- It works with two proteins that put the calcium where it belongs, and it keeps it from going where it doesn't belong.
    - One these proteins binds to the calcium and deposits it in the "bone bank," right where we need it to go.
    - The other protein prevents the calcium from being deposited where it doesn't belong, in blood vessels or kidneys, and will scavenge the calcium from these structures.
- Daily Vitamin K2 dose is 100-180 mcg/day. MK-7 is the form that was used in studies.
- People on blood thinners (coumadin or warfarin) should consult with their primary provider before beginning Vitamin K2; they may have to adjust the dose of your blood thinning mediation.
- Many people have difficulty converting Vitamin B12 and Folate into their methylated form that the body can use. This is vital for all metabolism, including building bone, and a supplement may be recommended.

RECOMMENDED TIER 1 TREATMENT

	NUTRIENT	DOSE
	Calcium Citrate per day (in at least two divided doses)	mg Daily (OTC)
	Vitamin D3	I.U. Daily (OTC)
	Vitamin K2	100 – 180 μg Daily (OTC)
	Stress B Methyl-Vitamin B12/Folate (Thorne Research)	One Capsule Twice Daily

TIER 2 TREATMENT – NUTRITION PLUS HORMONES OR PHARMACEUTICALS

- Hormone production decreases with age, and nearly all body functions depend on them, including mineral metabolism that builds and maintains bones. Additional labs will be drawn to determine additional metabolic and hormone status.
- All hormones are not alike. Bioidentical hormones are identical to the ones your body makes and are formulated by a compounding pharmacy. They are usually not covered by insurance companies. Synthetic hormones (commercially available hormones) are close, but do not act in the body as well as the bioidentical form, and sometimes they can actually be harmful. We recommend only bio-identical hormones – not synthetic kinds that are associated with cancer and blood clots. Studies that make these claims used only synthetic hormones!
- For bone building, bioidentical estradiol and testosterone are key. Without it, you lose more bone than you build.
- In women, it is important to balance estradiol with bio-identical progesterone. We NEVER prescribe the synthetic medroxyprogesterone (ProVera); this has been associated breast cancer in the WHI study.
- Those with a history of breast or other hormone receptor cancer should consult their oncologist before beginning bioidentical hormone replacement.
- If there is a personal history of blood clots (DVT or pulmonary embolism) we would use caution with oral estradiol and may choose to use a transdermal form.
- Men get their estradiol by converting it from testosterone by a process called "aromatization." Testosterone levels in men begin to drop at age 35! So, as a man ages, he loses the important physical strength benefit of testosterone, as well as the bone building benefit of estradiol. Supplementing, to ensure there is ENOUGH testosterone can help to correct this.
- Building bone relies on **optimal functioning** of hormones. When hormone function fails, the result is a loss of bone. Hormones, especially testosterone, also preserves lean muscle mass for better energy and fat burning.

RECOMMENDED TIER 2 TREATMENT

	Testosterone Topical Cream (men and women)
	DHEA (men and women)
	Estradiol capsules (Women, and sometimes men)
	Progesterone capsules (women only)
	Abaloparatide (Tymlos) daily injections (maximum 24 months)**
	Teriparatide (Forteo) daily injections (maximum 24 months)**

**Use of Tymlos and Forteo carries a low but possible risk of osteosarcoma (bone cancer)

ADDITIONAL TIER 2 TREATMENT FOR SURGICAL CONSIDERATION:

- BMI targets as low as 25 to 30 **are required to have the best surgical outcomes**.
- Eat a Ketogenic or Low-Carb diet to trim fat quickly.
- How much water to drink per day: Your weight in pounds divided by 2 = how many ounces of water you should drink every day. (Always consult your primary care physician before starting any new diet regimen, and water restrictions may apply).
- Optimal thyroid function is important in order to support a high metabolic rate. You need high cellular energy to build bone and burn dangerous fat.

ADDITIONAL TIER 2 RECOMMENDATIONS FOR SURGERY

	Iodoral (Iodine/Iodide) Tablets 12.5mg for thyroid support
	Natural Desiccated Thyroid Tablets (T4 and T3)
	Liothyronine (T3) Tablets

ALTERNATIVE TREATMENTS FOR OSTEOPOROSIS:

There are other options for the treatment of osteoporosis or osteopenia such as the use of anti-resorptive agents. These agents include the bisphosphonates, such as Fosimax (alendronate), risedronate, ibandronate, and zoledronic acid. On the other hand, there are side-effects to these agents including osteonecrosis of the jaw and fractures that are not typical of osteoporosis, such as thigh fractures. Outside of the use of the Tier 1 and 2 treatment recommendations above, it is advisable for you to see a primary care provider or endocrinologist who has a special interest in mineral metabolism before utilizing bisphosphonate medications. Additionally, you may have other medical conditions and medications that can affect bone mineral metabolism that should be addressed by either your primary care physician or an endocrinologist.

CONCLUSION:

This primer should serve as a mere introduction for optimizing the metabolic aspect of your neuro-musculoskeletal care and recovery. It is important to recognize that obtaining and maintaining proper general medical condition and body mass index is also very important to your neuro-musculoskeletal health.

Miguel Schmitz, MD Susan Steadman, ARNP Michelle Moore, ARNP

Target Levels for Optimization

MALE:	**LabCorp**	**Quest Diagnostics**
Testosterone (free)	30 – 40 pg/ml (Use test code 081786)	170 - 210
Estradiol (total)	75 – 100 pg/ml	75 - 100
TSH	0.3 - 2.0 uIU/ml (0.3 optimal)	0.3 - 2.0 (0.3 optimal)
Free T3	4.0 - 4.3 pg/ml or optimize to symptom improvement	4.0 - 4.3 or optimize to symptom improvement
DHEA-S	500 – 600 ug/dl	500 - 600
Vitamin D	60-100 ng/ml	60-100 ng/ml
FEMALE:		
Testosterone (total)	200 – 300 ng/dl	200 - 300
Testosterone (free)	30 - 40 pg/ml (Use test code 081786)	6.0 - 8.0
Estradiol (total)	75 – 100 pg/ml	75 - 100
Progesterone	***	10-30 ng/ml
TSH	0.3 - 2.0 uIU/ml (0.3 is optimal)	0.3 - 2.0 (0.3 is optimal)
Free T3	4.0 - 4.3 pg/ml or optimize symptom improvement	4.0 - 4.3 or optimize symptom improvement
DHEA-S	200 – 250 ug/dl	200 - 250
Vitamin D	60-100 ng/dl	60-100 ng/ml

*** multiply progesterone serum level done at LabCorp by 3.5 to correlate with Quest diagnostics target level.

Sixth Avenue Medical Pharmacy

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Monday – Friday 8:30 AM to 6:00 PM
Saturday 9:00 AM to 1:00 PM
Sun - closed

The highly trained staff at Sixth Avenue Medical Pharmacy have worked with us to provide you with all the prescriptions and specific nutritional supplements you will need. They will work closely with you to get the best insurance coverage possible, but be aware that insurance **does not commonly** pay for "compounded hormones," even if studies show that they are more effective.

- Sixth Avenue Pharmacy will call you to arrange for payment and delivery options.
- If you have not heard from them within one week, please give them a call.