

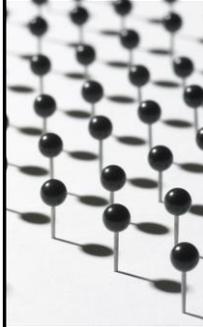


Calcium and Vitamin D Supplements

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Speaker Disclosure

- No financial relationships or affiliations to disclose.

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Poll

What is the first word that comes to mind when you think of osteoporosis and nutrition?



Text likedog261 to 22333 to participate.

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Objectives

- Identify dietary sources of calcium and vitamin D
- Describe regulation and absorption of calcium in the body
- Describe the activation and absorption of Vitamin D
- Assess sufficiency of calcium and Vitamin D intake
- Optimize calcium and Vitamin D through diet and supplements
- Identify risks of excessive supplementation
- Assess the calcium and Vitamin D needs of high-risk patients

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Role of Nutrition in Prevention and Treatment

- Overall dietary patterns rich in fruit, vegetables, whole grains, poultry and fish, nuts, seeds, and legumes, and low-fat dairy products are positively associated with bone health.
- Lifelong adequate calcium and vitamin D intake are important in prevention of osteoporosis.
- When unable to meet needs through diet, supplements may be indicated.



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Food sources of calcium

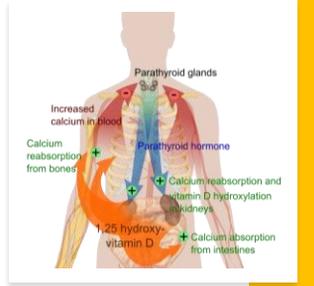
- Milk
- Yogurt
- Kefir
- Cheese
- Cottage cheese
- Ricotta
- Fortified plant milks
- Fortified juices and cereals
- Salmon and sardines with bones
- Greens – collards, kale, turnip
- Broccoli and cauliflower
- Legumes/beans
- Tofu, calcium processed
- Almonds, sesame seeds, chia seeds
- Dried fruits - figs, prunes, apricot
- Blackstrap molasses

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Calcium absorption

- Low levels of blood calcium stimulate PTH
 - Renal activation of vitamin D and reabsorption of calcium
 - Increases calcium resorption from bones
 - Increases GI absorption
- Calcium absorbed into intestinal cells with help of calbindin 9K, a protein that is regulated by vitamin D
- A magnesium dependent enzyme assists with movement of calcium from enterocytes to bloodstream
- Lower pH favors absorption from gi tract



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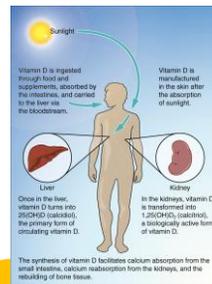


Illustration from: Anatomy & Physiology: Connections
Web site: http://aia.org/center/coll1149611_4/

Vitamin D

- Cutaneous production
- Diet, supplements
 - Few foods
- Absorbed with dietary fat
- Hydroxylated twice
 - First in liver 25(OH) Vitamin D
 - Second in kidney 1,25 (OH)₂ Vitamin D
- Facilitates absorption of calcium from gut, reabsorption from kidneys
- May also play a role in fall prevention
- Other functions

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Target intake

Table 7. Recommended Calcium and Vitamin D Intakes for Women and Men

LIFE STAGE GROUP	CALCIUM Recommended Dietary Allowance (mg/day)	CALCIUM Safe Upper Limit (mg/day)	VITAMIN D 2019-2020 Recommendation (units/day)	VITAMIN D Safe Upper Limit (units/day)
51-70 year old women	1,200	2,500	600/800-1000	4000
51-70 year old men	1,000	2,000	600/800-1000	4000
70+ years old men and women	1,200	2,000	600/800-1000	4000

From: National Osteoporosis Foundation Healthcare Professionals Toolkit

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1. What is the best way to assess dietary calcium intake?
 - a. Serum calcium
 - b. 24-hour urine calcium
 - c. DEXA scan
 - d. Dietary assessment

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Dietary Assessment

- Consult your Registered Dietitian Nutritionist

National Osteoporosis Foundation's

- [Calcium Intake Calculator](#)



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Calcium Supplements

- Controversies
 - Are they effective?
 - Do they increase risk of coronary artery disease?
 - Do they increase risk of kidney stones?
- Common Forms
 - Carbonate
 - Citrate
 - Gluconate
 - Lactate



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2. What is the best measure for vitamin D status?

- a. 25 (OH) Vitamin D
- b. 1,25 (OH) Vitamin D₂
- c. Total vitamin D
- d. Dietary assessment

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Vitamin D units of measure

- International Units (IU) or micrograms (mcg)
 - 1 IU = 0.025 mcg
 - 1000 IU = 25 mcg
 - 2000 IU = 50 mcg
- Serum levels measured in ng/mL or nmol/L

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Vitamin D supplements

- Deficiency <20 ng/mL
 - 50,000 IU Vitamin D₂ or D₃ weekly or 6000 IU daily x 8 weeks then reassess;
 - follow with 50,000 IU D₂ every other week or 1000 – 2000 IU's for maintenance
 - For patients on Medicare, must use appropriate diagnosis code to check levels
- Insufficiency 20 - < 30 ng/mL
 - No clear guidelines. ~1000 – 4000 IU Vitamin D₃ daily
- Sufficiency ≥ 30 ng/mL
 - RDA Adults age 50 – 70 = 600 IU
 - RDA Adults age 70+ = 800 IU
 - may need up to 1500 – 2000 IU for level >30 ng/mL
- Toxicity – hypercalcemia, hypercalcuria

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Vitamin D special considerations

- Higher repletion and maintenance doses
 - Obesity
 - Malabsorption
 - Anticonvulsant Meds
 - Glucocorticoids
- Caution with
 - Extra-renal production – sarcoidosis, TB

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Osteoporosis in special populations: Transplant

- Specific risk factors for solid organ transplant
 - Pre-existing bone disease in end-stage organ failure
 - Immobilization, sedentary lifestyle
 - Glucocorticoid usage
 - Smoking history
 - Alcohol history
 - Secondary hyperparathyroidism in kidney transplant
 - Hypomagnesemia from calcineurin inhibitors

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Case study 1

- 60 year old female with cirrhosis and end stage liver disease. History of alcohol use disorder; quit drinking 6 months ago. She has ascites and +2 BLE edema. Being evaluated for liver transplant.

Height 160 cm (63") Weight 65 kg (143 lbs) BMI 25 kg/m²

Labs:

133	95	24	107	Calcium 9.0 mg/dL	Magnesium 1.3 mg/dL
4.2	28	1.24			

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Case study 1

- Diet recall:
 - Breakfast 1 soft boiled egg, 1 slice toast with jelly
 - Lunch – tuna salad sandwich, fruit
 - Dinner – stewed chicken – 1 thigh or ½ breast, string beans, rice. Uses KCL salt sub
 - Snacks – loves fruit
 - Beverages – Iced green tea. 48 oz fluid restriction due to hyponatremia and ascites.
- Meds – folic acid 1 mg, pantoprazole 40 mg, spironolactone 100 mg, furosemide 40 mg, cholecalciferol 25 mcg

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Case study 1

- Does her BMI put her at risk for osteoporosis?
- Is her calcium intake adequate?
- How would you evaluate her vitamin D status?
- How does her hypomagnesemia affect her risk of osteoporosis?
- What tests would you order?
- What referrals should you make?
- What dietary suggestions might the Registered Dietitian make?

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Case study 2

- 61 year old female s/p double lung transplant for interstitial lung disease with bronchiectasis. GFR declining due to CNI toxicity, has hyperkalemia and hyperphosphatemia with GFR 27. Hemoglobin A1C in prediabetes range due to prednisone. Placed on renal diabetic diet, told to reduce potassium, phosphorus, cholesterol, and sugar.
- DXA: L1-L4 T score -2.5, femoral neck -2.6. 1% decrease in spine from prior study and 3% decrease femoral neck.
- Labs:

25(OH) vitamin D	21 ng/mL
PTH	38 pg/mL
Potassium	4.9 - 5.6 mmol/L
Phosphorus	5.0 - 5.5 mg/dL
Magnesium	2.0 mg/dL

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Case study 2

- Breakfast** - 2 eggs or bagel, iced tea
Lunch - not sure what to eat, skips
Dinner - spaghetti and meatballs, pork, chicken
Snacks - popcorn, candy
Beverage intake: iced tea with sugar 6-8 cups per day
- Ht 168 cm (66") Wt 50.3 kg (110.7 lbs) BMI 17.7 kg/m²
 - Meds include: prednisone 5 mg, tacrolimus 1 mg BID, valganciclovir 450 mg, pantoprazole 40 mg, Mg Chloride 64 mg. Changed from alendronate to abaloparatide due to CKD.

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Case Study 2

- How do you address her calcium and vitamin D needs?
- What do you need to consider from a dietary standpoint given her pre-diabetic state and declining renal function?
- What referrals does she need?

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Case Study 2: 6 months later

- Anti-rejection meds adjusted
- Eating more, added oral nutrition supplement and "kidney friendly" sources of dietary calcium
- BMI up to 18.5 kg/m²
- 25 (OH) Vitamin D 35 ng/mL
- Potassium and phosphorus controlled
- HbA1C normal

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Conclusions

Questions?

Take home messages:

- Identify patients at high risk for osteoporosis
- Assess calcium intake and vitamin D status
- Optimize calcium and vitamin D intake through diet and supplements

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