

Role of Calcium and Vitamin D in Promoting Health

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Calcium and Vitamin D: Outline

1. What do they do?
2. Why care about nutrient recommendations?
3. Why important with aging?
4. Good sources?
5. Recommendations.



Johnson, MA & Kimlin, MG, Vitamin D, Aging, and the
2005 Dietary Guidelines for Americans, Nutrition Reviews, 2006 (Fall) 2

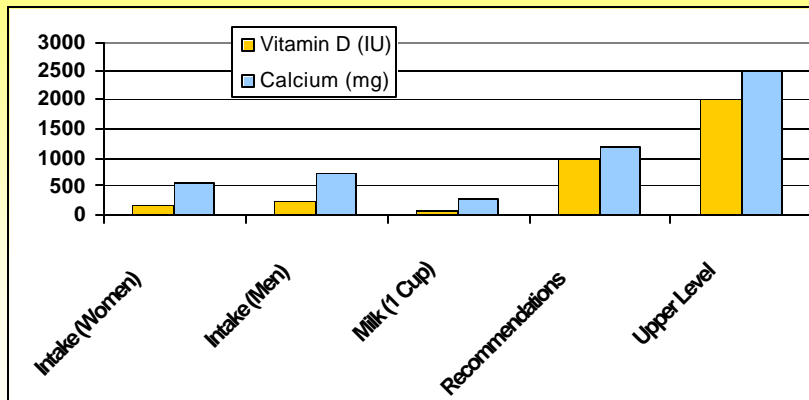
What is calcium?

- **Essential nutrient**
 - Mainly in dairy foods
 - Fortified foods
 - Supplements
- **Needed for**
 - Bones and teeth
 - Nervous system
 - Other organs



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Vitamin D and Calcium Intake are Low in Older Adults



DHHS & USDA, 2005; Ervin et al., 2004;
IOM, 1997; Moore et al., 2004

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What is vitamin D?

- **Essential nutrient**
 - Skin from sunlight
 - Fish, mushrooms
 - “Fortified” (e.g., milk)
- **Needed for**
 - Calcium absorption
 - Bone & teeth
 - Other organs



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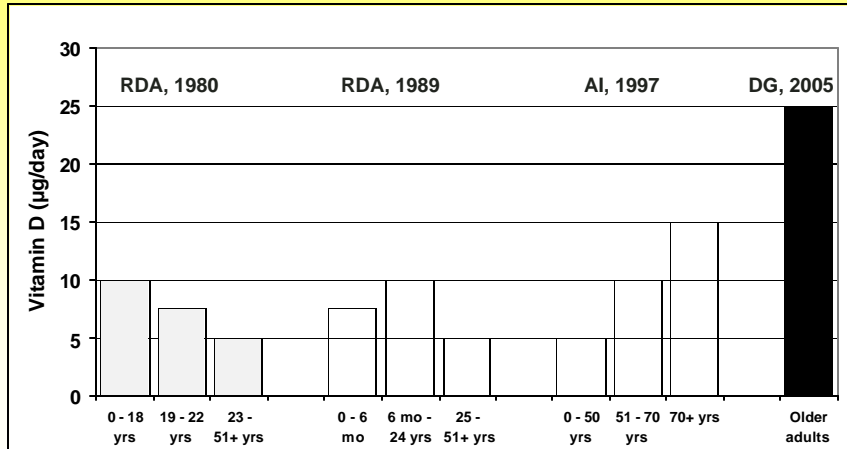
Why care about nutrient recommendations?

- **Support health**
- **New research**
- **Meal planning**
- **Primary:**
 - 2005 Dietary Guidelines for Americans
 - RDAs, other, Institute of Medicine



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Changes in vitamin D recommendations



Abbreviations: AI, Adequate Intake; DG, Dietary Guidelines;
RDA, Recommended Dietary Allowance.

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2005 Dietary Guidelines

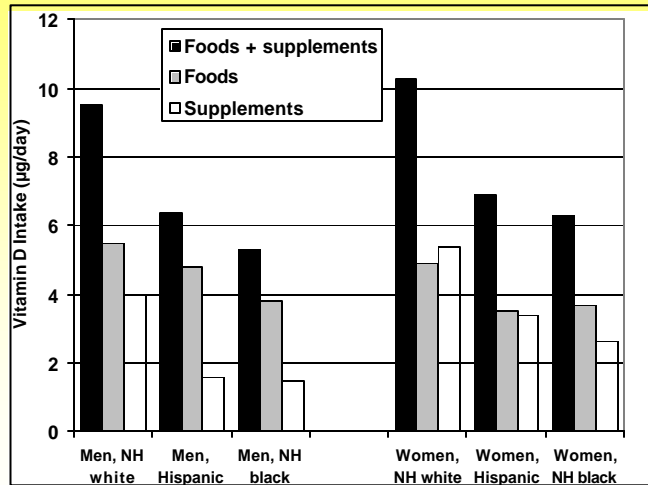


- Consume “extra vitamin D (25 ug or 1,000 IU/day) in populations at risk of vitamin D deficiency, such as older adults, people with darker skin, and people exposed to insufficient UV radiation.”
- Why?
 - Low skin synthesis

USDHHS & USDA, 2005, www.health.gov

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Current intakes: vitamin D

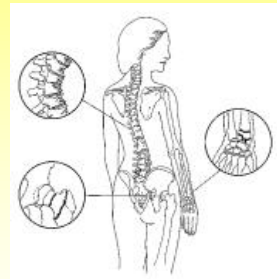


NHANES 1999-2000, Age 50 and Older, Moore et al., 2005

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Why is vitamin D important for older adults?

- **Intervention:** vitamin D supplements decrease:
 - Fractures (by > 20%)¹
 - Falls (by > 20%)²
- **Observation:** low vitamin D *might* increase:³
 - Cancer, hypertension, depression
 - Other conditions



¹Bischoff-Ferrari et al., 2005; ²Bischoff-Ferrari et al., 2004; ³Holick, 2005

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Low blood or dietary vitamin D:

- Congestive heart failure¹
- Peripheral arterial disease²
- Pain^{3,4}
- Lower back pain⁵
- Periodontal disease⁶
- Poor muscle function⁷
- Disability⁸
- Diabetes, heart disease, cancer, immune disorders⁹
- Falls, low BMD, fractures, osteoporosis¹⁰



¹Zitterman et al., JACC, 2003; ²Fahrleitner et al., JGIM, 2002; ³Plotnikoff and Quigley, Mayo Clin. Proc., 2003; ⁴Mascarenhas and Mobarhan, Nutr. Rev., 2004; ⁵Al Faraj and Mutairi, Spine, 2003; ⁶Dietrich et al., AJCN, 2004; ⁷Pfeifer et al., Osteo. Int., 2002; ⁸Bischoff-Ferrari et al., AJCN, 2004; ⁹Sharkey et al., JNHA, 2004; ¹⁰Holick, AJCN, 2004; ¹⁰Bischoff-Ferrari et al., JAMA, 2004; Chapuy et al., NEJM, 1992; Dawson-Hughes et al., NEJM, 1997; Papadimitropoulos et al., Endoc. Rev., 2002; Shea et al., 2002.

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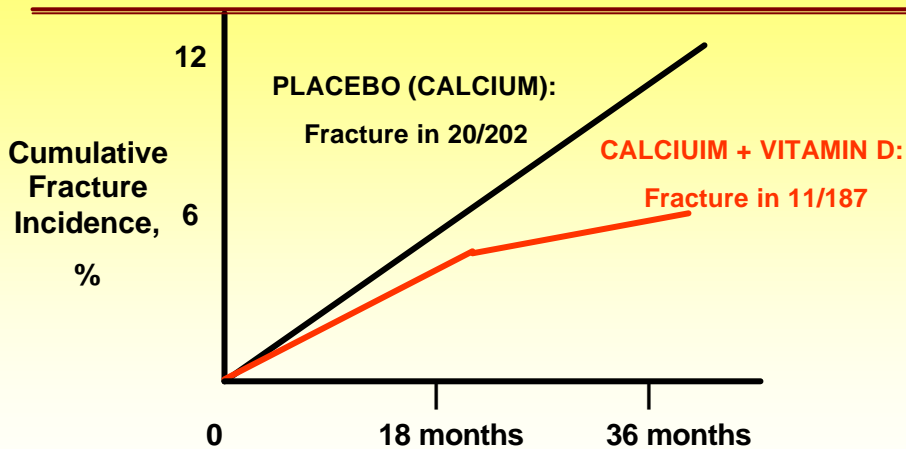
Vitamin D and Calcium Supplements Decrease Fracture Risk

| | |
|--------------|--|
| Boston | 176 Men, 213 Women, community, 65+ yrs Calcium intake = 700 mg/day Vitamin D intake = 200 IU/day |
| Dose | Placebo (500 mg Ca) <u>or</u> 500 mg Ca + 700 IU vitamin D, 3 years |
| Benefits | Slowed bone loss, p<0.05 Decreased fractures (non-vertebral), p = 0.02 |
| Side-effects | Ca+D: 1 hypercalciuria, 1 sweating, 1 epigastric distress, 3 constipation |

Dawson-Hughes et al., NEJM, 1997

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Vitamin D and Calcium Supplements Decrease Fracture Risk



Dawson-Hughes et al., NEJM, 1997

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Why did two new studies of vitamin D and calcium supplements find no benefits?

- **Porthouse et al., BMJ, 2005**
 - 1° prevention of fractures in women at risk
 - Placebo vs. 800 IU D3 and 1000 mg calcium
 - Rate of fractures < 5% (about ½ of expected)
 - < 60% compliance with supplements
 - Baseline mean calcium intake was > 1000 mg/day
- **RECORD, Lancet, 2005**
 - 2° prevention of fractures in men and women
 - 800 IU D3 and/or 1000 mg calcium (2 x 2)
 - < 60% compliance with supplements
 - Serum 25(OH)D increased from 38 to 62 nmol/L (not in beneficial range)

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Will eating more low fat dairy products, calcium, and vitamin D help me lose weight?

- **Best chance for weight loss**
 - Decrease energy intake
 - Increase physical activity
- **3 cup low-fat milk/day recommended**



Zemel, JACN, 2005, http://www.jacn.org/cgi/reprint/24/suppl_6/537S
Harvey-Berino et al., 2005, <http://www.obesityresearch.org/cgi/reprint/13/10/1720>

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Good sources of vitamin D

Need 1,000 IU/day (or 25 ug)

FOODS:

- 100 IU/cup: fortified milk, yogurt, orange juice
- 400 IU in 4 ounces salmon

SUPPLEMENTS:

- 400 IU in most multivitamins
- 1,000 IU in new multivitamins
- 0 to 400 IU in calcium supp's
- 400, 800, or 1,000 IU in vitamin D supp's



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Practical Recommendations

1. The new recommendation for vitamin D for older adults is 25 mg (1000 IU) daily.
2. Consume vitamin D-fortified foods such as milk daily.
3. Most older people will need dietary supplements that provide 20 to 25 mg (800 to 1000 IU) of vitamin D daily. Vitamin D₃ is the preferred source because of its superior bioavailability.
4. Assure older adults that they can take more than 100% of the Daily Value of 10 mg (400 IU) that is listed on the Supplement Facts Panel.

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Practical Recommendations

5. Do not exceed the Upper Level for vitamin D of 50 mg (2000 IU) daily, unless under a physician's care.
6. Most older people don't eat enough calcium, so calcium supplements may also be needed.
7. Consult a registered dietitian and your physician for assistance with choosing a dietary supplement.



EXAMPLE:

If consume 1 cup milk daily, then take

- ✓ 400 IU in a multivitamin
- ✓ 400 IU vitamin D supplement
- ✓ 500 mg calcium

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Practical Recommendations

- 8. Do not recommend or self-prescribe additional sun exposure or artificial UV radiation to meet the vitamin D recommendation for older people. Instead, to reduce the risk of skin cancer, increase sun protective behaviors such as avoiding the sun between 10 a.m. and 4 p.m., wearing sun-protective clothing when exposed to sunlight, using sunscreen with a sun-protection factor (SPF) of 15 or higher, and avoiding artificial sources of UV radiation.**

Healthy People 2010, www.healthypeople.gov

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Further Reading

**Mary Ann Johnson, PhD
Michael G. Kimlin, PhD
University of Georgia and Queensland
Technical University
Vitamin D, Aging, and the 2005 Dietary
Guidelines for Americans
Nutrition Reviews, 2006 (fall)**

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Vitamin D and Calcium Intake are Low in Older Adults

| | Vitamin D (IU/day) | Calcium (mg/day) |
|------------------------|-----------------------|---------------------|
| Intake | | |
| Men | 232 | 716 |
| Women | 180 | 563 |
| Milk, 1 cup | 100 | 300 |
| Recommendations | 1,000 | 1,200 |
| Upper Level | 2,000 | 2,500 |

DHHS & USDA, 2005; Ervin et al., 2004;
IOM, 1997; Moore et al., 2004