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Nutrition 102 – Class 1

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Welcome to Nutrition 102

- Live class from Washington, DC
  - June 18th
- Webinar classes
  - June 28th, July 12th, July 19th,

    July 26th, August 2nd

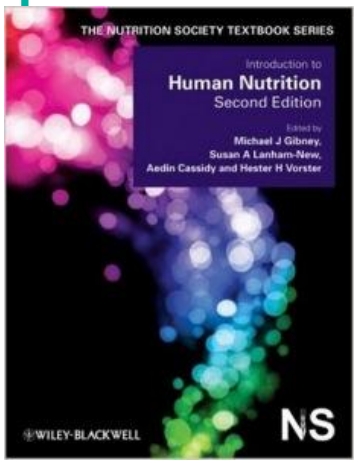
Archived

- All classes for 1 year

"Introduction to Human Nutrition" second edition

Edited by Michael J. Gibney, Susan A. Lanham-New, Aedin Cassidy, and Hester H. Vorster

May be purchased online but is not required for the class.



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Nutrition 102 Classes

- Week 1 – Vitamins A and D
- Week 2 – Vitamins E , K, C and Bioflavonoids
- Week 3 – B Vitamins
- Week 4 – Minerals and Trace Elements
- Week 5 – Minerals and Trace Elements
- Week 6 – Food additives, preservatives, artificial sweeteners, and measuring food intake

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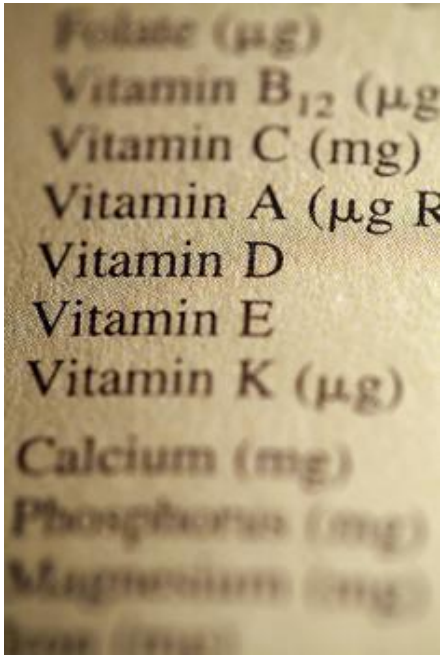
Priorities for Today's Session

- Define vitamins
- Examine Vitamins A and D
  - What it is
  - Source
  - Function
  - Requirement
  - Absorption
    - Deficiency
    - Toxicity



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What Are Vitamins

- Chemical group of compounds
- Organic
- Required in very small amounts
- Fat soluble
- Water soluble

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Vitamin A

- First vitamin to be discovered
- 2 groups
  - Preformed Vitamin A
    - Retinol, retinaldehyde, and retinoic acid
  - 50 Carotenoids
    - Beta-carotene

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Sources for Vitamin A

- Preformed Vitamin A
  - Best source is liver
  - Animal sources such as eggs, meat and dairy products

- Carotenoids
  - Best sources are green, yellow, and red fruits and vegetables
  - Liver, margarine, milk and milk products

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Function of Preformed Vitamin A

- Role in vision
  - As the prosthetic group of the light sensitive proteins in the retina
- Role in regulation of gene expression and tissue differentiation
- Retinoic acid is essential for the responses to Vitamin D, thyroid hormone and long chain PUFA derivatives

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Function of Carotenoids

- Precursors of Vitamin A
- Antioxidant action
- Lower incidence of cancer and cardiovascular disease

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Prudent upper levels of Vitamin A

Age Group	Upper limit of intake (ug/day)	Reference intakes (ug/day)
Infants	900	350-375
1 – 3 years	1800	400
4 – 6 years	3000	400-500
6 – 12 years	4500	500-700
13 – 20 years	6000	600-700
Adult men	9000	600-1000
Adult women	7500	600-800
Pregnant women	3000-3300	700

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Retinol Absorption

- 70-90% absorbed
- Absorbed from the small intestine dissolved in lipid
- Very low fat intake (less than 10% of energy from fat), impairs absorption of both retinol and carotene
- Low fat diets are associated with Vitamin A deficiency

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Absorption for Carotenoids

- Biological availability and absorption varies between 5-60%
  - Nature of food
  - Cooked or raw food
  - Amount of fat in meal

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Vitamin A Deficiency

- Worldwide, major public health problem
- Most preventable cause of blindness
- Mild deficiency leads to increased susceptibility to a variety of infectious diseases – impairs immune response

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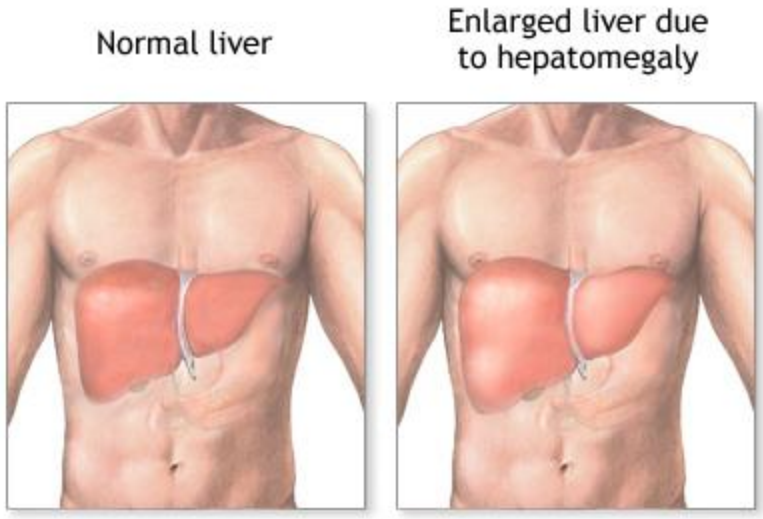
Vitamin A Toxicity

- Limited capacity to metabolize vitamin A
- Excessive intake accumulates in the liver and other tissues
- Leads to liver and bone damage, hair loss, vomiting, and headaches



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Chronic Toxicity of Vitamin A

- Prolonged and regular intake of more than 7.5-9 mg/day by adults
  - CNS
  - Liver
  - Bones
  - Skin
  - Impaired responsiveness to Vitamin D

Vision Impairment

- Initially , loss of sensitivity to green light
- Next, impairment to adapt to dim light
- Then, inability to see all in dim light: night blindness
- Severe → xerophthalmia: keratinization of the cornea, followed by ulceration – irreversible damage to the eye that causes blindness

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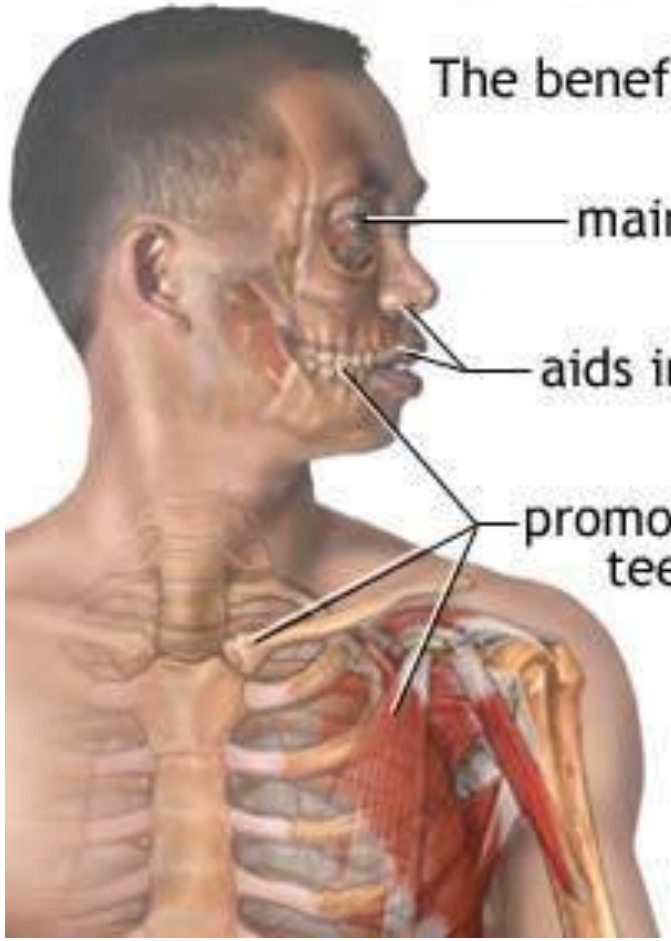
Vitamin A



The benefits of vitamin A:

- maintains health of specialized tissues such as the retina
- aids in growth and health of skin and mucous membranes
- promotes normal development of teeth, soft and skeletal tissue

Adult RDA: 1000 µg RE

Fat-soluble

A.D.A.M.

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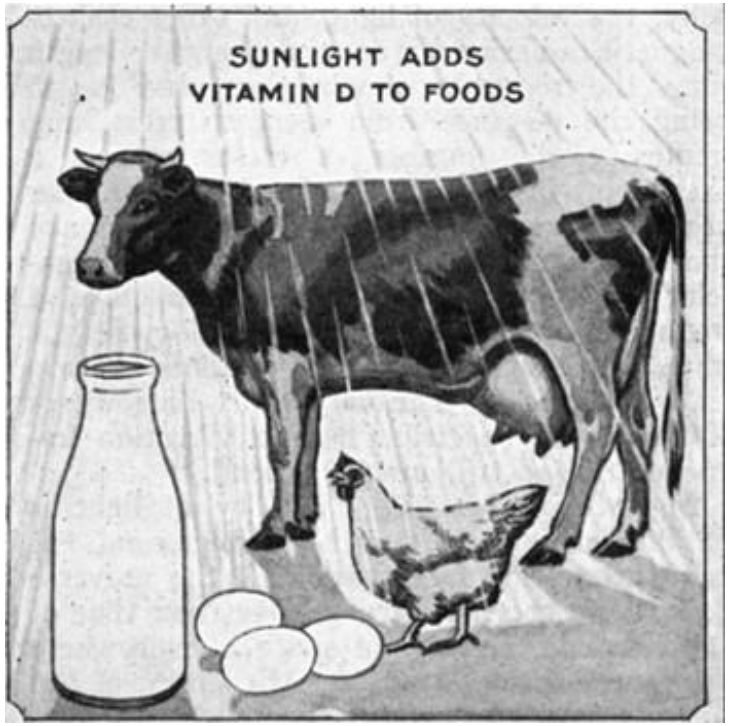
Vitamin D

- Vitamin D1 – irradiation of ergosterol
- Vitamin D2 – ergocalciferol (some enriched foods)
- Vitamin D3 – normal dietary form of Vitamin D is cholecalciferol (calciol)



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Sources for Vitamin D

- Synthesized in the skin when sunlight exposure is adequate
- Food sources: oily fish, eggs, liver, butter, fortified milk containing ergocalciferol

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Vitamin D Function

- Regulation of calcium absorption and homeostasis
- Mediated by nuclear receptors that regulate gene expression

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Vitamin D Requirements

- Difficult to determine since major source is synthesis in the skin
- Increased sunlight exposure improves Vitamin D status without risk of toxicity, but sunlight exposure is a cause of skin cancer

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Adequate Intake (AI) for Vitamin D			
Life Stage	**Age**	**Males** mcg/day (IU/day)	**Females** mcg/day (IU/day)
Infants	0-12 months	5 mcg (200 IU)	5 mcg (200 IU)
Children	1-13 years	5 mcg (200 IU)	5 mcg (200 IU)
Adolescents	14-18 years	5 mcg (200 IU)	5 mcg (200 IU)
Adults	19-50 years	5 mcg (200 IU)	5 mcg (200 IU)
Adults	51-70 years	10 mcg (400 IU)	10 mcg (400 IU)
Adults	>70 years	15 mcg (600 IU)	15 mcg (600 IU)
Pregnancy	all ages	—	5 mcg (200 IU)
Breast-feeding	all ages	—	5 mcg (200 IU)

Abbreviations: mcg = microgram, IU = international unit

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Vitamin D Absorption

- Absorbed in lipid micelles and incorporated into chylomicrons
- People on a low-fat diet will absorb little of such dietary Vitamin D as is available

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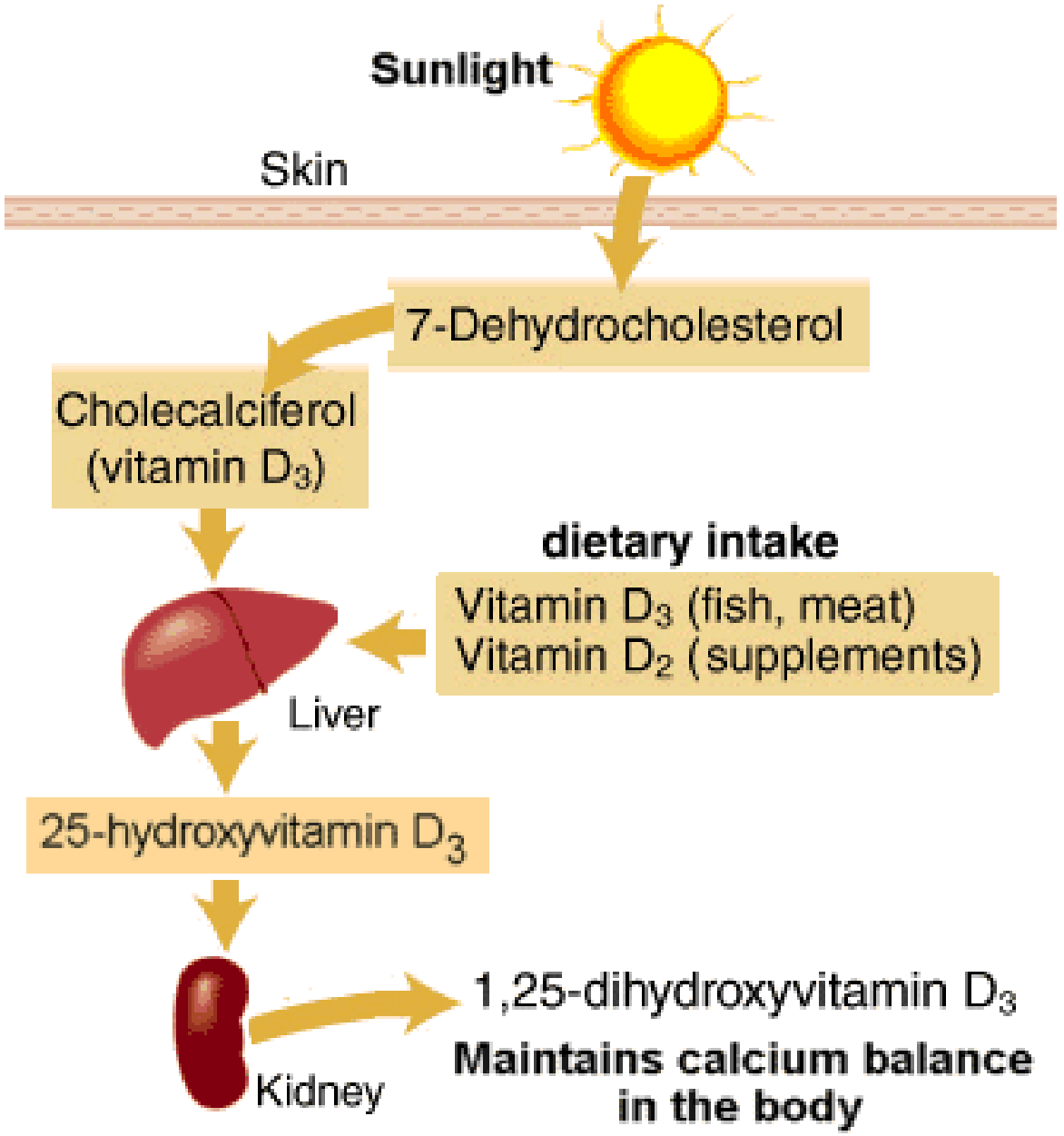
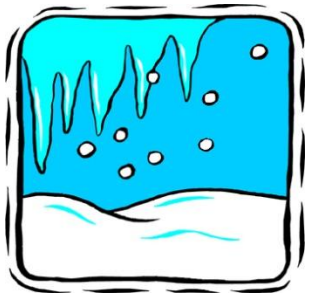


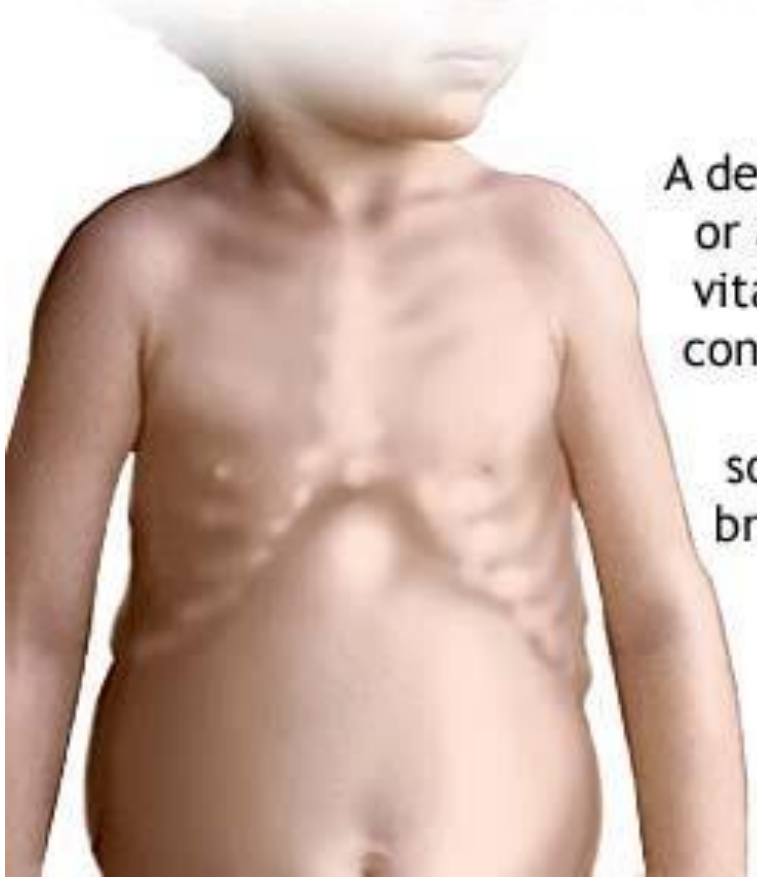
Climate Effect on Absorption of Vitamin D

- Temperate Climates
  - Plasma concentration of Vitamin D is highest at the end of summer and lowest at the end of winter
  - Summer – considerable amount of UV light even on a cloudy day and can penetrate thin clothes

- Northerly Climates
  - Polluted, industrial cities with little sunlight may not provide enough UV light to meet Vitamin D needs
  - Need to rely on dietary sources of Vitamin D



Vitamin D



A deficiency of vitamin D or an inability to utilize vitamin D may lead to a condition called rickets, a weakening and softening of the bones brought on by extreme calcium loss

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Low Vitamin D Status

- Impaired glucose intolerance
- Insulin resistance and non-insulin dependent diabetes mellitus
- Obesity and the low grade chronic inflammation associated with (especially abdominal) obesity
- Factor in etiology of some cancers

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Vitamin D Deficiency

- Rickets
  - Toddler and adolescent disease
  - Bow-legs or knock knees
  - Can lead to collapse of ribcage and pelvic bone deformities
- Osteomalacia
  - Adult disease especially older people
  - Demineralization of bone
  - Highest risk are women with little sunlight exposure and several pregnancies

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Vitamin D Toxicity

- Vitamin D poisoning
  - elevated plasma concentration of calcium
    - Leads to contraction of blood vessels
      - dangerously high blood pressure
    - Also leads to calcinosis
      - calcification of soft tissues including kidney, heart, lungs, and blood vessel walls

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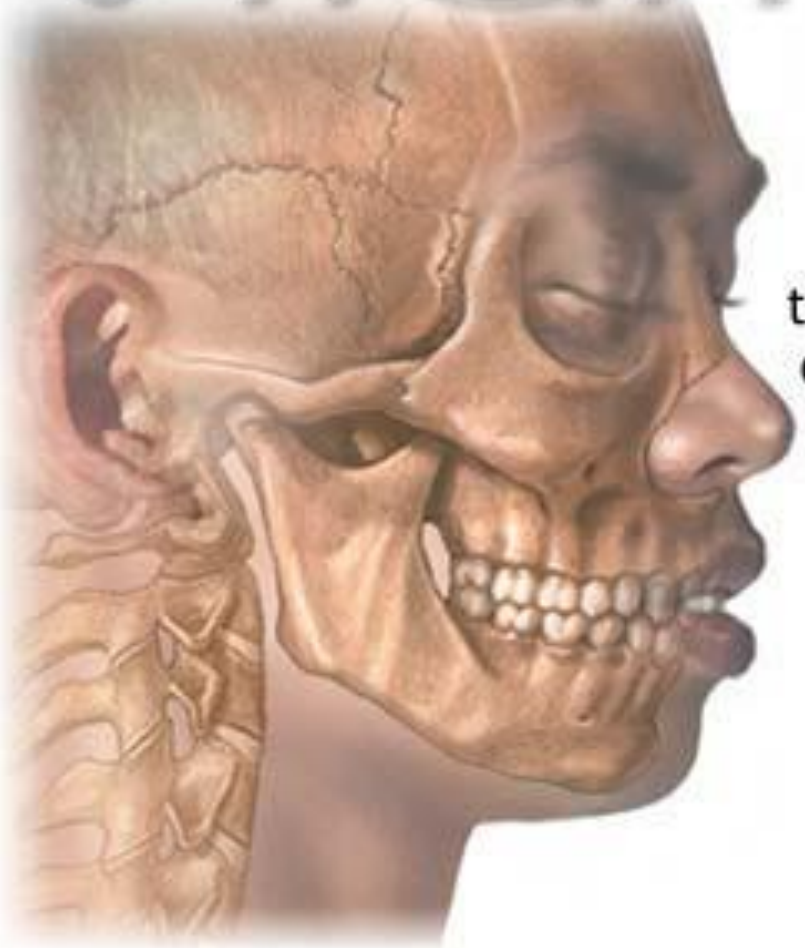
Vitamin D



Vitamin D promotes the body's absorption of calcium, essential to development of healthy bones and teeth

DRI: 5 µg

Fat-soluble

A.D.A.M.

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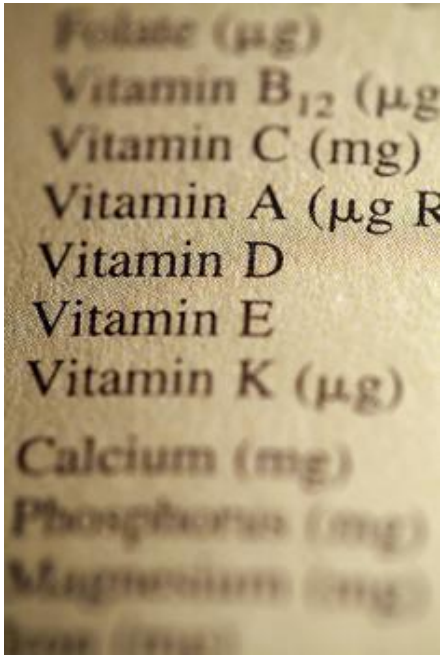

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Questions, Comments

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