

Chapter 9
Vitamins:
Fact and Fallacies

Hewlings/Medeiros

PowerPoint presentation created by
Susan J. Hewlings, PhD, RD

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**Vitamins: A Little Goes
a Long Way**

- Vitamins are required only in mg and mcg.
- Macronutrients need them to function.
- Not a fuel source
- Stored in small amounts compared to macronutrients

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Macronutrients and Micronutrients

Contributions of vitamins and minerals
to body weight of a 175 lb man.

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Water-Soluble Vitamins

- Thiamin
- Riboflavin
- Niacin
- Folate
- Biotin
- Pantothenic acid
- Vitamin C
- B₆
- B₁₂

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Fat-Soluble Vitamins

- Vitamin A
- Vitamin D
- Vitamin E
- Vitamin K

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Provitamins

- Precursors
- Beta-carotene (converted to vitamin A)
- Tryptophan (converted to niacin)

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Vitamin A

- Three different chemical forms:
 - Retinol
 - Most active form
 - Stored in liver
 - Retinol
 - Retinoic acid

Retinol Activity Equivalents (RAE)
Beta-carotene and other precursors

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Vitamin A Functions

- Normal vision
- Gene regulation
- Immune function
- Bone growth
- Reproduction
- Production of red blood cells
- Cell membrane stability
- Integrity of epithelial cells
- Synthesis of cortisol
- Maintenance of nerve lining

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Role of Vitamin A in Night Vision



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Vitamin A and Eyesight

- Vitamin A deficiency number-one cause of blindness worldwide
- Early sign = night blindness
- Healthy cornea
- Xerophthalmia
- Bitot spots
- Macular degeneration disease

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Vitamin A Toxicity

- Very toxic
 - Stored in fat and liver
 - Affects the same tissues as deficiency
 - Seen historically in Eskimos
- Pregnant women must be very careful.


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Recommended Intakes of Vitamin A

- DRI is 900 mcg for men, 700 mcg for women
- Breast-feeding—1,200 to 1,300 mcg
- Tolerable Upper Intake is 3,000 mcg
- Beware of supplements: It is easy to reach toxic levels.
- Beta-carotene not as dangerous

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Sources of Vitamin A



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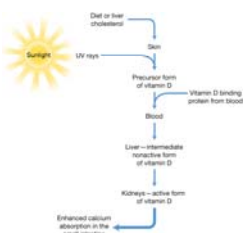
Vitamin D

- Classified as a hormone and a steroid
- Also called cholecalciferol
- Controls metabolism of calcium and phosphorus
- Deficiency = rickets in children; osteomalacia in adults

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Making Your Own Vitamin D

- The body can make vitamin D on exposure to sunlight.



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Recommendations and Food Sources of Vitamin D

- DRI 5 mcg/day; 10 mcg/day for adults 50–70; 15 mcg for adults over 70
- Vitamin D fortified milk or milk products and margarine
- Liver
- Sardines
- Salmon
- Shrimp

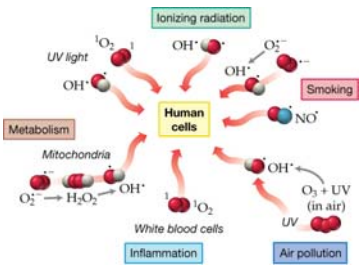
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Vitamin E: A Vitamin That Fights Free Radicals

- Vitamin E = a group of compounds: four different types of tocopherols
- Alpha tocopherol: greatest vitamin E activity
- Essential for reproduction, immune function, nerve cells
- An antioxidant nutrient = it fights free radicals

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Free Radical Sources



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Vitamin E

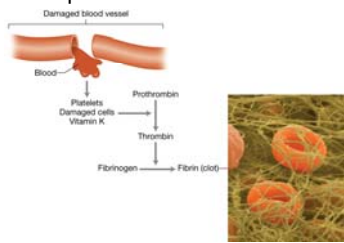
- DRI 15 mg for adults
- UL is 1,000 mg
- Can be toxic
- Deficiency rare
 - (except in premature infants)
- Food sources
 - Vegetable oils, wheat germ, nuts, seeds, green leafy vegetables



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Vitamin K

- Blood clotting
- Bone development




The diagram shows a cross-section of a blood vessel with a tear. Blood is leaking out. Labels include: Damaged blood vessel, Blood, Platelets, Damaged cells, Vitamin K, Prothrombin, Thrombin, Fibrinogen, and Fibrin (clot). An arrow points from the blood vessel to the clotting factors. A photograph of several red tomatoes is shown to the right of the diagram.

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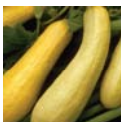
Vitamin K

- Green leafy vegetables: spinach, collard greens, Brussels sprouts, broccoli, asparagus
- Made in body
- Deficiency rare in adults
- DRI 120 mcg for men and 90 mcg for women
- Can be toxic



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Are You Getting a VARIETY of Vegetables?



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Vitamin C: Ascorbic Acid

- Deficiency = scurvy
- **DRI** = 90 mg for men, 75 mg for women (10–15 mg to prevent scurvy)
 - Greater in smokers
- Toxicity: very low
- Functions
 - Antioxidant (watery parts of cell)
 - Production of collagen
 - Immune function
 - Wound healing
 - Blood vessel structure

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Food Sources of Vitamin C

Citrus fruits, green peppers, strawberries, tomatoes, broccoli and sweet and white potatoes are all excellent sources of Vitamin C.

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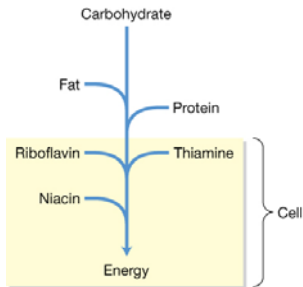
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B-Complex Vitamins

- Key role in energy metabolism
- Thiamin, riboflavin, niacin, pantothenic acid, and biotin release energy from macronutrients.
- B₆ and B₁₂, amino acids
- B₁₂, breakdown of stored carbohydrates
- Function as coenzymes and cofactors

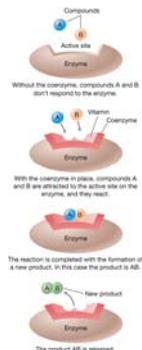
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Vitamins in Energy Metabolism



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How Cofactors Work



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Vitamin B₁ (Thiamin)

- Releases energy from carbohydrates
- Nerve function - synthesis of the neurotransmitter acetylcholine
- Deficiency = beriberi
- DRI = 1.2 mg/day for men; 1.1 mg/day for women

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Vitamin B₂ (Riboflavin)

- Major role in carbohydrate and fatty acid breakdown
- Deficiency
- Often with thiamin deficiency
- Cracked mouth, inflamed tongue, skin rashes, hypersensitivity to light
- DRI = 1.3 mg/day for men; 1.1 mg/day for women

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Vitamin B₃ (Niacin)

- Found in two forms: nicotinic acid and nicotinamide
- Release of energy from macronutrients and fatty acid synthesis
- Deficiency = pellagra (the four Ds)
 - diarrhea, dermatitis, dementia, and death
- DRI = 16 mg/day for men; 14 mg/day for women
 - Synthesized from amino acid tryptophan
 - Every 60 mg of tryptophan in the diet = 1 mg niacin
- Toxicity can occur
 - UL 35 mg/day

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Food Sources

- **Thiamin:**
 - Pork, whole grains, breakfast cereals, enriched grains and pasta, green beans, milk, orange juice, organ meats, peanuts, dried beans, and seeds
- **Riboflavin:**
 - Milk, enriched breads, cereals, pastas
- **Niacin:**
 - Milk, eggs, meat, poultry, fish, whole grains, enriched breads and cereals, nuts
 - Tryptophan: Red meat, dairy, nuts, seeds, bananas, tuna, shellfish, turkey, soy

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Vitamin B₆

- Three active forms: most active, pyridoxine
- Converts one amino acid into another (transamination)
- Deficiency:
 - Diverse symptoms
 - Depression
 - Vomiting
 - Dermatitis
 - Convulsions
 - Decreased immunity
- Functions:
 - Tryptophan to niacin
 - Production of serotonin
 - Hemoglobin synthesis
 - Immune system
 - Glycogen breakdown
 - Fetal brain development

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Food Sources of Vitamin B₆

- Beef liver
- Meat, poultry
- Baked potato
- Banana
- Broccoli
- Spinach
- Water melon
- Salmon and navy beans
- DRI 1.3 mg/day
- UL 100 mg/day

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Folate and B₁₂

- Work together
- Supplementation of one can mask deficiency of the other
- Red blood cells
- Nervous system
- Deficiency = anemia

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Folate

- Functions
 - Hair, skin, lining of digestive and urinary tracts
 - Cell division
- Deficiency = macrocytic anemia
 - Spina bifida in babies



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Folate

- DRI is 400 mcg/day
- Pregnant women 600 mcg/day
- Folic acid
 - Synthetic form supplements enriched foods
 - Stronger = greater toxicity
- UL 1 g
- High dose masks B₁₂ deficiency


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Food Sources of Folate

- Orange juice
- Green leafy vegetables
- Organ meats
- Sprouts
- Beans
- Vegetables
- Cereal
- Bread



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Vitamin B₁₂

- Has mineral cobalt
- Synthesized by bacteria
- Found in animal sources
- Converts folate coenzymes to active form
- Maintains nerve linings
- Intrinsic factor
 - Pernicious anemia

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Food Sources of B₁₂

- Animal foods
- Milk and cheese
- Meat
- Poultry
- Seafood
- Fortified soy products
- Cereals
- Vegans need to be sure to consume adequate amounts, especially when pregnant.
- DRI 2.4 mcg/day
- No toxicity reported

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Homocysteine

- Elevated homocysteine = increased risk of heart disease
- B₁₂ and folate lower levels

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Biotin and Pantothenic Acid

- Help to obtain energy from macronutrients
- Biotin = cofactor for metabolism enzymes
- Pantothenic acid = fatty acid synthesis of lipids, steroid hormones, neurotransmitters, and hemoglobin
- Deficiencies rare

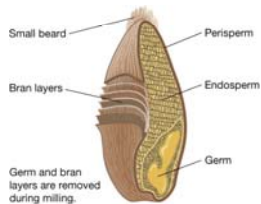
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Enrichment

- Adding nutrients present in food before processing
- Mandatory in milled, refined, or polished grains
- Thiamin, riboflavin, niacin, and iron must be added



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Fortification

- When vitamins and minerals are added to food that are not naturally found in that food
- Mandated that A and D be added to milk and folic acid in enriched cereal and grain

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Do You Need a Multivitamin?

- Maybe
- Assess your diet.
- Remember, enriched and fortified foods contribute.
- Do your homework.
- Be careful of toxicities.
- More is not always better.

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