Vitamins

The Nature of Vitamins :

- Vitamins are organic (carbon) compounds needed for normal function, growth and maintenance.
- Vitamins are cofactors, they don't do anything by themselves.
- They are not a source of calories.
- Organic cofactors
- Physiological role – specific metabolic function
- Prevents disease – unlike "supplements" which may promote "some thing" or have general metabolic effect

(ex. Omega 3s, fibers)

- Natural = Synthetic (except Vitamin E)
- Nutritional Value lost by:
  - Light
  - Heat
  - Oxidation
  - Bacteria
  - Enzymes
  - Insects
  - (Nutritional value of baby food must be assured.)
- Food processing can preserve nutrients.

Vitamin Requirements:

- Daily Values (DV): standard nutrient intake values developed by FDA
  - Includes DRIs (Daily Recommended Intakes for Individuals) and (DRVs) Daily Recommended Values (Proteins, etc.)
  - Disease prevention
  - Best met through a consumption of a wide variety of foods
- Dietary Reference Intakes (DRI): recommendation for *individuals* (more accurate, but would be impossible to label)
  - Age
  - Gender
  - Pregnancy
  - Lactation
- Daily Reference Values (DRV): standards established for protein and other dietary components lacking nutrient standard
- Constitute part of the Daily Values (DV) used on food labels

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Fat Soluble Vitamins:

- **A** – orange, carotenoids, vision, antioxidant- used as color and antioxidant
- **D** – we make it with sunlight, deficiency causes rickets, in milk, regulates Ca:P ratios
- **E** – tocopherols, antioxidants, role in preventing stroke, cancer, heart disease- used as antioxidant
- **K** – contributes to blood clotting factor

Vitamin A:

- Carrotinoids Used in food industry as a colorant (orange)
- Antioxidant
- Stored in liver
- Important for sight
  - Deficiency causes ~500,000 cases of "night blindness" worldwide, Rough, scaly skin and infections in the respiratory tract and other areas of the body.
- Genetically engineered rice with high Vitamin A can prevent night blindness
- **Carrotenosis**

Vitamin D:

- Also known as calciferol due to its role in calcium absorption
- Main role is to maintain calcium and potassium levels
- It is the only fat soluble vitamin that we can make- in the presence of sunlight
- Can be made from cholesterol

- Can be stored in fat tissues (as can all fat soluble vitamins)
- Elderly and shut ins are at risk- not enough sunlight
- We get vitamin D form fortified milk and cereal
- Toxicity is very dangerous
  - Occurs only from excess supplementation
  - Can lead to calcium deposits in kidneys, heart and blood vessels

-Rickets can be caused by lack of sunlight, but also from insufficient calcium. Vitamin D linked to calcium absorption.

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Vitamin E:

- Used as an anti-oxidant in foods
- Since aging is considered an "oxidation" reaction, many "anti-oxidants" are used as dietary supplements
- Deficiencies are not well understood
- Role is stroke, cancer, heart, and immune response
- Americans spend $300 million per year on vitamin E supplements

Vitamin K:

- **Contributes to synthesis of blood clotting factors**
- Can be reactivated to continue biological action
- Works as a cofactor for an enzyme that makes two bone proteins

Water Soluble Vitamins:

- Relatively cheap to add to food
- Only Vitamin C is used for its functionality

- B_1, thiamine
- B_2, riboflavin
- B_6, pyridoxamine
- B_{12}
- Biotin
- Panothenic acid
- Niacin
- Folacin
- Vitamin C
- Vitamin B_1
  - Thiamine
  - Involved in carbohydrate metabolism
  - Helps body metabolize glucose, affects central nervous system
- B_2 - riboflavin
  - Energy metabolism
- B_6 - Pyridoxamine
  - Neurotransmitter, co-enzyme in over 100 reactions

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- B_{12} –
  - Development of red blood cells
  - Lack of it makes one anemic
- Biotin –
  - Involved in fatty acid synthesis
  - Deficiency causes skin disease and hair loss
- Panthothenic acid
  - Found in many foods
  - Essential for metabolism of carbohydrates, protein, alcohol and fat
- Choline
  - A major component of cell membranes
  - Folacin = Folate = Folic acid
  - Deficiency causes ***neural tube defects – in utero***

Vitamin C

- Ascorbic acid
- Very inexpensive to add to food, marketing tool. Antioxidant
- Deficiency leads to bleeding gums, hemorrhages
- High in citrus fruits, limes.

Helps maintain healthy capillaries, bones, skin, and teeth. Helps your body heal wounds and resist infections. Aids in the absorption of iron and works as an antioxidant. Plays a role in caring for collagen that gives structure to bones, cartilage, muscle, and blood vessels.

Niacin (B3)

- Energy metabolism
- Disease – pellagra – The Four D's
  - Dermatitis
  - Diarrhea
  - Dementia
  - Death

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