1 # The Vitamins & Supplements

Chapter 7

2 ## Objectives

- Upon completion of this unit, the student will be able to:
  - Identify the fat soluble and water soluble vitamins by name.
  - List the function and dietary sources of the various vitamins discussed in class.
  - Define the terms phytochemical, free radical, antioxidant and oxidant/pro-oxidant.
  - Identify the antioxidant vitamins.
  - Evaluate the content of your own diet for antioxidants, vitamins and phytochemicals.

3 ## Objectives

Upon completion of this unit, the student will be able to:

- Describe circumstances under which supplements may be desirable and undesirable.
- Discuss DSHEA and how the US government oversees supplements on the market.
- Describe symptoms of deficient and excess intake of the vitamins discussed in class.
- Describe criteria to consider when selecting a supplement.
- Identify where phytochemicals are found and discuss the potential benefits of them.

4 ## Characteristics

Vitamins are:

- Organic, essential nutrients
- Required in small amounts
- They have specific physiological functions to support life

5 Pg 215

6 ## Precursors

- Some vitamins come in inactive form in food called precursors or provitamins
- Once absorbed the body converts the precursor to active form of vitamin
  - Carotenoids >>>> Vitamin A

7 ## Vitamin retention in foods

(Water soluble more prone to being lost from food)

- Fresh vs canned vs frozen
- Storage
- Preparation / cooking

8 In-text Figure

Page 322

9 # Fat soluble vitamins

- Vitamins A, D, E, K
- Digestion, absorption & transport similar to triglycerides
- Body can store large quantities
- Increased risk of toxicity
- Daily intake not so crucial

10 ## Vitamin A

- Vitamin A (retinoids – animal sources)
  - Liver, fish oils, whole and fortified milk, eggs
- Provitamin A (carotenes – plant sources)
  - A precursor
  - Dark green and orange vegetables and fruits
  - Carrots, greens, squash, broccoli, apricots, tomatoes

11 ## Functions Vitamin A

- Vision
- Epithelial cells and tissues

12 **Eye section, pg 216**

13 ## Figure 7-1

14 **Mucous Membrane**

15 ## Carotene Toxicity

- Hypercarotenemia
- Too much carotene
  - Orange-yellow skin
  - Safe?

16 Figure 7-4

17 Vitamin A Toxicity

- Diagnostic term is Hypervitaminosis A
- Too much active retinoid
- Fetal malformations, headaches, bone pain, and others.

18 Fig. 7-3

19 Snapshot 7-1, pg 219

20 Vitamin D

- Sunshine vitamin!
  DRI committee set Vit D DRI assuming no sun exposure
- Food source - fortified milk/margarine, liver, sardines, salmon, shrimp
- A vitamin and a hormone

21 Photo pg 221

22 Vit D Synthesis & Latitude

23 Vitamin D Functions

- Regulate calcium, phosphorus and bone metabolism
  - Enhance absorption calcium and phosphorus absorption
  - Reduce kidney excretion calcium and phosphorus
  - Regulate calcium deposition in bone

24 Figure 7-5

25 Vitamin D Toxicity

- Highly toxic
- Toxic at 2.5 - 5 X DRI in children
- Symptoms - hypercalcemia

26 Snapshot 7-2. pg 223

27 **Water soluble vitamins**

- Vitamin B complex (8) and Vitamin C
- Absorbed directly into blood & travel freely throughout body
- Little storage capacity – daily intake important
- Small excesses excreted by kidneys

28 B Complex

Coenzymes required to assist enzymes in releasing energy from CHO, proteins and fats

29 Table 7-1

30 Figure 7-10

31 Vitamin C

- Ascorbic acid
- Functions
  - Collagen synthesis
  - Antioxidant
  - Enhance iron absorption
- Food sources:

32 Photo pg. 233

33 Photo pg. 233

34 Vitamin C Needs

- DRI: 75 mg women, 90 mg men
  +35 mg smokers
- Dr. Linus Pauling
  - 1000 to 4000 mg
  - Prevent and cure common cold ?
  - Not substantiated

35 Megadoses Vitamin C

- Harmful?
  - <1000 to 2000 mg
  - Higher (>2000 mg)
    - Inflammation of stomach
    - Diarrhea
    - Overabsorption iron
    - Oxalate kidney stones
    - Rebound scurvy

36 ☐ Pg 230

37 ☐ Snapshot 7-5 pg 232

38 ☐ After Lecture Assessment

1. Fat soluble vitamins are easily excreted from the body.
2. Overcooking will decrease the vitamin content of fruits and vegetables.
3. Carotenes are precursors to Vitamin A.
4. The Vitamin C DRI for smokers is lower than for nonsmokers.
5. A primary role of B vitamins is in the metabolism of CHO, Pro and Fat.
6. Because Vitamin C is water soluble, it is nearly impossible to take in harmful amounts

39 ☐ **Vitamin Supplements: Who Benefits?**

Controversy 7

40 ☐ **Class discussion**

- How many take supplements?
- What supplements do you take?
- Why do you take the supplements?

41 ☐ **Class discussion**

- How many do not take supplements?
- Why do you not take supplements?
- Have you ever taken supplements? And when, if so?

42 ☐ **Type/Formulation**

- Multi-nutrients
- Single nutrients

- Form
  - Liquid
  - Chewable
  - Pill / tablet

43 ☐ Photo pg. 255

44 ☐ FDA Regulation of Dietary Supplements

(1994 Dietary Supplement Health & Education Act or DSHEA)

- Do not have to prove safe and effective before putting on market
- FDA must prove poses risk
  - Consumers are to notify FDA re adverse effects
- Marketing materials are to be "truthful and not misleading"
- Let the buyer beware . . .

45 ☐ Table C7-3

46 ☐ **Arguments For Supplements**

- Correct deficiencies, improve nutrition status
- Reduce disease risk
- Support increased nutrient needs

47 ☐ **Arguments Against Supplements**

- Toxicities
- Imbalances
- False sense security
- Unknown needs
- Nutrients from food

48 ☐ **Can supplements *increase* disease risk?**

- Beta carotene
- Vitamin E

49 ☐ ## Do **You** Need Them?

- Diet
- Fortified foods

50 ☐ Photo pg 255

51 ☐ ## Who should consider a supplement?

- Strict vegetarians
- Chronic dieters
- Certain disease states/conditions
- Elderly
- Pregnant/Lactating women
- People who avoid whole food groups
- Drug/alcohol addictions
- Severe injury/illness
- Diagnosed nutrient deficiencies

52 ☐ ## Table C7-5

53 ☐ ## **Selection of Supplements**

- Not greater than 50-200% daily value (limit to 100% if fat soluble)
- Balanced formulation
- Form
- Cost

If you don't know what something is…don't take it.

54 ☐ ## USP symbol, pg 261

55 ☐ ## **PHYTOCHEMICALS**

(Controversy 2 : pg 57-62)

- Nonnutritive compounds found in **plant foods**
  - Fruits, vegetables, whole grains, legumes
  - Determine taste, odor and color of plant foods
- Have biological activity in the body
- Protection against disease (antioxidants)
- **NOT** enough data to isolate and package as supplements

56 Terms to Know

- Phytochemical
- Free Radical
- Antioxidant
- Oxidant/prooxidant

57 Antioxidants

- Compounds that significantly decrease adverse affects of free radicals (oxidants) in the body.
- Nutrients that are antioxidants
  - Vitamin C
  - Vitamin E
  - Beta-carotene (pro-vitamin A)
  - Selenium – a mineral
- Many phytochemicals are also antioxidants
- At high doses, some antioxidants can become "pro-oxidants".

58 Table C7-4

59 Free Radicals

- Unstable reactive atoms with unpaired electrons
- Can negatively affect physiological functions via oxidative stress
- Antioxidants neutralize free radicals

60 A Few Sources of Free Radicals

- Oxygen with extra electron
- UV radiation
- Air pollution
- Cigarette smoke

61 Free Radical Damage

- Attack FA of lipoproteins and cell membranes
- Attack cell proteins

- Attack DNA creating mutations

62 ▨ Figure 7-6

63 ▨ After Lecture Assessment

1. Plentiful intake of phytochemicals can reduce your risk of cancer.
2. Grilled steak is a good source of phytochemicals.
3. Women taking folate supplements before and during early pregnancy reduce the risk of neural tube defects in the infant.
4. Free radical act as antioxidants in the body.
5. This lecture makes me hungry for a big bowl of broccoli.