HUMAN NUTRITION

Post graduate lecture
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Science of Nutrition

* The study of food and the substances they contain

* The study of nutrients - their action, interaction & balance – in relation to health & disease

The Study of Food

* **Food –** derived from plant or animal sources
  * Provide energy and nutrients
    * Used by the body for maintenance, growth, and repair

The Study of Food

* **Diet -**the foods one consumes
  * The quality of which affects health and the risk of chronic diseases
  * The word “diet” is derived from the Greek word “diatia” which means “manner of living”

Food Selection

* Food Selection–Why do we eat as we do?
    1. Personal Preference
    2. Positive & Negative Associations
    3. Habit
    4. Ethnic Heritage/Tradition
    5. Values

Food Selection – cont.

6. Social Pressure
7. Emotional Comfort
8. Availability/Convenience/Economy
9. Body Weight & Image
10. Medical Conditions
11. Nutrition & Health Benefits

The Study of Nutrients

* **Nutrients** – substances used by the body to:
    1. Supply energy
    2. Promote growth & repair of body tissues
    3. Regulate body processes

The Nutrients

Defined by:

1. Organic or inorganic
2. Essential or nonessential
3. Macronutrients or micronutrients
4. Energy-yielding

The Nutrients

- Chemical composition of nutrients

Inorganic Nutrients

Minerals

Water

Organic Nutrients

Carbohydrates

Lipids

Protein

Vitamins

The Nutrients

TABLE 1-1 Elements in the Six Classes of Nutrients

Notice that organic nutrients contain carbon.

	Carbon	Hydrogen	Oxygen	Nitrogen	Minerals
Inorganic nutrients					
Minerals					✓
Water		✓	✓		
Organic nutrients					
Carbohydrates	✓	✓	✓		
Lipids (fats)	✓	✓	✓		
Proteins[a]	✓	✓	✓	✓	
Vitamins[b]	✓	✓	✓		

[a] Some proteins also contain the mineral sulfur.

[b] Some vitamins contain nitrogen; some contain minerals.

The Nutrients

6 Classes of Essential Nutrients

* Carbohydrates
* Proteins
* Lipids
* Vitamins
* Minerals
* Water

The Nutrients

* **Macronutrients** are required by the body in relatively large amounts (measured in grams)
  * **Carbohydrates**
  * **Protein**
  * **Lipids**

The Nutrients

* **Micronutrients** are required in small amounts (measured in milligrams or micrograms)
  * **Vitamins**
  * **Minerals**

The Nutrients

Vitamins

- Organic
- Not energy-yielding
- Essential
- Water soluble vs. fat-soluble
- Vulnerable to destruction

The Nutrients

Minerals

- Inorganic
- Not energy-yielding
- Essential
- Indestructible

The Nutrients

Water

- Inorganic
- Not energy-yielding
- Essential

The Nutrients

* Energy-Yielding Nutrients
  * Carbohydrates
  * Proteins
  * Lipids
* Measures of Energy
  * Kilocalories – measure of food energy
  * Kilojoules – international unit of food energy
  * 1 kcal = 4.2 kJ

TABLE 1-2 kCalorie Values of Energy Nutrients

Energy Nutrients	kCalories[a] (per gram)
Carbohydrate	4 kcal/g
Fat	9 kcal/g
Protein	4 kcal/g

NOTE: Alcohol contributes 7 kcalories per gram that can be used for energy, but it is not considered a nutrient because it interferes with the body's growth, maintenance, and repair.

[a] For those using kilojoules: 1 g carbohydrate = 17 kJ; 1 g protein = 17 kJ; 1 g fat = 37 kJ; and 1 g alcohol = 29 kJ.

Nutrition Standards & Guidelines

How much do we need?

Nutrient Recommendations

Dietary Reference Intakes – a set of nutrient intake values used for planning & assessing diets including:

* Estimated Average Requirements
* Recommended Dietary Allowances
* Adequate Intakes
* Tolerable Upper Limits

Nutrient Recommendations

* **Estimated Average Requirement**
  1. The average daily amount of a nutrient needed in the diet that will maintain physiological activities and reduce disease risks
  2. Different criterion for each nutrient and each gender and age group of people

Nutritient Recommendations

Recommended Dietary Allowances (RDA)

1. Estimates for average daily nutrient intakes which are believed adequate to prevent deficiency in nearly all healthy Americans
2. Goals for individuals

Nutrient Recommendations

* **Adequate Intakes** – a value used as a guide for sufficient nutrient intake when there is insufficient scientific evidence to establish a RDA
* **Tolerable Upper Intake Levels** – the maximum daily amount of a nutrient that appears safe for most healthy people

Energy Recommendations

* Estimated Energy Requirement – the average dietary energy intake that maintains energy balance in a healthy person of a given age, gender, weight, height, and activity level
* Acceptable Macronutrient Distribution Ranges
  * Carbohydrate: 45% - 65%
  * Fat: 20% - 35%
  * Protein: 10% - 35%

Nutrition Assessment of Individuals

Malnutrition – undernutrition vs. overnutrition

* Historical information
* Anthropometric data
* Physical examination
* Laboratory tests

Nutritional Assessment of Populations

* National Nutrition Surveys - used to assess:
  1. What people eat
  2. Nutritional health
  3. Nutrition knowledge, attitudes & behaviors

TABLE 1-5 Leading Causes of Death in the United States

	Percentage of Total Deaths
1. Heart disease	28.9
2. Cancers	22.9
3. Strokes	6.8
4. Chronic lung diseases	5.1
5. Accidents	4.0
6. Diabetes mellitus	2.9
7. Pneumonia and influenza	2.6
8. Alzheimer's disease	2.2
9. Kidney diseases	1.6
10. Blood infections	1.3

NOTE: The diseases highlighted in green have relationships with diet; yellow indicates a relationship with alcohol.

TABLE 1-6 Factors Contributing to Deaths in the United States

Factors	Percentage of Deaths
Tobacco	20
Poor diet/inactivity	14
Alcohol	6
Microbial agents	4
Pollutants/toxins	3
Firearms	2
Sexual behavior	1
Motor vehicles	1
Illicit drugs	1

SOURCE: Centers for Disease Control, www.cdc.gov.

Dietary Guidelines

Aim for a healthy weight.

Be physically active each day.

Let the Pyramid guide your food choices.

Choose a variety of grains daily, especially whole grains.

Choose a variety of fruits and vegetables daily.

Keep food safe to eat.

Choose a diet that is low in saturated fat and cholesterol and moderate in total fat.

Choose beverages and foods to moderate your intake of sugars.

Choose and prepare foods with less salt.

If you drink alcoholic beverages, do so in moderation.

NOTE: These guidelines are intended for adults and healthy children ages 2 and older.

SOURCE: U.S. Department of Agriculture and U.S. Department of Health and Human Services, *Nutrition and Your Health: Dietary Guidelines for Americans,* Home and Garden Bulletin no. 232 (Washington, D.C.: 2000).

Nutrition Assessment of Populations

* *Healthy People 2010 Nutrition & Overweight Objectives* – a national public health initiative that identifies the most significant preventable threats to health and focuses efforts towards eliminating them including:

  reducing obesity in adults & children, growth retardation in low-income children, increase servings of fruits, vegetables, and whole grains, decrease total fat, saturated fat, and sodium intake, reduce iron deficiency anemia

Diet-Planning Principles

The 3 "keys" to a healthy diet

(nutritional adequacy & calorie control)

1. Variety – eat a wide selection of foods
2. Moderation – don't eat to excess
3. Balance – achieve dietary adequacy within your energy budget by choosing foods of high **nutrient density** (nutrients relative to kcals)

Food Guide Pyramid

MILK, CHEESE, AND YOGURT: 2 SERVINGS PER DAY

(3 servings per day for older children, teenagers, young adults, pregnant/lactating women, and older adults.)
These foods contribute calcium, riboflavin, protein, vitamin B_{12}, and, when fortified, vitamin D and vitamin A.

Serving = 1 c milk or yogurt; 2 oz process cheese food; 1½ oz cheese.

- Fat-free and 1% low-fat milk (and fat-free products such as buttermilk, cottage cheese, cheese, yogurt); fortified soy milk.
- 2% reduced-fat milk (and low-fat products such as yogurt, cheese, cottage cheese); chocolate milk; sherbet; ice milk.
- Whole milk (and whole-milk products such as cheese, yogurt); custard; milk shakes; pudding; ice cream.

Note: These serving recommendations were established before the 1997 DRI, which raised the recommended intake for calcium; meeting the calcium recommendation may require an additional serving from the milk, cheese, and yogurt group.

FATS, SWEETS, AND ALCOHOLIC BEVERAGES: USE SPARINGLY

These foods contribute sugar, fat, alcohol, and food energy (kcalories). They should be used sparingly because they provide food energy while contributing few nutrients. Miscellaneous foods not high in kcalories, such as spices, herbs, coffee, tea, and diet soft drinks, can be used freely.

- Foods high in fat include margarine, salad dressing, oils, lard, mayonnaise, sour cream, cream cheese, butter, gravy, sauces, potato chips, chocolate bars.
- Foods high in sugar include cakes, pies, cookies, doughnuts, sweet rolls, candy, soft drinks, fruit drinks, jelly, syrup, gelatin, desserts, sugar, and honey.
- Alcoholic beverages include wine, beer, and liquor.

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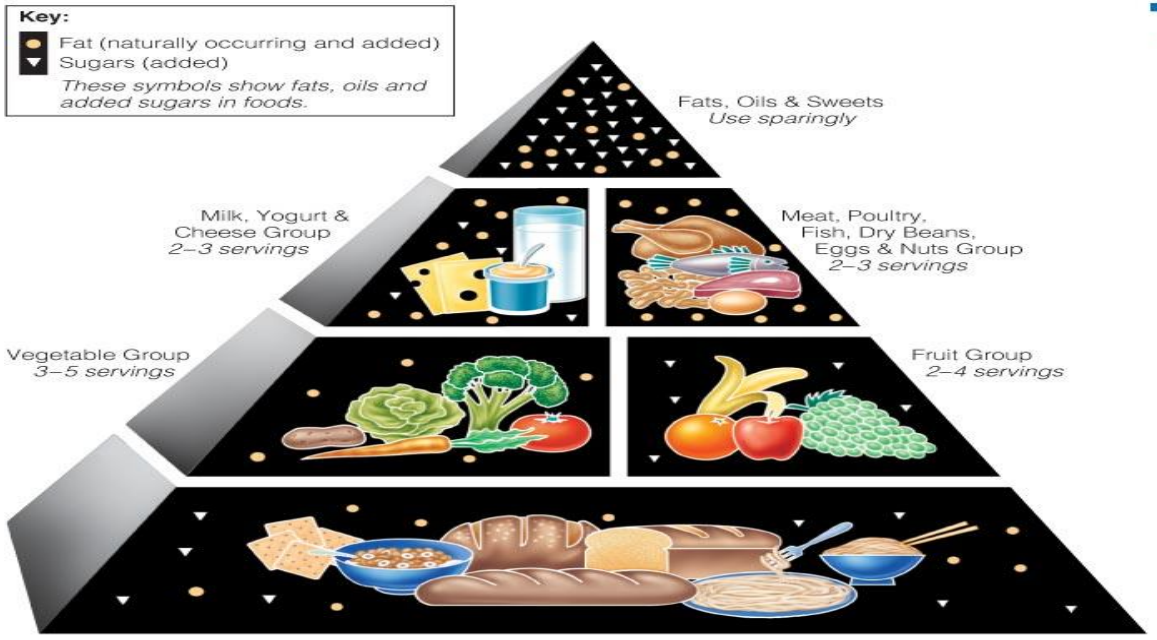

Food Guide Pyramid

A Guide to Daily Food Choices
The breadth of the base shows that grains (breads, cereals, rice, and pasta) deserve most emphasis in the diet. The tip is smallest: use fats, oils, and sweets sparingly.

From Guidelines to Groceries

Food labels help consumers make informed food choices by showing:

1. Ingredients – listed in descending order by weight
2. Serving size – the same for a given type of product

3. Nutrition information – on calories, fat, cholesterol, sodium, carbohydrates, protein, vitamins, & minerals
4. % Daily Value* - how a food contributes to recommended daily intakes ;
   *based on 2000 kcals/day
5. Other information – descriptive terms & health claims are regulated by the Food and Drug Administration

Reading a Food Label

The name and address of the manufacturer, packer, or distributor

The common or usual product name

Approved nutrient claims if the product meets specified criteria

The net contents in weight, measure, or count

Approved health claims stated in terms of the total diet

Nutrition Facts

Serving size ¾ cup (28 g)
Servings per container 14

Amount per serving

Calories 110 Calories from fat 9

	% Daily Value*
Total Fat 1 g	2%
Saturated fat 0 g	0%
Trans fat 0 g	
Cholesterol 0 mg	0%
Sodium 250 mg	10%
Total Carbohydrate 23 g	8%
Dietary fiber 1.5 g	6%
Sugars 10 g	
Protein 3 g	

Vitamin A 25% • Vitamin C 25% • Calcium 2% • Iron 25%

*Percent Daily Values are based on a 2000 calorie diet. Your daily values may be higher or lower depending on your calorie needs.

	Calories:	2000	2500
Total fat	Less than	65 g	80 g
Sat fat	Less than	20 g	25 g
Cholesterol	Less than	300 mg	300 mg
Sodium	Less than	2400 mg	2400 mg
Total Carbohydrate		300 g	375 g
Fiber		25 g	30 g

Calories per gram
Fat 9 • Carbohydrate 4 • Protein 4

INGREDIENTS, listed in descending order of predominance: Corn, Sugar, Salt, Malt flavoring, freshness preserved by BHT. **VITAMINS and MINERALS:** Vitamin C (Sodium ascorbate), Niacinamide , Iron, Vitamin B_6 (Pyridoxine hydrochloride), Vitamin B_2 (Riboflavin), Vitamin A (Palmitate), Vitamin B_1 (Thiamin hydrochloride), Folic acid, and Vitamin D.

The serving size and number of servings per container

kCalorie information and quantities of nutrients per serving, in actual amounts

Quantities of nutrients as "% Daily Values" based on a 2000-kcalorie energy intake

Daily Values reminder for selected nutrients for a 2000- and a 2500-kcalorie diet

kCalorie per gram reminder

The ingredients in descending order of predominance by weight

TABLE 2-6 Daily Values for Food Labels

Food labels must present the "% Daily Value" for these nutrients.

Food Component	Daily Value	Calculation Factors
Fat	65 g	30% of kcalories
Saturated fat	20 g	10% of kcalories
Cholesterol	300 mg	—
Carbohydrate (total)	300 g	60% of kcalories
Fiber	25 g	11.5 g per 1000 kcalories
Protein	50 g	10% of kcalories
Sodium	2400 mg	—
Potassium	3500 mg	—
Vitamin C	60 mg	—
Vitamin A	1500 µg	—
Calcium	1000 mg	—
Iron	18 mg	—

NOTE: Daily Values were established for adults and children over 4 years old. The values for energy-yielding nutrients are based on 2000 kcalories a day.

TABLE 2-7 Food Label Health Claims—The "A" List

- Calcium and reduced risk of osteoporosis
- Sodium and reduced risk of hypertension
- Dietary saturated fat and cholesterol and reduced risk of coronary heart disease
- Dietary fat and reduced risk of cancer
- Fiber-containing grain products, fruits, and vegetables and reduced risk of cancer
- Fruits, vegetables, and grain products that contain fiber, particularly soluble fiber, and reduced risk of coronary heart disease
- Fruits and vegetables and reduced risk of cancer
- Folate and reduced risk of neural tube defects
- Sugar alcohols and reduced risk of tooth decay
- Soluble fiber from whole oats and from psyllium seed husk and reduced risk of heart disease
- Soy protein and reduced risk of heart disease
- Whole grains and reduced risk of heart disease and certain cancers
- Plant sterol and plant stanol esters and heart disease
- Potassium and reduced risk of hypertension and stroke

Nutrition in Your Life

* Do you eat the minimum number of servings from each of the five food groups daily?
* Do you try to very your choices within each food group from day to day?
* What dietary changes could you make to improve your chances of enjoying good health?