

---

# *Nutritional Requirements*

---

**Dr. Sumbul Fatma**  
**Department of Pathology**

---

# *Objectives*

- Understand the basic terms of nutritional requirements that are important for establishing intake of a nutrient in a population.
  - Understand the food pyramid that recommends daily serving size from each food group for vegetarians and non-vegetarians.
  - Identify dietary guidelines and goals that are necessary for good health
  - Discuss energy requirement in humans including basic energy expenditure and the factors that affect it.
  - Know about total parenteral nutrition (TPN) and its applications
-

---

# *Overview*

- What is nutrition?
  - Assessment of malnutrition
  - Dietary reference intakes (DRIs)
  - Estimated Average Requirement (EAR)
  - Recommended Dietary Allowance (RDA)
  - Adequate Intake (AI)
  - Acceptable Macronutrient Distribution Ranges (AMDR)
  - The Food Pyramid: dietary guidelines and goals
  - Energy requirement and expenditure in humans
  - Total parenteral nutrition (TPN)
-

---

# *What is nutrition?*

- **Composition and quantity of food intake by living organisms**
  - **Biochemical utilization of food**
  - **Human nutrition is divided into three areas:**
    - **Undernutrition (nutrient deficiency)**
    - **Overnutrition (excessive nutrient intake)**
    - **Optimal nutrition (balanced nutrient intake)**
-

---

# *Assessment of malnutrition*

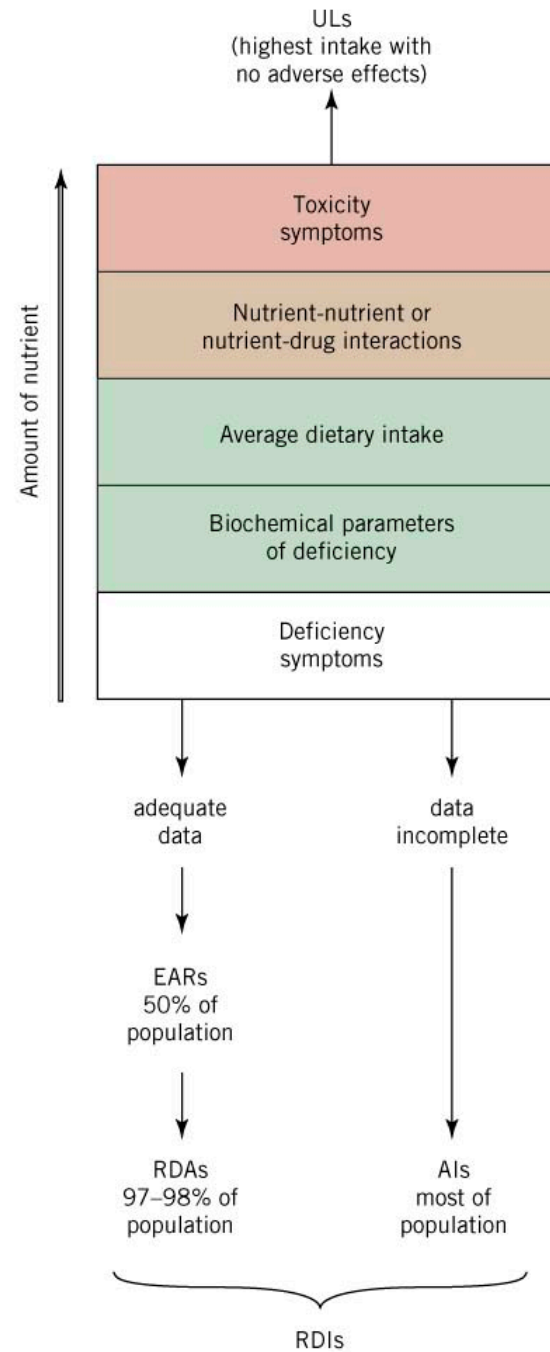
- Malnutrition in humans is measured by:
  - **Dietary intake studies:** identify people with deficient diets
  - **Biochemical studies:** identify subclinical nutritional deficiencies
  - **Clinical symptoms:** identify clinical nutritional deficiencies
-

---

# *Dietary Reference Intakes (DRIs)*

- **Quantitative estimates of nutrient intakes required to prevent deficiencies and maintain optimal health in populations**
  - **Recommended by: Food and Nutrition Board of the National Research Council, USA**
-

## Dietary Reference Intakes (DRIs)



---

# *Dietary Reference Intakes (DRIs)*

- **DRIs** have four standards:
  - **Estimated Average Requirement (EAR)**
  - **Recommended Dietary Allowance (RDA)**
  - **Adequate Intake (AI)**
  - **Tolerable Upper Intake Level (UL)**
-



---

# *Estimated Average Requirement (EAR)*

- The amount of nutrient intake estimated to meet the nutritional requirement of half of the healthy individuals (50%) in an age and gender group
-

---

# *Recommended Dietary Allowance (RDA)*

- The amount of nutrient intake that is sufficient to meet the nutritional requirement of nearly all (97-98%) healthy individuals in a group
  - RDA is two SD above EAR
  - $RDA = EAR + 2 SD$
-

---

# *Adequate Intake (AI)*

- It is **used instead of EAR and RDA** if:
  - A nutrient is considered essential but the experimental data are inadequate for determining EAR and RDA
  - **AI** covers the nutritional requirement of *all individuals in a group with approximation* due to insufficient data
-

---

# *Tolerable Upper Intake Level (UL)*

- **The highest level of daily nutrient intake that has no adverse health effects or toxicity in almost all individuals**





---

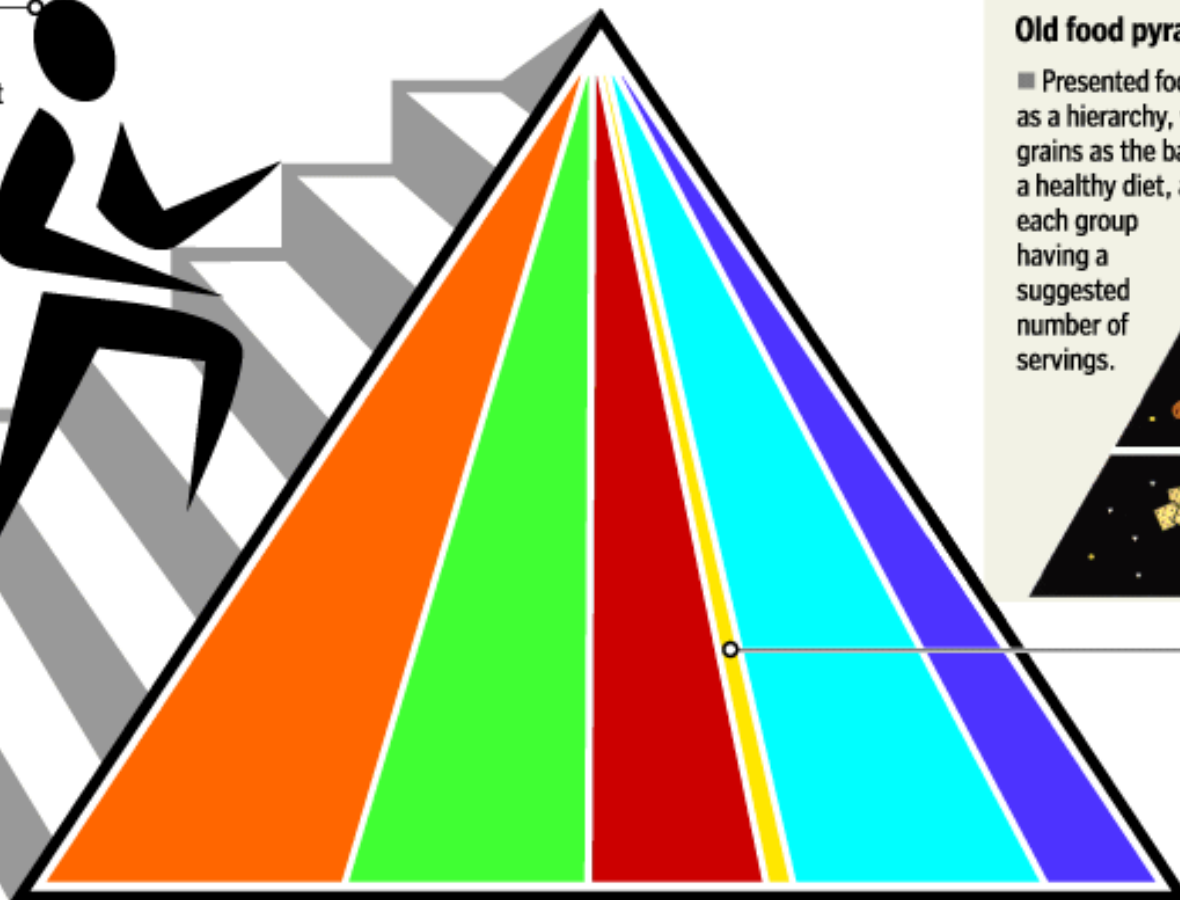
# *Food Pyramid*

United States Department of Agriculture  
Center for Nutrition Policy and Promotion

- **Public educational tool established in 1992**
  - **Recommends size of daily servings**
  - **Pyramid shape**
  - **Fats, oils and sweets have small serving size**
-

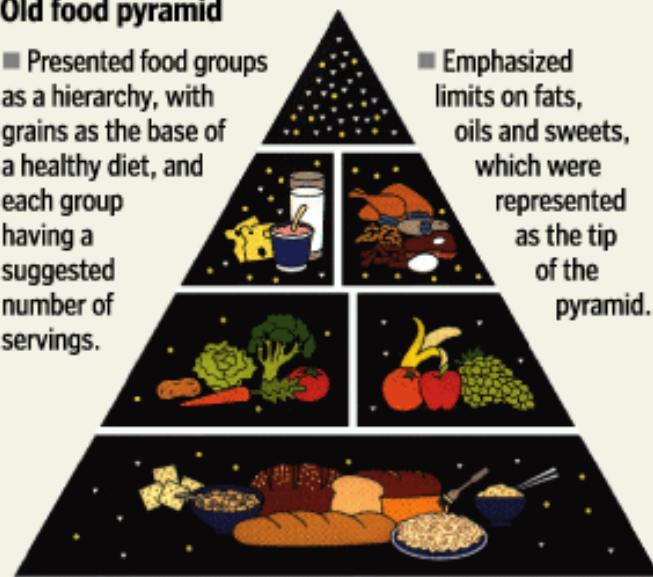
### Exercise

- Adults should be physically active for at least 30 minutes most days of the week, children for 60 minutes.
- Sixty to 90 minutes of daily physical activity may be needed to prevent weight gain or sustain weight loss.



### Old food pyramid

- Presented food groups as a hierarchy, with grains as the base of a healthy diet, and each group having a suggested number of servings.
- Emphasized limits on fats, oils and sweets, which were represented as the tip of the pyramid.



### Oils

- Most fat should be from fish, nuts and vegetable oils.
- Limit solid fats, such as butter, margarine or lard.
- Keep consumption of saturated fats, trans fats and sodium low.
- Choose foods low in added sugar.

### CATEGORY

#### Grains

#### Vegetables

#### Fruits

#### Milk

#### Meat and beans

### RECOMMENDATION

Half of all grains consumed should be whole grains.

Vary the types of vegetables you eat.

Eat a variety of fruits. Go easy on juices.

Eat low-fat or fat-free dairy products.

Eat lean cuts, seafood and beans. Avoid frying.

### DAILY AMOUNT

6 oz.

2.5 cups

2 cups

3 cups

5.5 oz.

Based on a 2,000 calorie diet.

Recommended nutrient intakes at 12-calorie levels can be found on [mypyramid.gov](http://mypyramid.gov).

# The Food Pyramid

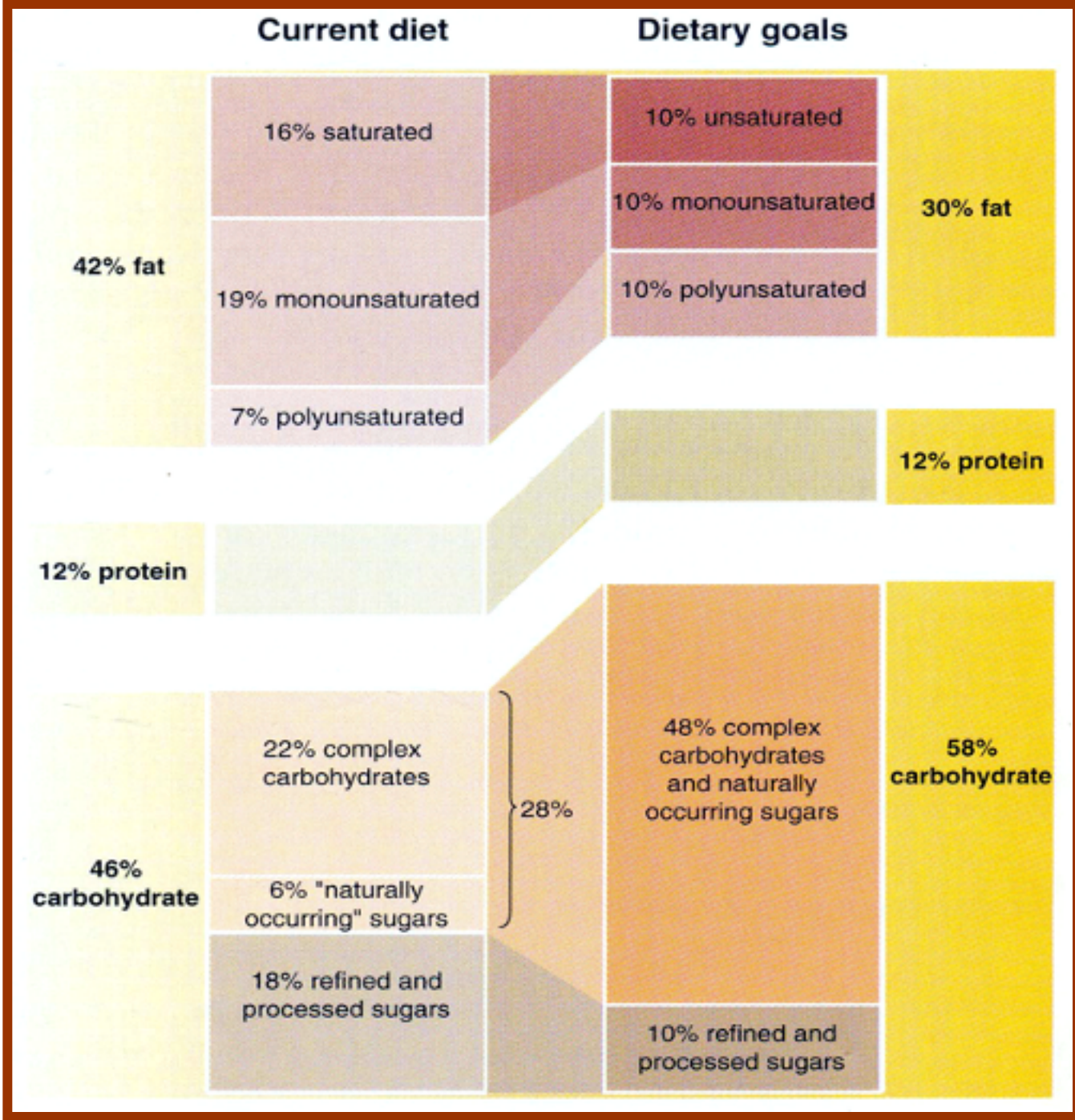
---

# *Dietary guidelines and goals*

- Consume a variety of foods from the basic food groups
  - Control calorie intake to manage body weight
  - Be physically active everyday
  - Choose fats and CHO's wisely for good health
  - Increase daily intake of fruits, vegetables, whole grains, and non-fat or low-fat milk and milk products
  - Choose and prepare foods with little salt
-



# Dietary Goals



---

# *Energy requirement in humans*

- The dietary energy intake required to maintain energy balance in a healthy individual
  - Energy balance is maintained by calorie intake and energy expenditure
  - Energy content of food is measured in calories or kilocalories (heat energy)
-

# *Energy requirement in humans*

<b>Sex</b>	<b>Age</b>	<b>Weight (Kg)</b>	<b>Avg. Energy Needs (kcal)</b>
<b>Men</b>	23–50	70	upto 2900
<b>Women</b>	23–50	55	upto 2200
<b>Pregnant</b>	-	-	+300
<b>Lactating</b>	-	-	+500

# *Vegetarians and nutrient intake*



- Lower intake of **iron, calcium and vitamin D**
  - Long-term vegans may develop megaloblastic anemia due to **vitamin B<sub>12</sub>** deficiency
  - Most consume enough **protein**
  - Lower in total dietary **fat**
-

# *Vegetarians and chronic disease*

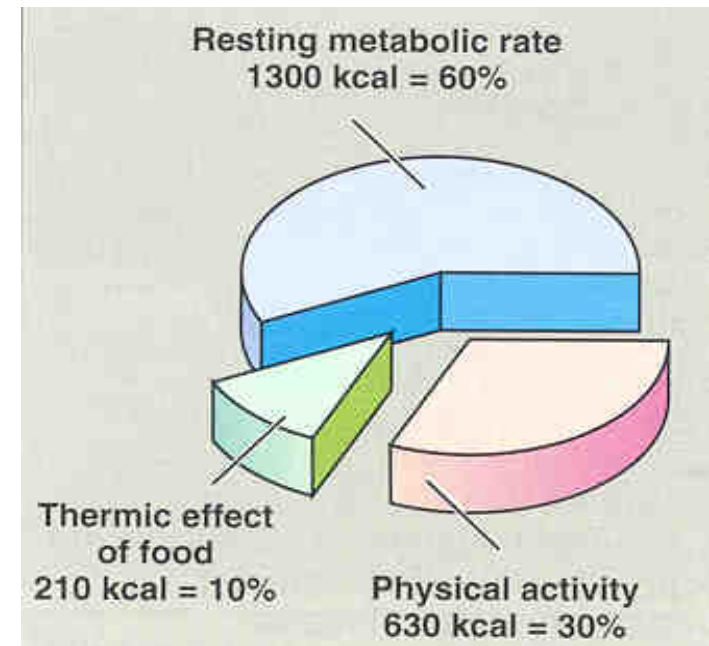


- Lower Body Mass Index (BMI)
- Lower death rate from ischemic heart disease
- Lower blood pressure
- Lower cancer rates compared to non-vegetarians

# *Basic energy expenditure depends on:*

## **Resting metabolic rate (RMR)**

- Energy expense at rest
- Required for normal body function
- Depends on age, sex, growth, body surface area, fever, fasting, stress
- Men: 1800 kcal
- Women: 1300 kcal



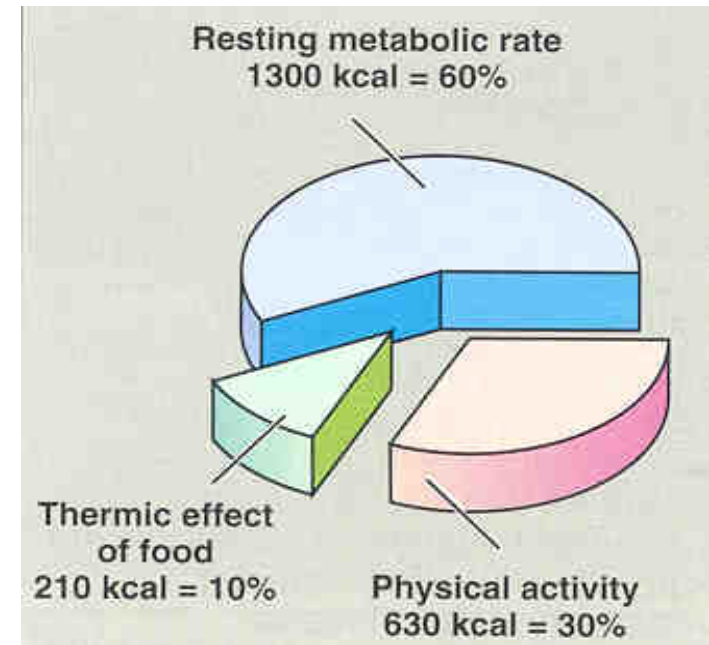
# *Basic energy expenditure depends on:*

## Physical activity

- Sedentary person: **30-50%** above RMR
- Active person: **100%+** above RMR

## Thermic effect of food

- Heat produced by the body due to food digestion and absorption
- **5-10%** of total energy expenditure



---

# *Total Parenteral Nutrition (TPN)*

- A type of exogenous nutrition in which terminally-ill patients are provided with all essential nutrients intravenously or through tube feeding
  - TPN is particularly indicated in severe inflammatory bowel disease, coma, cachexia, prolonged ileus and extensive burns
  - Nutrients are pumped into a large central vein to allow rapid dilution of the solution (3 L / 24 hr)
  - Tube feeding is only provided to patients whose GI tract is intact and supports this type of nutrition
-



---

# *Total Parenteral Nutrition (TPN)*

- Standard composition of TPN feed (24 hr requirement)
    - Energy content: 2000 kcal
    - Nitrogen: 12–14 g
    - Fat: 900 kcal
    - Glucose: 1000 kcal
    - Electrolytes, trace elements, vitamins: present
    - Volume: 3 liters
  - Individual nutritional requirements of patients may vary
  - Continuous biochemical, hematological and immunological monitoring of patient on TPN is required
-

---

# *References*

- Lecture Notes on Clinical Biochemistry 9th Edition  
A.F. Smith, Blackwell Publishing, UK.
  - Lippincott's Biochemistry 6th Edition
-