



# Nutritional Requirements

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## Color Index:

- **Blue** Main Topic
- **Black** Main content
- **Red** Important
- **Green** Drs' notes
- **Grey** Extra info



## 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)

# Nutrition

## 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 measured by

Dietary intake studies: identify people with deficient diets

Biochemical studies: identify subclinical nutritional deficiencies

Ex: vitamin D test to detect deficiency

Clinical symptoms: identify clinical nutritional deficiencies

# Dietary reference intake

## Dietary reference intake (DRI)

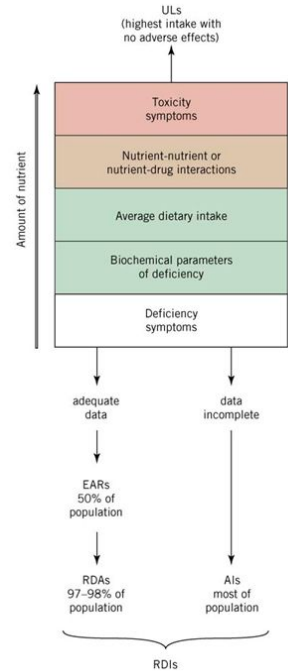
**quantitative estimates of nutrient intakes required to prevent deficiencies and maintain optimal health in population**

- Recommended by: Food and Nutrition Board of the National Research Council, USA

## DRI standards

estimated average requirement (EAR)	recommended dietary allowance (RDA)	adequate intake (AI)	tolerable upper intake level (UL)
the amount of nutrient intake estimated to meet the nutritional requirement of <u>half of health individuals</u> <u>50%</u> in an age and gender group	the amount of nutrient intake that is sufficient to meet the nutritional requirement of <u>nearly all healthy individuals</u> <u>97-98%</u> in a group <ul style="list-style-type: none"> <li>RDA is two SD above EAR</li> <li>RDA = EAR + 2 SD</li> </ul> <div style="border: 1px dashed gray; padding: 2px; width: fit-content; margin-left: 20px;">SD : standard deviation</div>	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 <ul style="list-style-type: none"> <li>it covers the nutritional requirement of <u>all individuals in a group with approximation</u> due to insufficient data</li> </ul>	the highest level of daily nutrient intake that has no adverse effects of toxicity in almost all individuals

## Dietary Reference Intakes (DRIs)



Doctor said that we have to know all the definitions, numbers and calculations

# acceptable macronutrient distribution ranges (AMDR)

range of adequate intake of a macronutrient associated with reduced risk of chronic diseases

- AMDR for adult (% of total calories)
- carbohydrates : 45-65%
  - Fats : 20-35%
  - Proteins : 10-35%
  - Fibers : >25 g
- Fibers has no calories but it's important for utilization of food

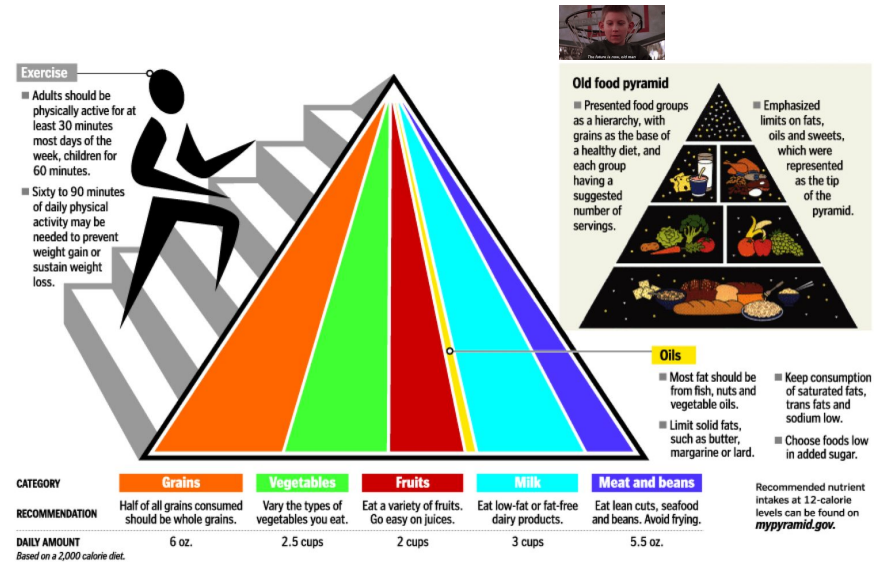
## Food pyramid

Public educational tool established in 1992

Recommends size of daily servings

Pyramid shape

Fats, oils and sweets have small serving size



Dr note: You don't have to memorize anything from this pic

# Dietary guidelines and goals

## Dietary guidelines and goals

Consume a variety of foods from the basic food groups

Control calorie intake to manage body weight

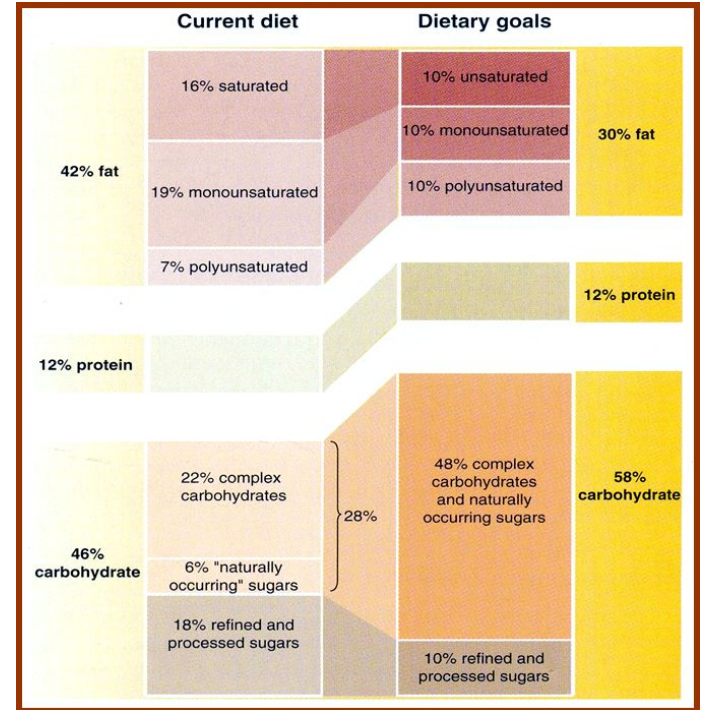
Be physically active everyday

Choose fats and CHOs 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

You don't need to memorize numbers in this pic



# Energy requirement in humans

- It is 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)

Sex	Age	Weight (Kg)	Avg. Energy Needs (Kcal)
Men	23-50	70	Up to 2900
Women	23-50	55	Up to 2200
Pregnant	-	-	+300
Lactating	-	-	+500



## Vegetarians



### 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**

### chronic disease

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



Don't mind him^ u guys are doing a great job -VSLR

# Basic energy expenditure depends on:

1

## 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

2

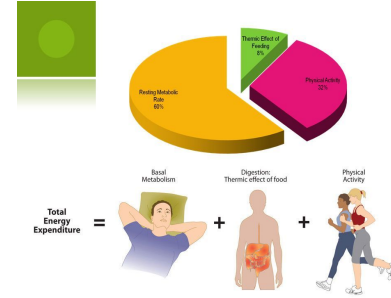
## Physical activity

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

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## 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)

## Definition

- A type of exogenous nutrition in which terminally-ill patients are provided with all essential nutrients **intravenously** or through **tube feeding**

## Indications

- TPN is particularly indicated in **severe inflammatory bowel disease, coma, cachexia, prolonged ileus<sup>1</sup> and extensive burns**

## How its done

- 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

## 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

## remember

- Individual nutritional requirements of patients may vary
- Continuous biochemical, hematological and immunological monitoring of patient on TPN is **required**

<sup>1</sup>. Loss of movement in a part of intestine



# Take Home Messages



**Basic standards of nutritional requirements are important for malnutrition assessment**



**Establishing these standards is essential for a population in order to avoid disease and maintain good health**



**Committees of American and Canadian experts organized by the Food and Nutrition Board of National Academy of Sciences have established Dietary Reference intakes (DRIs).**



**The DRIs replace and expand on the recommended Dietary Allowances (RDA)**

# Summary

## Nutritional Requirements

### Assessment of malnutrition:

- Dietary intake studies
- Biochemical studies
- Clinical symptoms

### DRI

- estimated average requirement (EAR)
- recommended dietary allowance (RDA)
- adequate intake (AI)
- tolerable upper intake level (UL)

### acceptable macronutrient distribution ranges (AMDR)

- carbohydrates : 45-65%
- Fats : 20-35%
- Proteins : 10-35%
- Fibers : >25 g

### Food pyramid

### Dietary guidelines & goals

### Energy requirement in humans

The dietary energy intake required to maintain energy balance in a healthy individual

### Vegetarians

- Low iron, calcium, V D
- Megaloblastic anemia
- Low BP & cancer rates

### Basic energy expenditure

#### -Resting metabolic rate (RMR):

Energy expense at rest Required for normal body function

#### -Physical activity

-Thermic effect: body produces heat d/t digestion & absorption

### Total Parenteral Nutrition (TPN)

-route of administration: I.V , tube feeding  
-Indications: IBD, coma, cachexia, prolonged ileus and extensive burns

# Quiz

## MCQs :

**Q1:** If a nutrient is considered essential but the experimental data are inadequate for determining EAR and RDA we use:

- a) Adequate intake (AI)      b) Tolerable upper intake level (UL)  
c) AMDR                              d) None of them

**Q2:** AMDR for adult regarding the fibers:

- a) 20%                      b) >20 g                      c) <20 g                      d) >20%

**Q3:** Biochemical studies identify :

- a) Clinical nutritional deficiencies      b) People with deficient diets  
c) Subclinical nutritional deficiencies      d) B & C

**Q4:** What type of anemia vegans may develop?

- a) Sideroblastic      b) Normocytic      c) Megaloblastic      d) Hemolytic

**Q5:** Energy balance maintained by:

- a) Energy expenditure      b) Fats      c) Calorie intake      d) Carbohydrates

**Q6:** Which of the following is determined by EAR + 2 SD?

- a) Adequate intake                      b) Tolerable upper intake level  
c) Estimated average requirement      d) Recommended dietary allowance

## SAQs :

**Q1:** Mention two Dietary reference intake standards.

**Q2:** Define dietary reference intake.

**Q3:** What does the energy expenditure depends on?

**Q4:** Define total parenteral nutrition.

### ★ MCQs Answer key:

1) A    2) B    3) C    4) C    5) A&C    6) D

### ★ SAQs Answer key:

1. estimated average requirement (EAR), recommended dietary allowance (RDA), adequate intake (AI), tolerable upper intake level (UL)
2. quantitative estimates of nutrient intakes required to prevent deficiencies and maintain optimal health in population
3. Resting metabolic rate , physical activity and thermic effect
4. A type of exogenous nutrition in which terminally-ill patients are provided with all essential nutrients intravenously or through tube feeding

# Team members

## Girls Team:

- Ajeed Al-Rashoud
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- Ghaliah Alnufaei
- Haifa Alwaily
- Leena Alnassar
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- Naif Alsolais
- Omar Alyabis
- Omar Saeed
- Omar Odeh
- Rayyan Almousa
- Yazan Bajeaifer
- VSLR \*chuckles\*

# Team Leaders

Lina Alosaimi

Mohannad Alqarni

★ You may see me struggle but you will never see me quit.



We hear you