






Nutritional requirements

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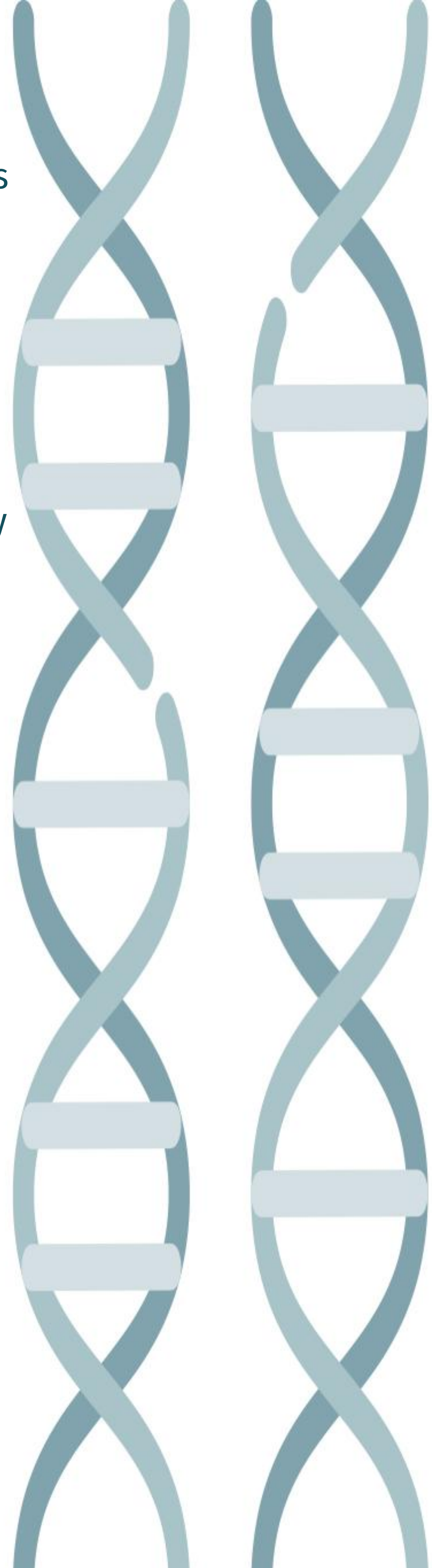
- Main Text
- Important
- Extra
- Dr.'s Notes
- Girls slides
- Boys slides

Objectives

-  Understand the basic terms of nutritional requirements that are important for establishing intake of a nutrient in a population
-  Interpret 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.
-  Understand 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
Quantity and quality of food



Biochemical utilization of food
To give ATP. E.g: if you're recovering from a disease your body will need more amount of protein



Human nutrition is divided into three areas:

- **Undernutrition** (nutrient deficiency)
Will show symptoms
- **Overnutrition** (excessive nutrient intake)
E.g: obesity
- **Optimal nutrition** (balanced nutrient intake) *taking the right amount that your body needs*

Assessment of malnutrition

These studies are done together

Malnutrition in humans measured by:

- ⊙ **Dietary intake studies:** identify people with deficient diets
 - ⊙ **Biochemical studies:** identify subclinical nutritional deficiencies
 - ⊙ **Clinical symptoms:** identify clinical nutritional deficiencies
- subclinical means with no symptoms of a deficiency, a blood sample can reveal the deficiency*

Dietary Reference Intakes (DRIs)

- ⊙ Quantitative estimates (*not exact values*) 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 Standards

Estimated Average Requirement (EAR)

Recommended Dietary Allowance (RDA) *it's the most accurate*

Adequate Intake (AI) *it's the least accurate*

Tolerable Upper Intake Level (UL)

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

*For example: we have 4 populations 1st is taking 50g and 2nd is taking 10g, 3rd taking 200, 4th taking 150g
We take the average (EAR):
 $(50+10+200+150)/4 = 125g$
That tells you if you're taking that much of nutrients at least 50% of the individuals' nutritional requirements will be met by this EAR*

The amount of nutrient intake that is sufficient to meet the nutritional requirement of nearly all healthy individuals 97-98% in a group

- RDA is two SD above EAR
- $RDA = EAR + 2 SD$

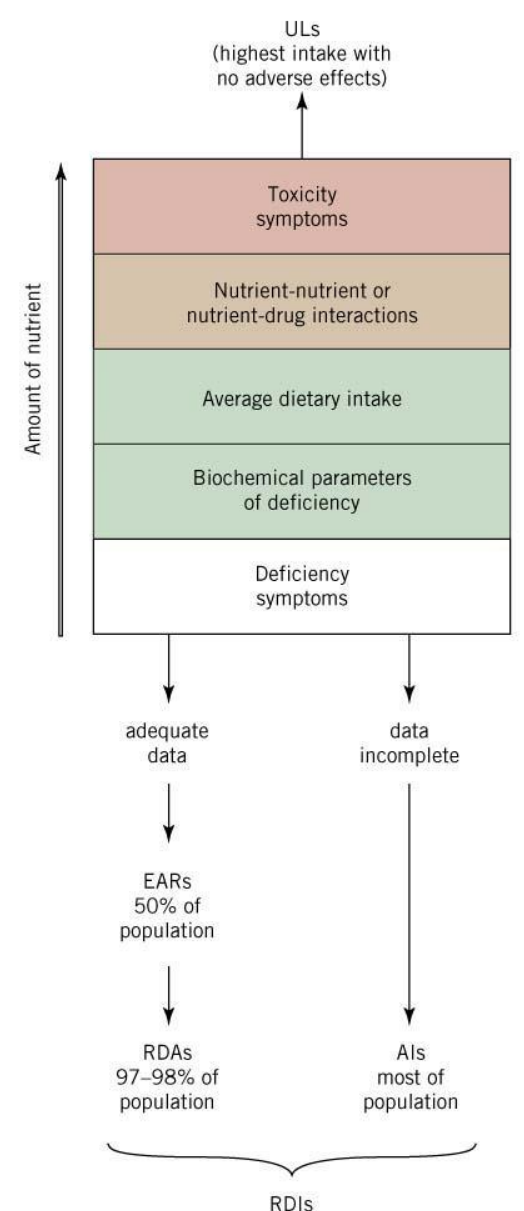
Dr: you have to know how to calculate the RDA

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

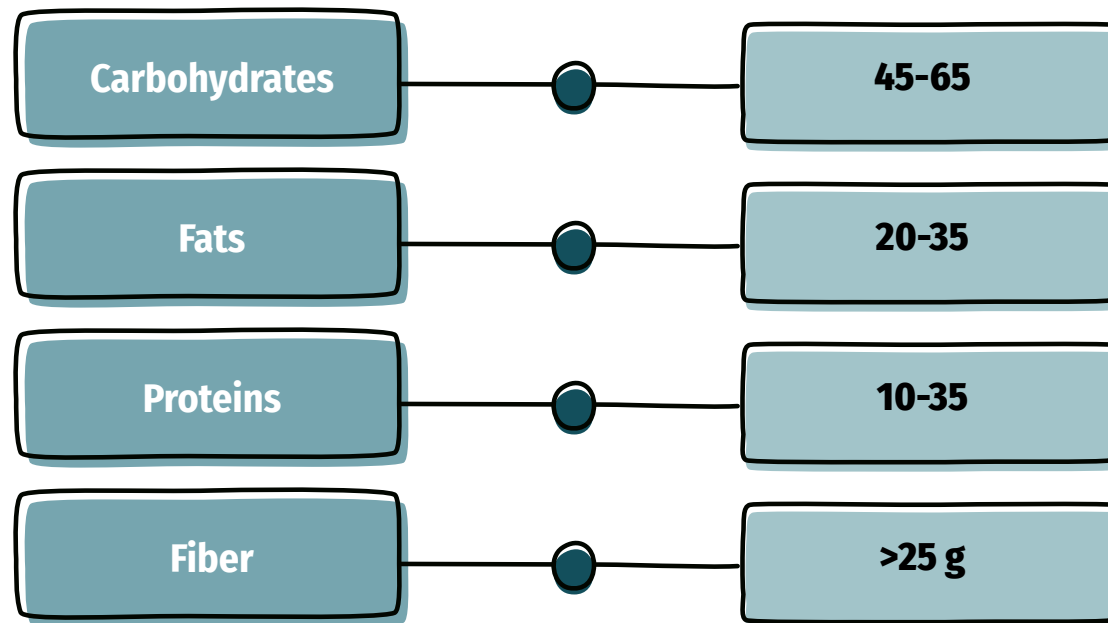
The highest level of daily nutrient intake that has no adverse health effects or toxicity in almost all individuals

Dietary Reference Intakes (DRIs)



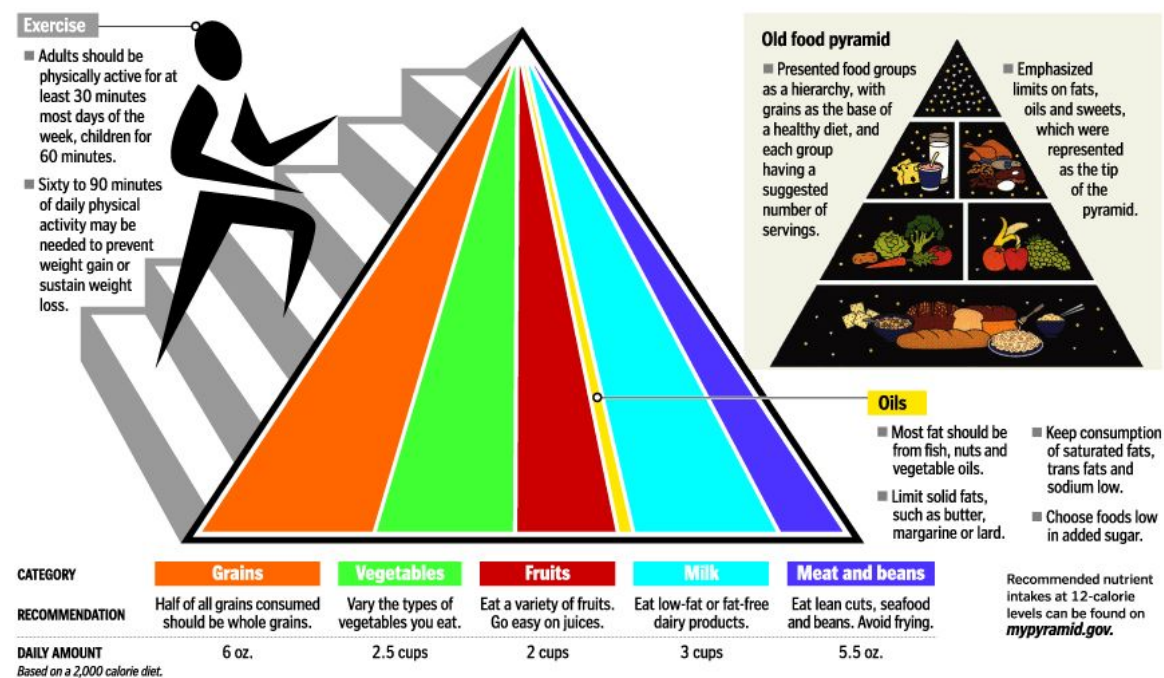
Acceptable Macronutrient Distribution Ranges (ADMR)

- Range of adequate intake of a macronutrient associated with reduced risk of chronic diseases
- ADMR for adults (% of total calories):

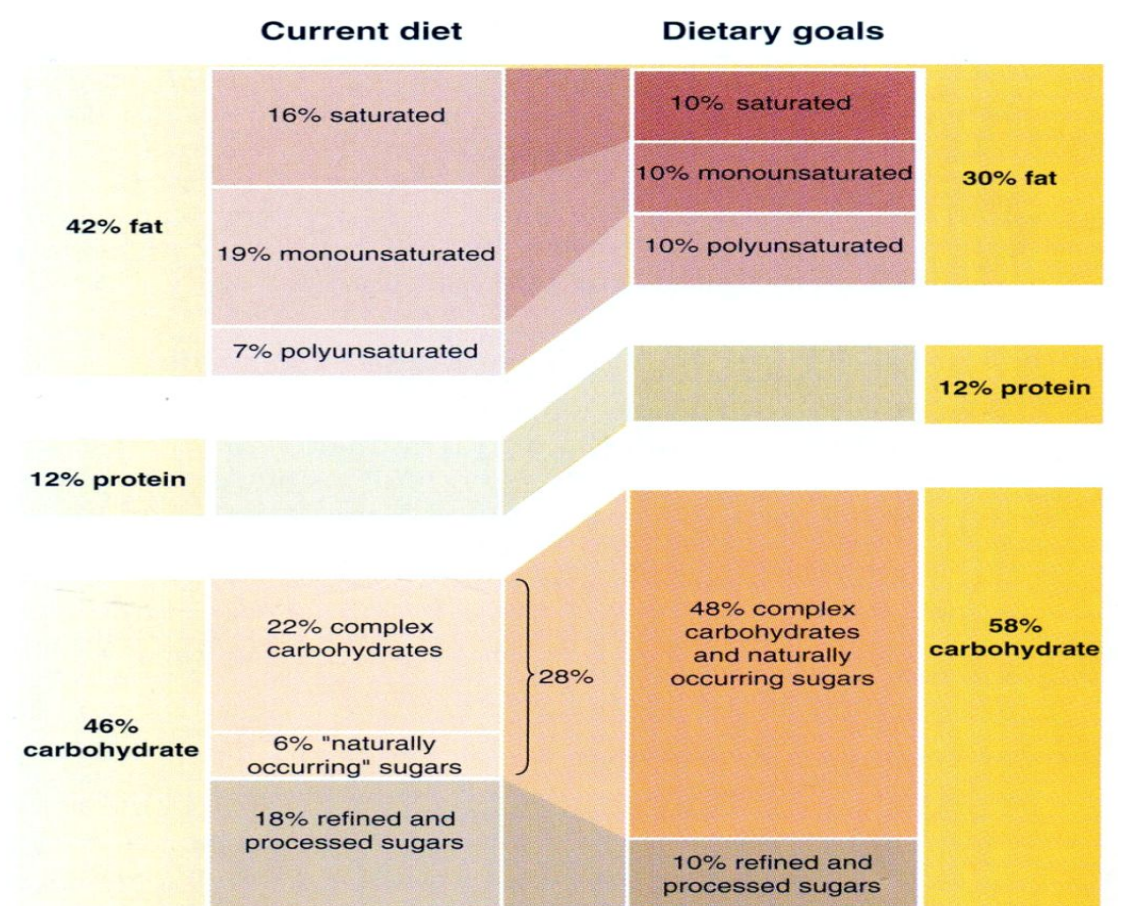
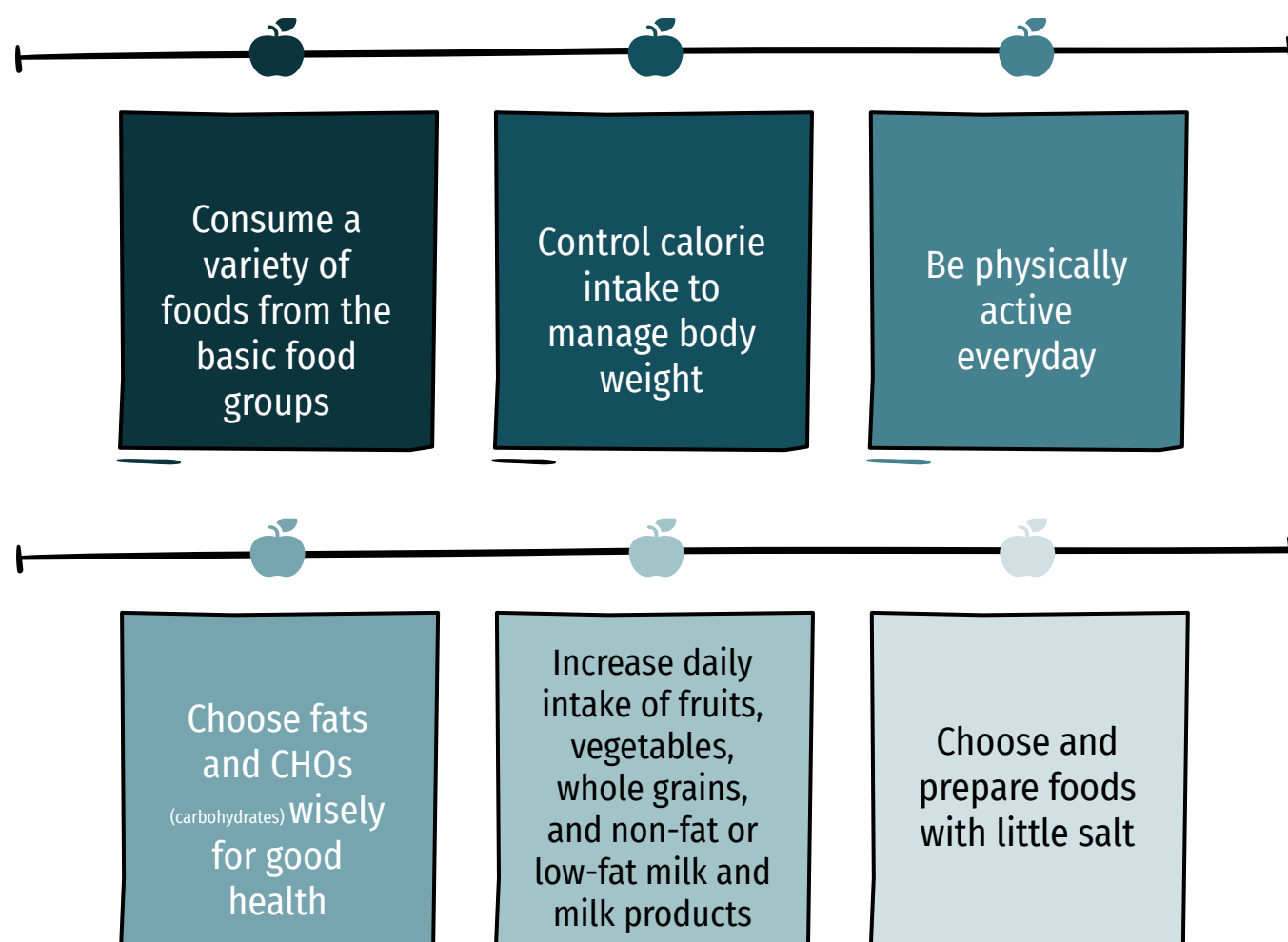


Food Pyramid

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



Dietary guidelines and 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)

Dr: you don't have to memorize this number "I don't know what number she meant, she didn't explain but i think she means the average numbers"

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

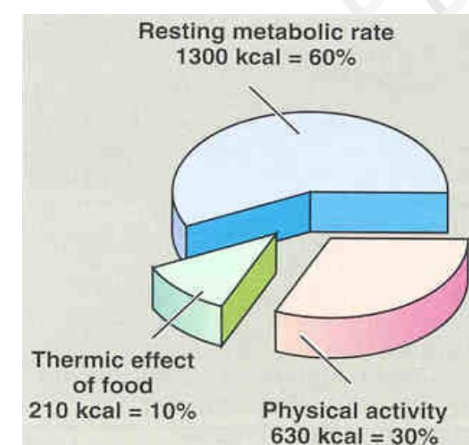
Vegetarians and nutrient intake

- Most vegetarian consume enough protein
- But they have LOWER
 - intake of iron, calcium and vitamin D
 - total dietary fat
 - Body Mass Index (BMI)
 - death rate from ischemic heart disease
 - blood pressure
 - cancer rates compared to non-vegetarians

Long-term vegans may develop megaloblastic anemia due to vitamin B12 deficiency

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
- 3 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

- 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

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



<h2>Nutrition</h2>	<p>Human nutrition:</p> <ul style="list-style-type: none"> • Undernutrition (nutrient deficiency) • Overnutrition (excessive nutrient intake) • Optimal nutrition (balanced nutrient intake)
<h2>Assessment of malnutrition</h2>	<ul style="list-style-type: none"> • Dietary intake studies • Biochemical studies • Clinical symptoms
<h2>Dietary reference intakes (DRIs)</h2> <ul style="list-style-type: none"> • Estimated Average Requirement (EAR) • Recommended Dietary Allowance (RDA) • Adequate Intake (AI) 	<ul style="list-style-type: none"> • (EAR): the nutritional requirement of <u>half of the healthy individuals 50%</u> in an age and gender group • (RDA): the nutritional requirement of <u>nearly all healthy individuals 97-98%</u> in a group <ul style="list-style-type: none"> ○ RDA is two SD above EAR ○ $RDA = EAR + 2\ SD$ • (AI): it is used instead of EAR and RDA, it covers the nutritional requirement of <u>all individuals in a group with approximation</u> 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
<h2>Acceptable Macronutrient Distribution Ranges (AMDR)</h2>	<p>Carbohydrates: 45 - 65 % Fats : 20 - 35 % Proteins : 10 -35 % Fibers : > 25 g</p>
<h2>The Food Pyramid</h2>	<p>Recommends size of daily servings Fats, oils and sweets have small serving size</p>
<h2>Energy requirement and expenditure in humans</h2>	<ul style="list-style-type: none"> • Vegetarian: consume enough protein but they have lower: <ul style="list-style-type: none"> ○ intake of iron, calcium and vitamin D ○ total dietary fat ○ Body Mass Index (BMI) ○ death rate from ischemic heart disease ○ blood pressure ○ cancer rates compared to non-vegetarians ○ Megaloblastic anemia • Energy expenditure depend on <ul style="list-style-type: none"> ○ Resting metabolic rate (RMR) ○ Physical activity ○ Thermic effect of food
<h2>Total parenteral nutrition (TPN)</h2>	<ul style="list-style-type: none"> • exogenous nutrition in which terminally-ill patients are provided with all essential nutrients intravenously or through tube feeding • 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)



 **MCQs**

1- Malnutrition is assessed by the following ways, except ?

A-Clinical symptoms

B-Biochemical studies

C-Biochemical methods

D-Dietary intake studies

2- The DRIs standard that covers the nutritional requirement of all individuals in a group with approximation is ?

A-Adequate Intake (AI)

B-Recommended Dietary Allowance (RDA)

C- Tolerable Upper Intake Level (UL)

D-Estimated Average Requirement (EAR)

3- AMDR for adult regarding the proteins is ?

A- 20-35

B- 25-35

C- 20-25

D- 10-35

4- Energy balance is maintained by ?

A- Carbohydrates

B- Energy expenditure

C- Daily intake of fruits

D- Calcium

5- Vegetarians have lower intake of

A- Vitamin B1

B- Protein

C- Calcium

D- Magnesium

6- TPN is particularly indicated in

A- Hemiplegia

B- Diarrhea

C- Mild burns

D- Cachexia

Answers key

1- C

2- A

3- D

4- B

5- C

6- D

SAQs

1- Human nutrition is divided into three areas:

- Undernutrition (nutrient deficiency)
- Overnutrition (nutrient excessive intake)
- Optimal nutrition (balanced nutrient intake)

2- Mention the dietary reference intake standards:

- Estimated Average Requirement (EAR)
- Recommended Dietary Allowance (RDA)
- Adequate Intake (AI)
- Tolerable Upper Intake Level (UL)

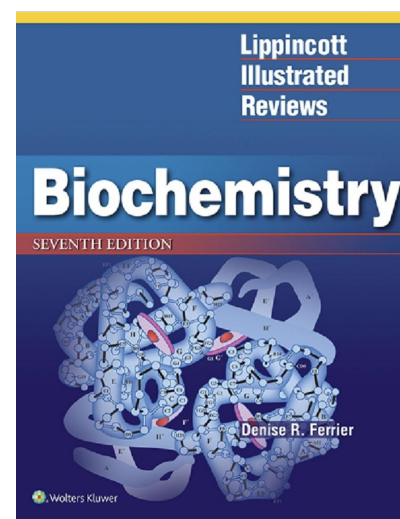
3- Define the energy requirement in humans.

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

4- Basic energy expenditure depends on ?

1. Resting metabolic rate (RMR)
2. Physical activity
3. Thermic effect of food

Resources Click on the book to download the resource





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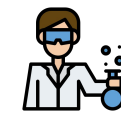
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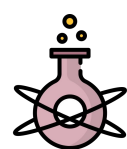
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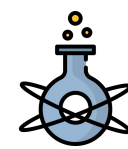
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Special thanks to Fahad AlAjmi for designing our team's logo.