

[lecture 3]

# Nutritional requirements



## The Objectives

- 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

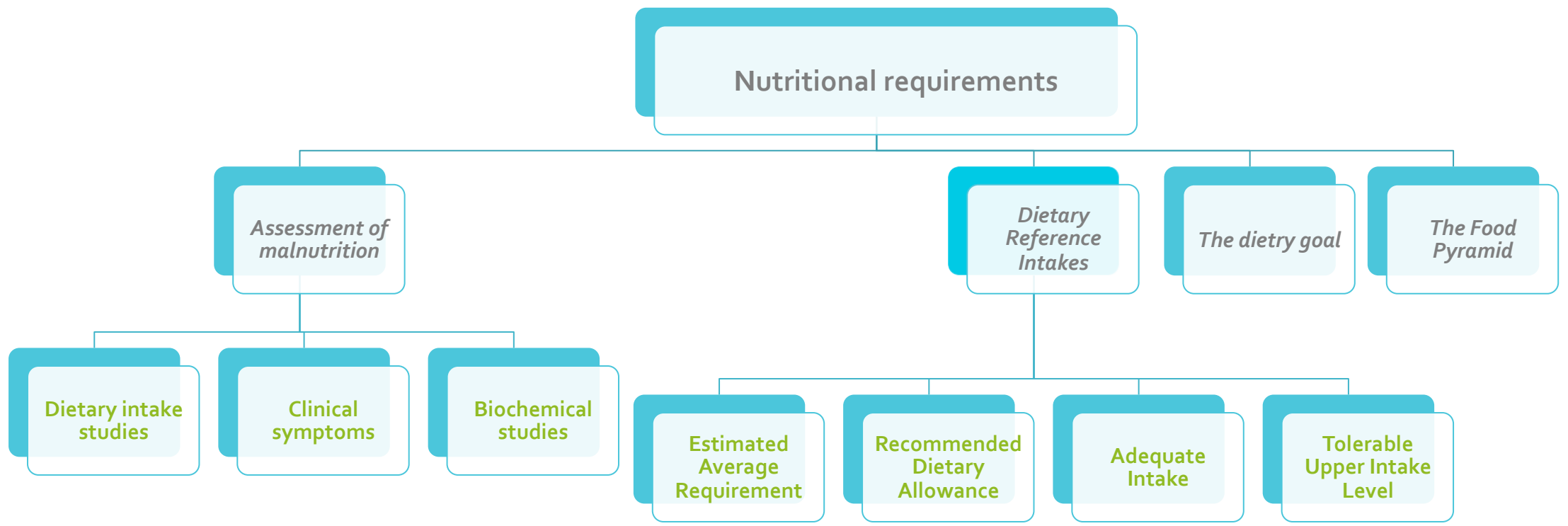
Red =  
Important

Blue =  
explain

Green =  
addition  
notes



# Mind Map





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# Nutritional requirements

## ◆ **What is nutrition?**

- ✧ It is a composition and quantity of food intake by living organisms
- ✧ Human nutrition is divided into three areas:
  - **Undernutrition (nutrient deficiency)**
  - **Overnutrition (excessive nutrient intake) which can cause diabetes, obesity, etc.**
  - **Optimal nutrition (balanced nutrient intake) take the only amount that you need .**

## ◆ **Assessment of malnutrition**

To establish the nutritional requirement, we need to do an assessment of Malnutrition , and we can measured it in three ways:

- **Dietary intake studies:** identify people with deficient diets (24hour dietary recall study)
- **Biochemical studies:** identify subclinical nutritional deficiencies. ( means the person has nutritional deficiencies but he has no symptoms)
- **Clinical symptoms:** identify clinical nutritional deficiencies

After those studies we establish the nutritional requirement and has 4 standards:

## ◆ **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



◆ DRIs have four standards:

- Estimated Average Requirement (EAR), or
- Recommended Dietary Allowance (RDA), or
- Adequate Intake (AI), and
- 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

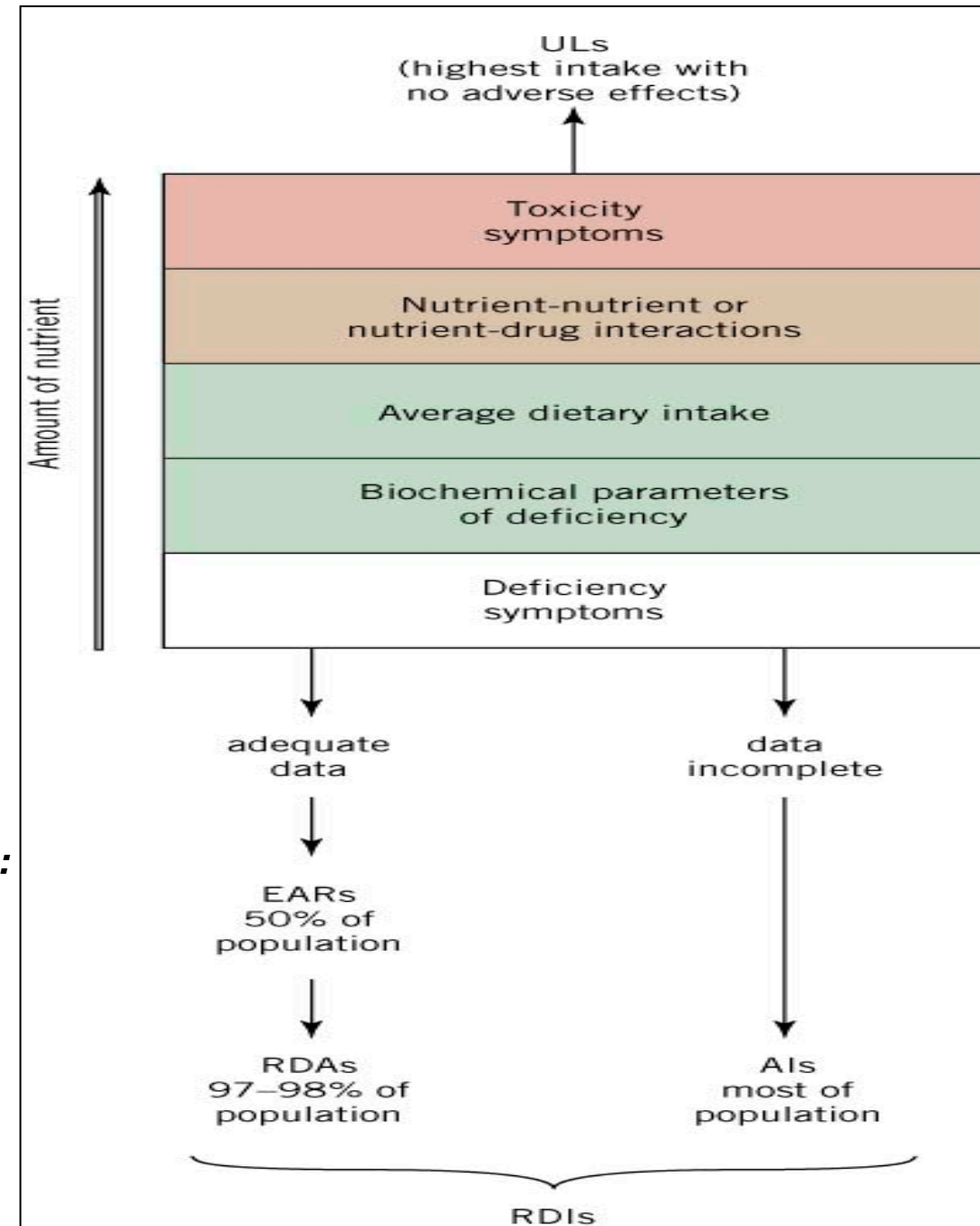
➤ **Recommended Dietary Allowance (RDA) it's more accurate than EAR:**

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

$RDA = EAR + 2 SD$

\*Standard deviation





## FROM 431 BIO TEAMWORK

Standard deviation means how much the data is varied. Let's say we have 3 students, one got 4 marks, the other 5 marks and the 3rd 6 marks, the average would be  $15/3 = 5$ , so the standard deviation would be  $5+1$  (the maximum value)  $5-1$  (the minimum value) by this, we get the whole range.

**Example:** for carbohydrates, EAR = 30 (+/-15) EAR (+/-SD). 50% of the population and the standard deviation 15, so the range = from 30-15 to 30 +15 = 15 to 45.  
RDA =  $30 + (2 \times 15) = 30 + 30 = 60$

To understand  
it more



➤ **Adequate Intake (AI) it's less accurate**

- 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.
- If the UL increase the **RISK** of adverse effect will increase.

◆ **Acceptable Macronutrient Distribution Ranges (AMDR)**

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

**AMDR** for adults (% of total calories)

Carbohydrates	45-65
Fats	20-35
Proteins	10-35
Fiber	>25 g

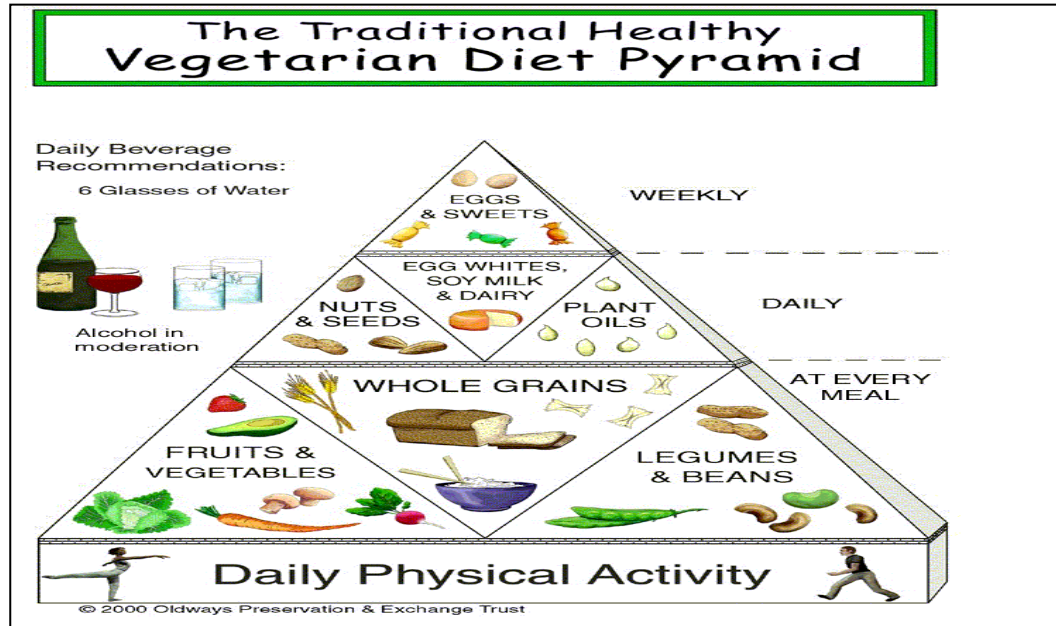
→ The amounts of nutrients that decrease chronic disease



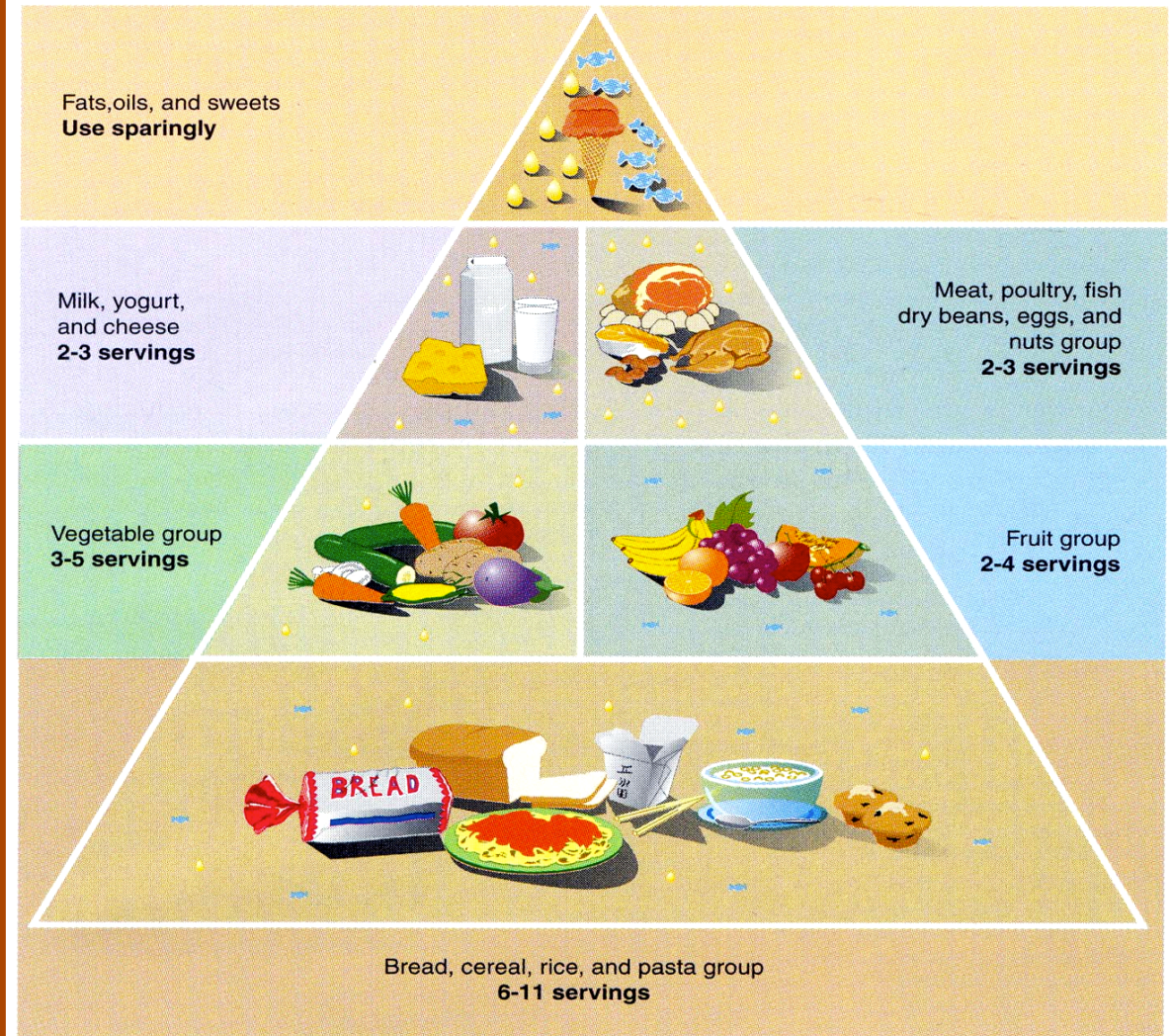
\*Doctor said this slide for your information

## ➤ Food Pyramid

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



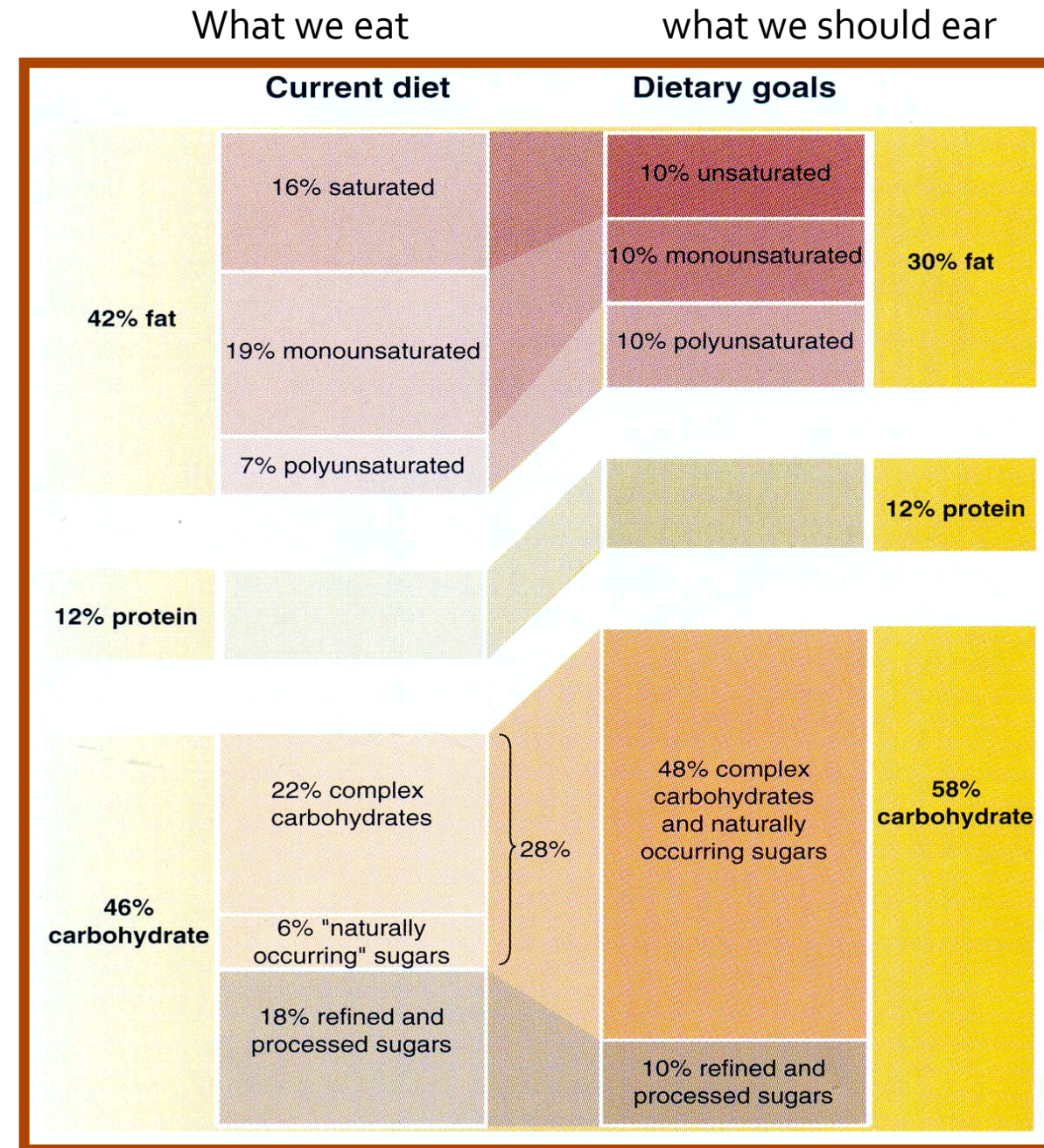
The Food Guide Pyramid  
A Guide to Daily Food Choices





## ◆ 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







## ◆ 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)

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

The table is not important

## ◆ Vegetarians and nutrient intake

The vegetarian usually have these symptoms below:

- 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:

The vegetarians usually associated with some chronic disease the mention below:

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



# The Energy

## ◆ 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

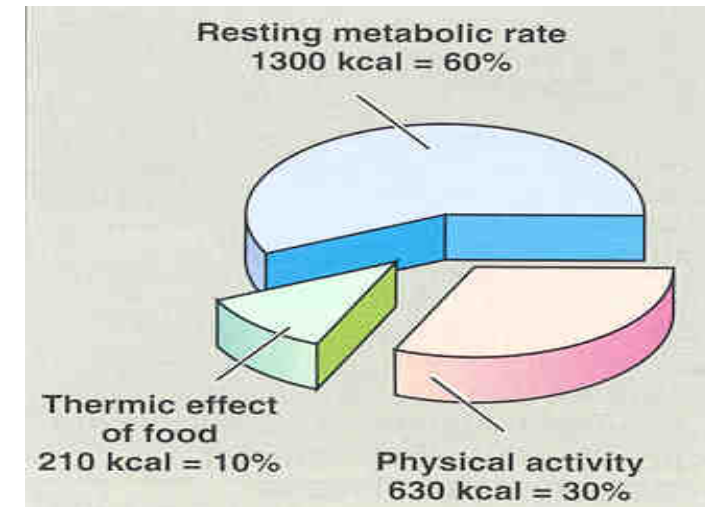
Sedentary (normal activity) person: **30-50%** above RMR

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





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# Summary

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- ❖ To establish the nutritional requirement we need to do an assessment, and we can do it in three ways:  
Dietary intake studies, Biochemical studies, and Clinical symptoms studies
- ❖ After studies we establish the nutritional requirement (RDA) and has 4 standards:  
Estimated Average Requirement (EAR), or Recommended Dietary Allowance (RDA), or Adequate Intake (AI), and Tolerable Upper Intake Level (UL)
- ❖ Energy balance is maintained by calorie intake and energy expenditure.
- ❖ The vegetarian usually have some symptoms like, Lower intake of iron, calcium and vitamin D and vitamin B12 deficiency.
- ❖ The vegetarians usually associated with some chronic disease like, Lower blood pressure, Lower cancer rates and Lower blood pressure

## Test your knowledge ...!

Q1/ Which one of the following standards of RDA we use due to insufficient data?

- A. Estimated Average Requirement (EAR).
- B. Recommended Dietary Allowance (RDA).
- C. Adequate Intake (AI).
- D. Tolerable Upper Intake Level (UL).

Q2/ Energy balance of the body is maintained by ?

- A. Fats & Carbohydrates
- B. Fiber & Proteins
- C. calorie intake & energy expenditure
- D. None of them

Q3/ which one of the following is associated with Vegetarians?

- A. Higher intake of calcium
- B. Higher Body Mass Index (BMI)
- C. Higher death rate from ischemic heart disease
- D. Lower blood pressure

Answers:  
Q1/ C  
Q2/ C  
Q3/ D



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If you find any mistake, please contact us:  
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*Biochemistry team leaders:  
Basil ALSuwaine And Manar AlEid*

*Thank you*

