



Important Doctors slides
Extra Information Doctors notes



Biochemistry

Nutritional requirements

A goal without a plan is nothing but wish



[Editing file](#)

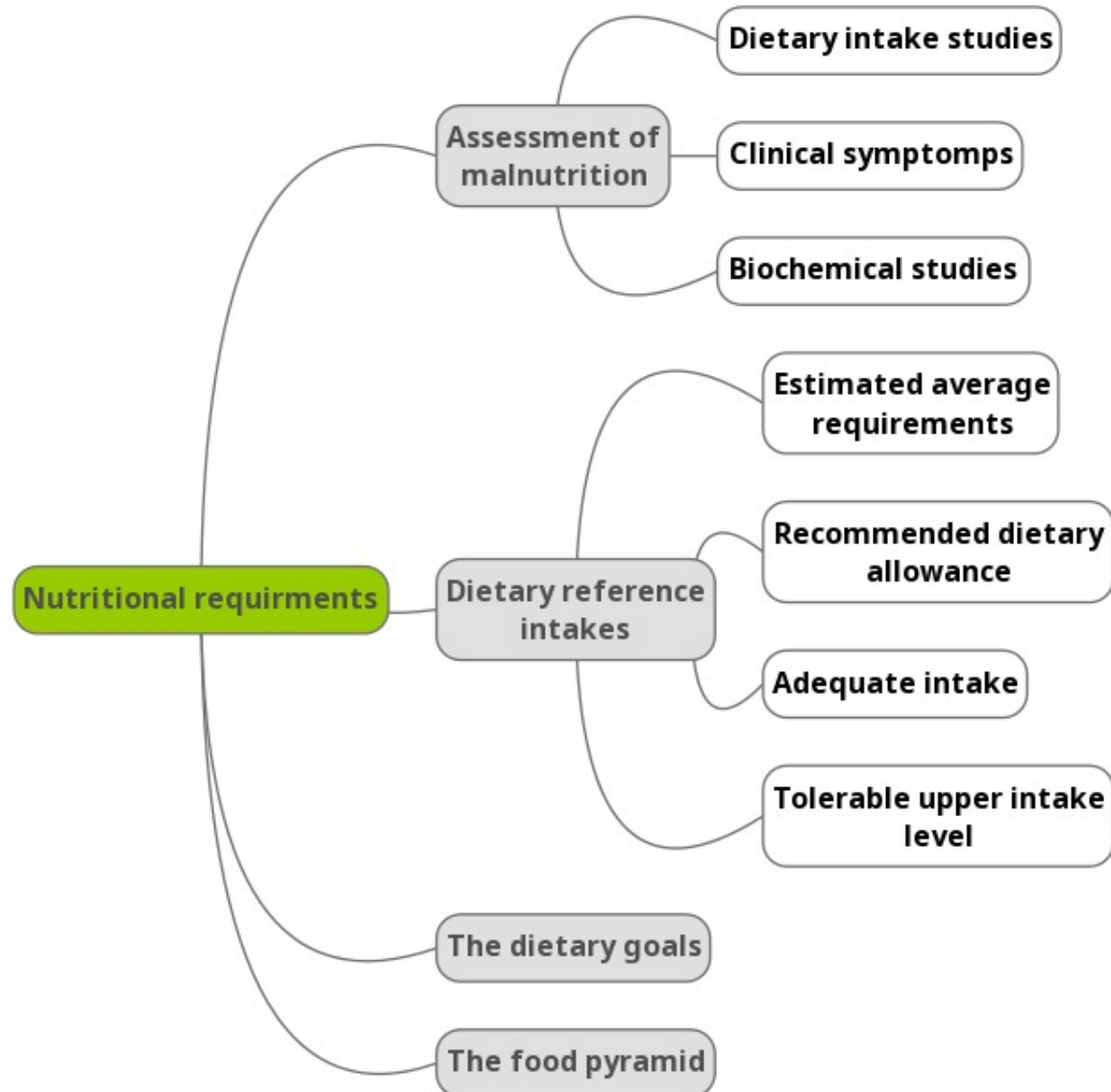
OBJECTIVES

By the end of this lecture, the students should be able to know:

- Understand the basic terms of nutritional requirements that are important for establishing intake of a nutrient in 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



Lecture overview



Nutrition

What Is Nutrition ?

Composition and quantity of food intake by living organisms.
Biochemical utilization of food.

❖ Human nutrition is divided into three areas:

1. Under-nutrition (nutrient deficiency)
 2. Over-nutrition (excessive nutrient intake)
 3. Optimal nutrition (balanced nutrient intake)
- ✓ The Ideal condition

Nutrition means whatever you eat and the quality and amounts of it ..

Biochemical utilization : How it's metabolized by the body to provide energy



Malnutrition

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)

❖ **What is it ?** 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

In malnutrition either the composition of nutrients or amount is impaired

To assess dietary intake studies we have to study the results of 24 hours food recall survey of a healthy selected population and submit the results as the normal amounts of nutrient should be taken per day ..

In biochemical studies it depends in biochemical investigations of some nutrients as vitamins.. where the individual has no clinical symptoms – looks healthy while having a deficiency

Dietary Reference Intakes (DRIs)

DRIs have four standards:

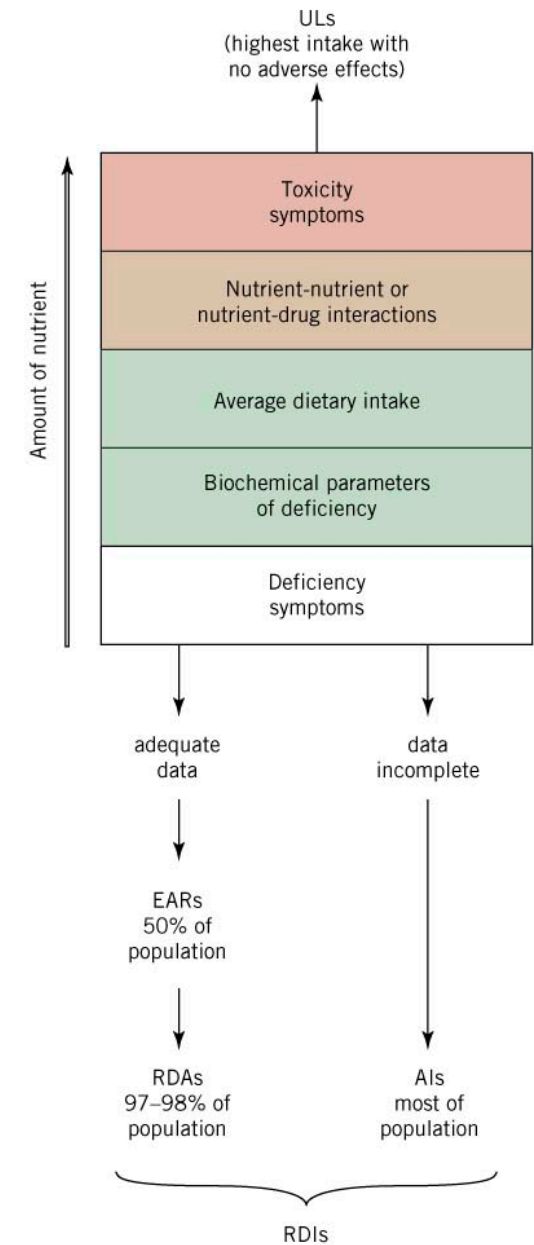
Estimated
Average
Requirement
(EAR)

Recommended
Dietary
Allowance
(RDA)
(Most Accurate)

Adequate
Intake (AI)
(Least Accurate)

Tolerable
Upper Intake
Level (UL)

Each standard is explained alone in next few slides



Dietary Reference Intakes (DRIs)

1) Estimated Average Requirement (EAR)

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

تغطي 50% من البوبيوليشن. مثال :
IF we have a population of 1000 individuals, then the EAR is going to be 500 (halve of the population) and based on that we come up with average number.
ومن هذي القيمة نقدر نحسب RDA

2) 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

هنا تقريبا اخذنا كل البوبيوليشن بس تركنا نسبة 2-3 % هذي النسبة المتروكة نقصد فيها الفئة من المجتمع اللي ما تمشي على RDA's مثل

1. Pregnant female
2. Lactating
3. Eldery
4. Children and athelets

If EAR of a certain nutrient was 24 mg and the standard deviation was ± 4 then how much is the RDA ??
 $24 + 2 \times 4 = 32 \text{ mg}$

Dietary Reference Intakes (DRIs)

3) 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**

Over estimation of a group of population. The experts set with data that are available and compute with higher number.. Such as when the study lacks biochemical studies ..

4) 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 nutrients intake is equal to or less than the EAR (not good)
- If the nutrients intake is less than RDA but between EAR and AI (better)

- For very nutrient we have to set a number limits so we don't develop toxicity
- If you crossed the UL THE RISKS for developing toxicity increase, but you DON'T develop toxicity. To develop toxicity you have to go much higher than UL for longer time.

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

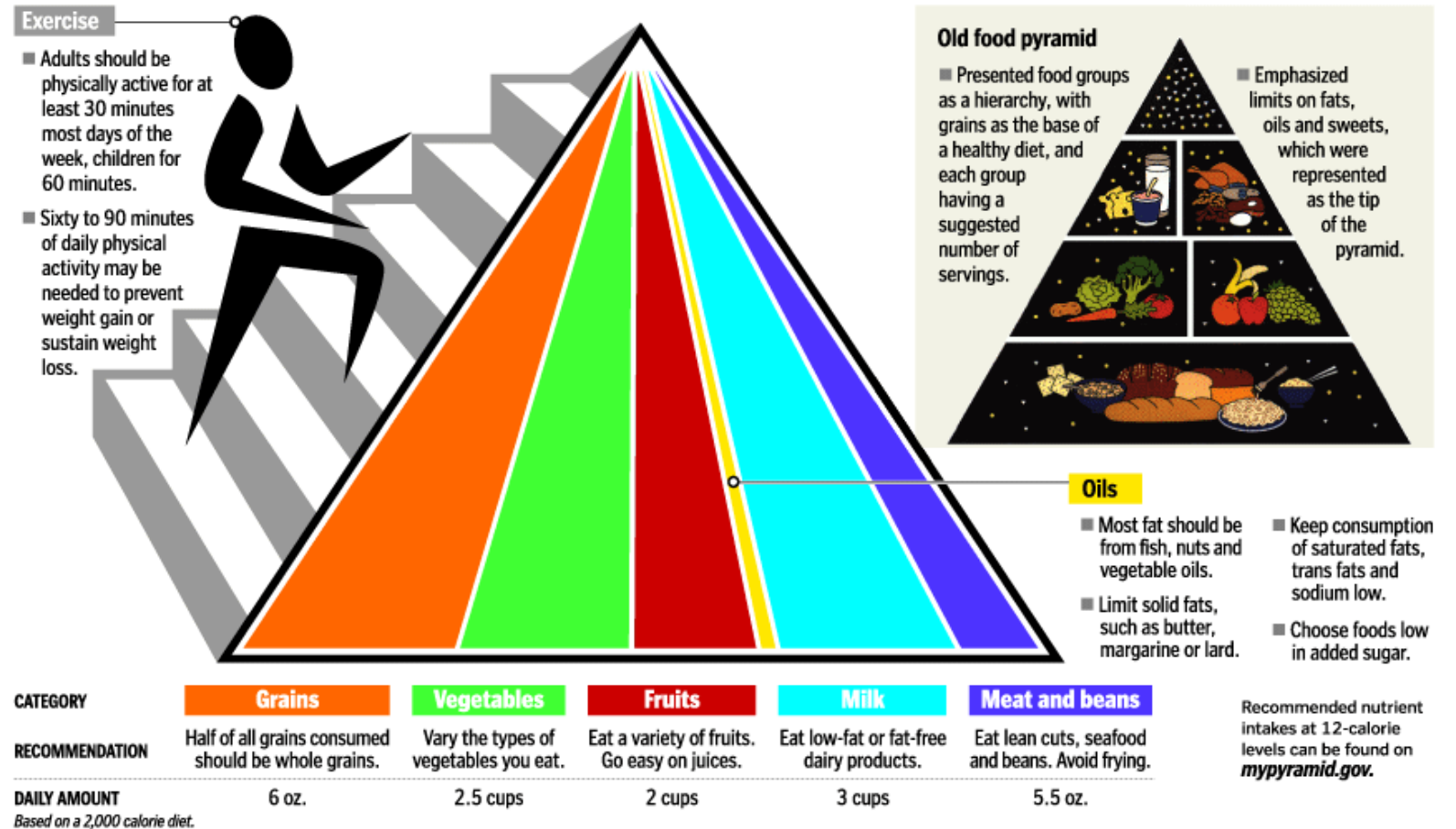
If the diet is modified according to these percentages the individual will have lower risk to develop chronic diseases



Food pyramid

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

The pyramid now is 3 dimensional because they added exercises as another recommendation along with grains, fruits .. Etc.

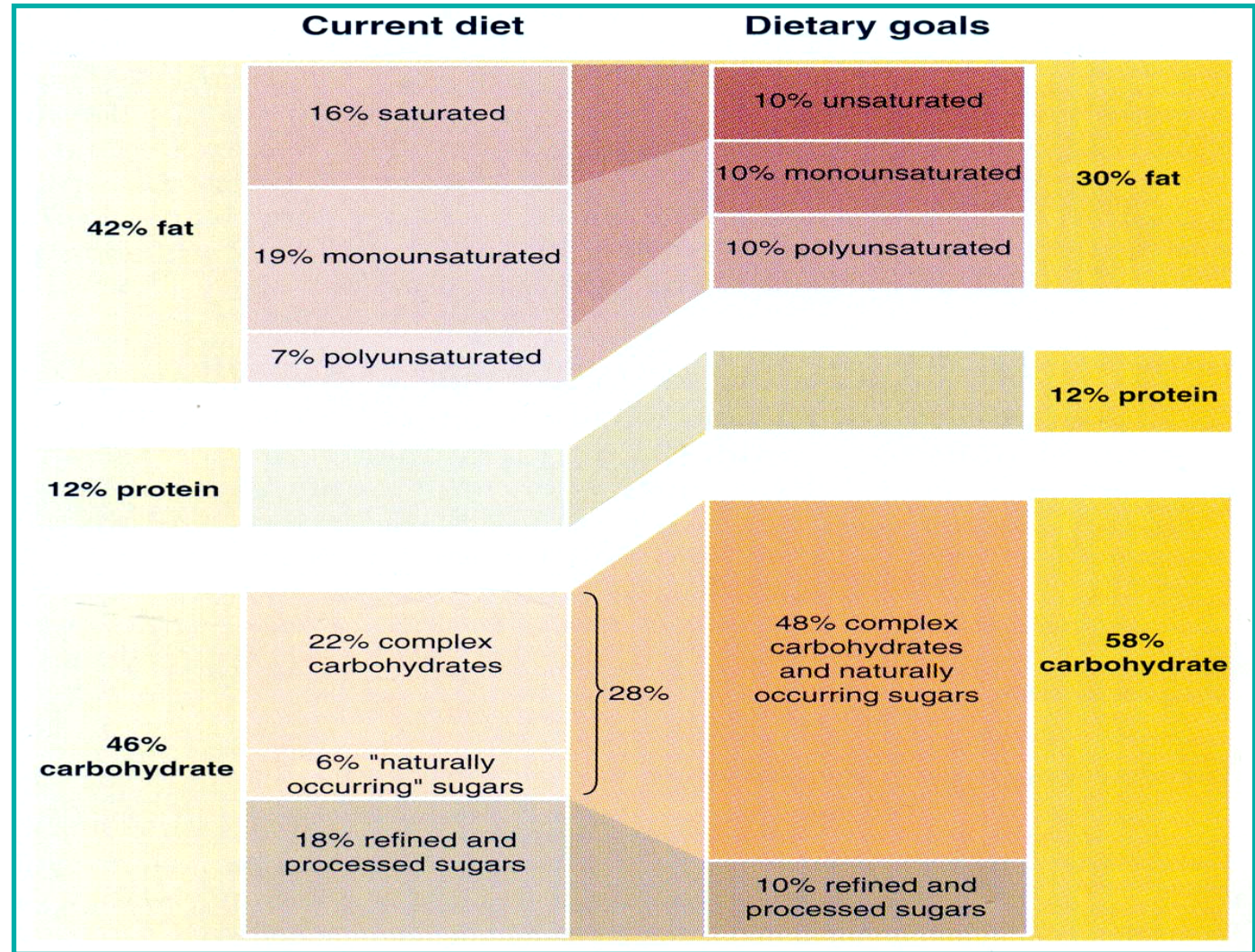


Dietary guidelines

Dietary Guidelines And Goals

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

Choose unsaturated fats



This normal studies are modified in the right side of the chart regarding dietary goals

Protein-Energy Malnutrition

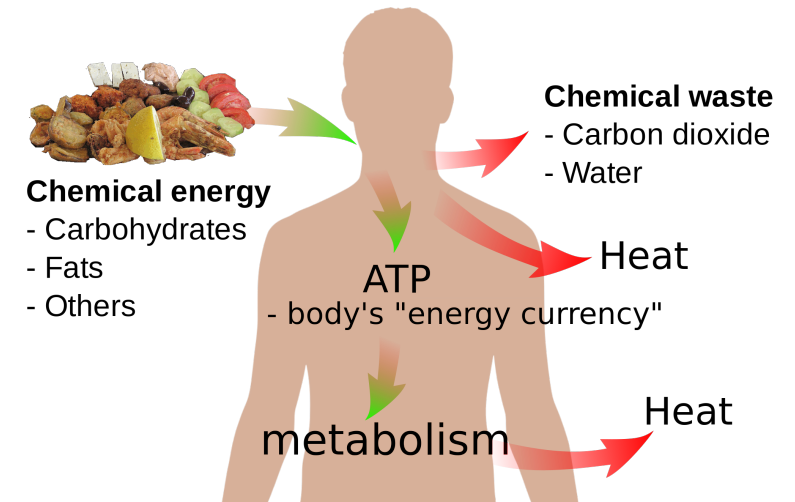
❖ Energy Requirement In Humans

- 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)

How do we calculate these calories:
We take different drips of food and burn them in a calorie meter and we measure how much heat is produced

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

Energy and human life



Vegetarians

Vegetarians and nutrient intake

- Lower intake of iron, calcium and vitamin D
- Long-term vegans may develop megaloblastic anemia due to vitamin B12 deficiency (B12 comes from animal sources)
- 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

The composition of nutrients that vegans are taking is slightly different thus they have some positive and some negative effects

Energy expenditure

➤ 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

When a person is only laying down doing nothing like sleeping. Just because you're alive you will consume energy for respiration, blood flow or maintaining the electrolyte balance AKA (basic physiological cases that require energy)

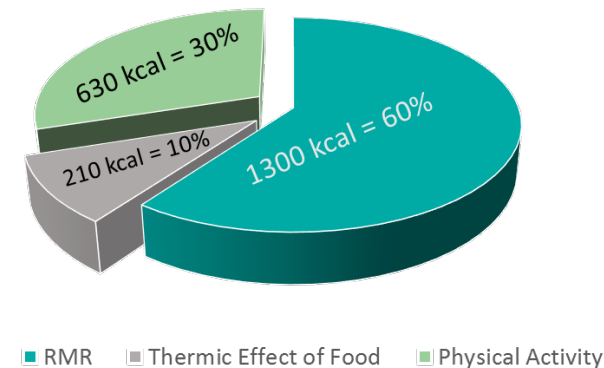
❖ Physical activity :

- **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 **after eating**
- **5-10%** of total energy expenditure

Sedentary person: is moving and doing something, like walking to the kitchen, grapping the remote control he consumes 30 -50 % calories above the RMR



Total Parenteral Nutrition (TPN)

- ❖ **What is it ?** A type of exogenous nutrition in which terminally-ill patients are provided with all essential nutrients intravenously **Bypassing GI tract** or through tube feeding ..

TPN is particularly indicated in severe inflammatory bowel disease, coma, cachexia **"Extreme muscle wasting"** , prolonged ileus and extensive burns
Nutrients are pumped into a large central vein to allow rapid dilution of the solution (3 L / 24 hours)

Tube feeding is only provided to patients whose **GI tract is intact** and supports this type of nutrition

Enteral nutrition not TPN, which you can use only when the GIT is intact and working.

And they right "NPO" beside the name of the patient in the ward
NPO refer to: Nil per os, Latin for "nothing by mouth"
Glucose should be monitored each 6 hours



Total Parenteral Nutrition (TPN)

Standard composition of TPN feed 24 hours requirement	
Energy content	2000 kcal
Nitrogen	12–14 g
Fat	900 kcal
Glucose	1000 kcal
Electrolytes, trace elements, vitamins	present
Volume	3 liters

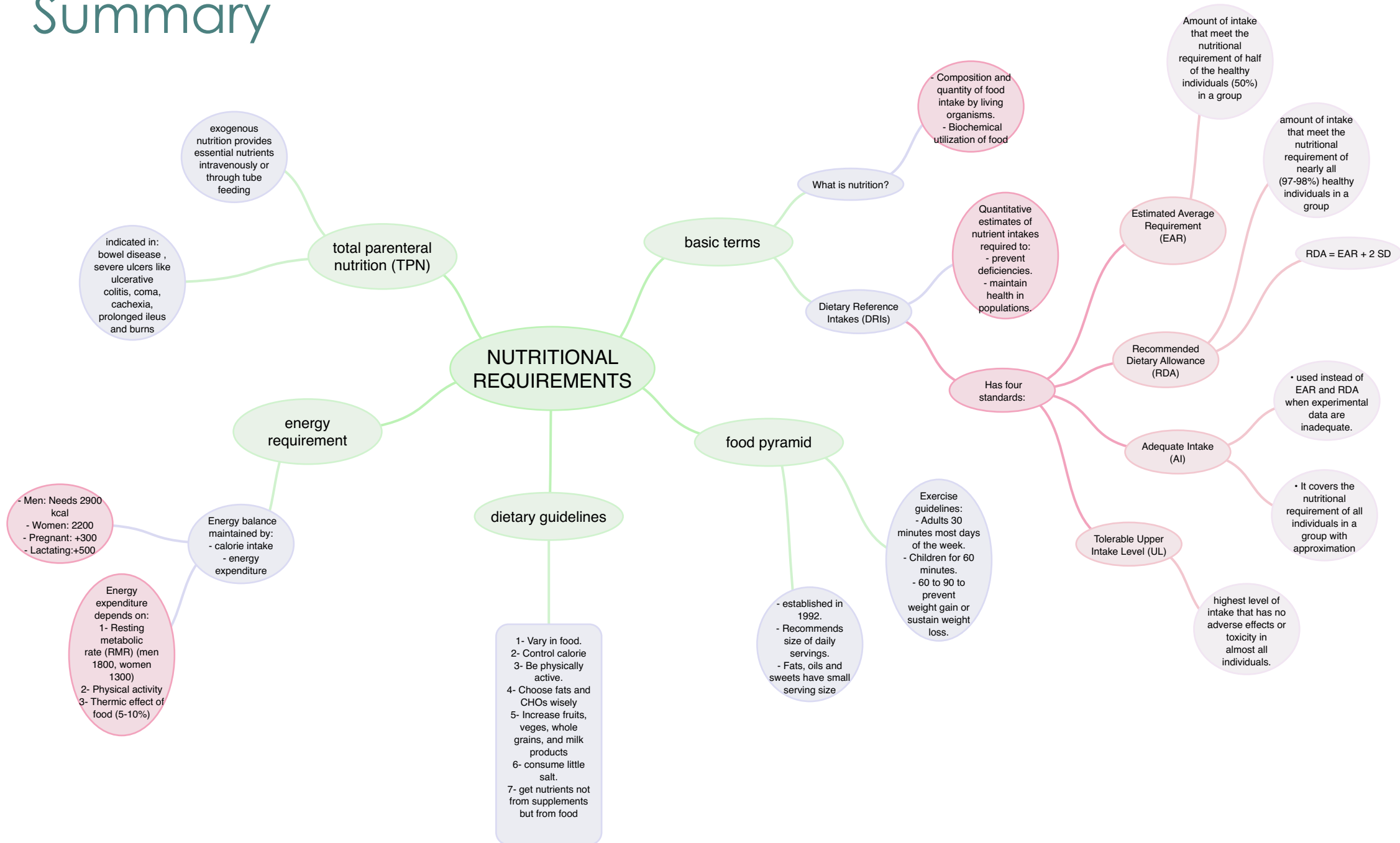
- ✓ Individual nutritional requirement of patients may vary
- ✓ Continuous biochemical, hematological and immunological monitoring of patient on TPN is required



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



QUIZ

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 : Which of the following will identify asymptomatic dietary deficiency?

- A- Dietary intake studies
- B- Clinical symptoms
- C- Biochemical studies
- D- A+B

Q3 : What type of anemia vegans may develop?

- A- Sideroblastic anemia
- B- megaloblastic anemia
- C- normocytic anemia
- D- None of the above

Q4 : Energy balance of the body is maintained by?

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

Q5 : has no adverse health effects or toxicity in almost all individuals?

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

Q6 : Which of the following is considered as lower intake in vegans?

- A- Iron
- B- Calcium
- C- Vitamin D
- D- All of the above

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

QUIZ

Q7 : How the energy balance is maintained ?

By calorie intake and energy expenditure.

Q8 : Why body expenditure 1800 kcal while we are resting ?

Because the functioning body consumes energy (heart, brain and digestive system all are functioning and need energy)

Q9 : Determine three situations where total parenteral nutrition (TPN) is particularly indicated?

severe inflammatory bowel disease, coma, cachexia, prolonged ileus and extensive burns

Q10 : What are the four standards of DRIs ?

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

[Suggestions and recommendations](#)



TEAM MEMBERS



BIOCHEMISTRY TEAM 436



Maha alghamdi



Mohannad alzahrani

TEAM LEADERS



Mohammad Almutlaq
Rania Alessa

THANK YOU

FOR CHECKING
OUR WORK



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US IF YOU HAVE
ANY ISSUE



• Lippincott's Illustrated Reviews Biochemistry 6th E



Review the notes



@436Biochemteam



Biochemistryteam436@gmail.com

