Tishk International University
Faculty of Applied Science
Department of Nutrition & Dietetics

Nutritional Biochemistry I/ NUT 207

TOPIC: Introduction to Nutrients (Week 1)

2nd Grade- Fall Semester 2025-2026

Lecturer: Amani Tahsin
Contact Info. : amani.tahsin@tiu.edu.iq

Outline

- Definition of some terms.
- History and developments in Nutrition.
- Components of energy expenditure.
- Nutrient needs determination.
- Acceptable Macronutrient Distribution Ranges (AMDR).

Nutritional Biochemistry

- The history of biochemistry actually started with nutrition.

- Nutritional biochemistry is one of the academic foundations that make up nutritional sciences.

- A discipline that encompasses the knowledge of nutrients and other food components with emphasis on their range of function and influence on mammalian physiology, health, and behavior.

Nutritional biochemistry is a sub-discipline that is made up of the core;

knowledge

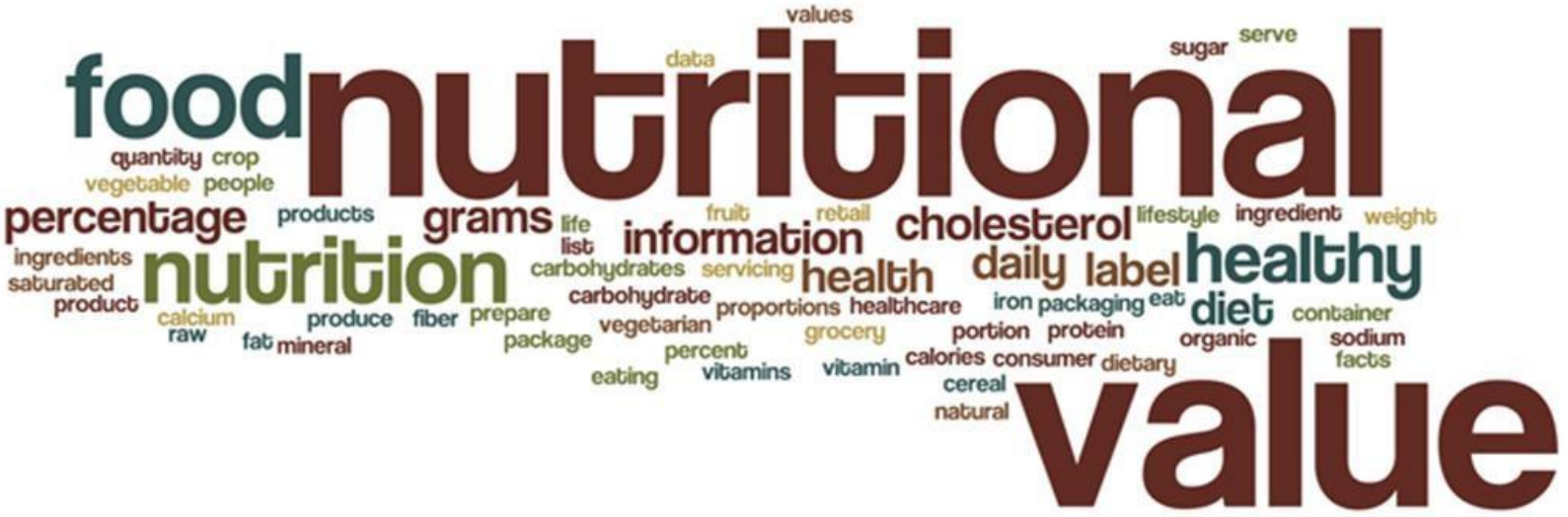
concepts

methodology

related to the chemical properties of nutrients and other dietary constituents and to their biochemical, metabolic, physiological, and epigenetic functions.

A primary focus of research in nutritional biochemistry

The scientific establishment of optimal *dietary intakes* (Dietary Reference Intakes or DRIs) for every nutrient and food component throughout the life cycle (Thomas and Earl, 1994; Standing Committee, 1998).



Scientific Developments in Nutrition

The concept of metabolism, the transfer of food and oxygen into heat and water in the body, creating energy, was discovered in 1770 by Antoine Lavoisier, the "Father of Nutrition and Chemistry."

"To eat is a necessity,
but to eat intelligently is an art."
~ La Rochefoucauld

History

- Nutrition was officially recognized as an independent field of study in 1928 with the formation of American Institute of Nutrition.

- Nutrition research tries to find out the impact of food on our body by examining the progress in allied fields such as physics, chemistry, biochemistry and immunology.

Nutrient

- Any substance that can be taken in and used in organic synthesis & can be metabolized by human body to give energy and build tissues is called Nutrient.

Food

- Any substance consumed to provide nutritional support to the body is called Food.

- Ay substance that is the source of Nutrition, can be metabolized by human body to give energy and to build tissues and that provide mental stimulus for thinking is called food.

Nutrition

The organic process of *nourishing* or *being nourished* by which an organism assimilate food and use for growth and maintenance is called **nutrition**.

Diet

- Sum of foods consumed by organisms or group or organisms is called diet.
- Prescribed food is called diet.

Balanced Diet

The diet that contain adequate amount of all necessary nutrients required for healthy growth and activity in a balanced proportion is called balanced diet.

Components of energy expenditure

- Basal Metabolic Rate (BMR) or Resting Metabolic Rate (RMR).
- Thermogenic effect of food.
- Daily physical activity and exercise.

Basal Metabolic Rate

Body's idling speed

The minimal working rate of internal energy expenditure during (metabolism, thermogenesis and body functions) at resting state.

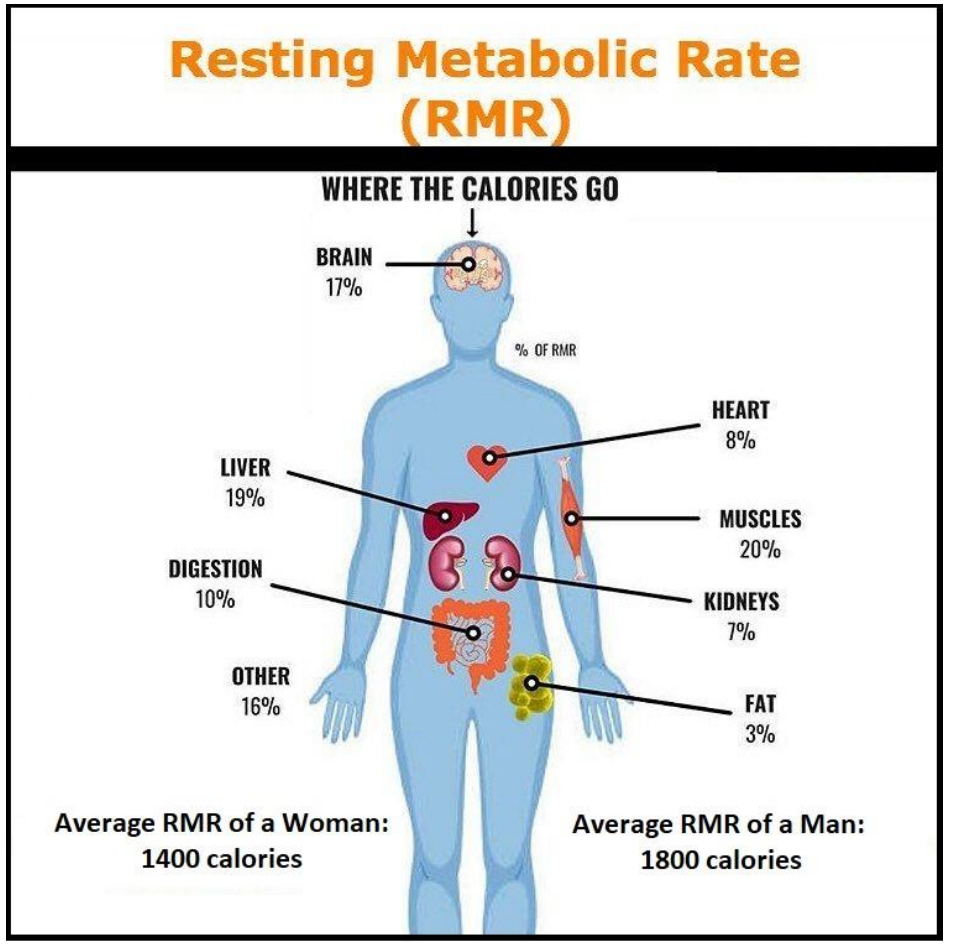
Conditions to calculate BMR

- Mentally and physically rest.
- Temperature = 25 °C.
- Post absorptive state (after 3 to 4 Hr of meal).

Resting metabolic rate

Combination of:

- Basal metabolic rate.
- Sleeping metabolism.
- Arousal metabolism.



Methods to calculate BMR

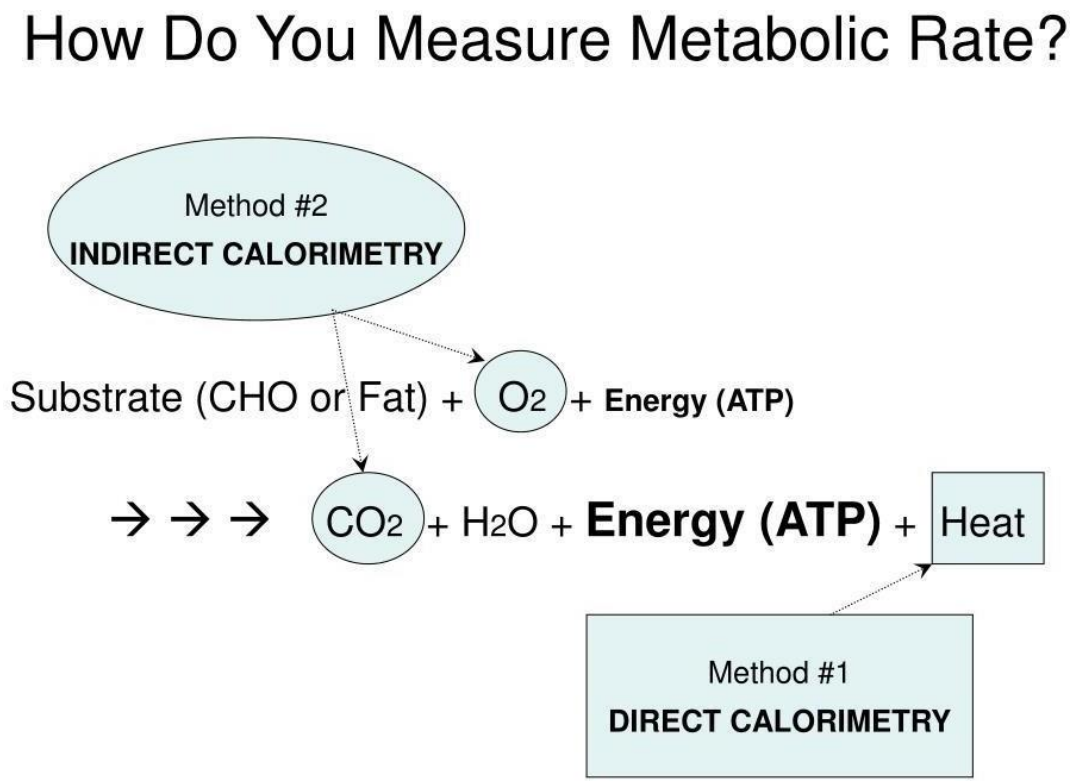
1. Direct method

- Calorimeter used – Energy produced is measured.

2. In direct method

- Measured by the consumption of O_2 and CO_2.

Methods to measure metabolic rate



Energy from metabolism

- 40% □ ATP
- 60% □ Heat.

❖ Digesting metabolism

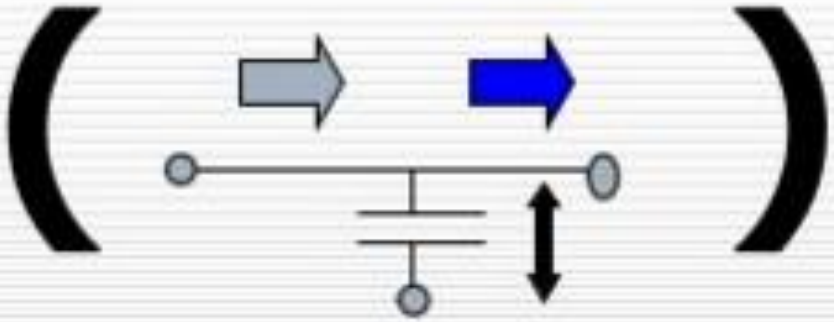
- Energy needed to digest the food.
- 10% of the metabolic demand.

Energy

- Capacity to do work is called Energy.
- Nutritional Unit → Calorie
- The amount of heat energy required to raise the temperature of 1 gram of water by 1 C is called Calorie.

Energy balance with respect to the body

INPUT - OUTPUT = STORAGE OR DEPLETION



OUTPUT = INTERNAL WORK + EXTERNAL WORK

INTERNAL WORK ➔ HEAT

Storage and/or Depletion

Input energy & output energy match → Energy balance

✓ Positive energy balance

- Input more than output→ storage in the form of glycogen or fats

✓ Negative energy balance

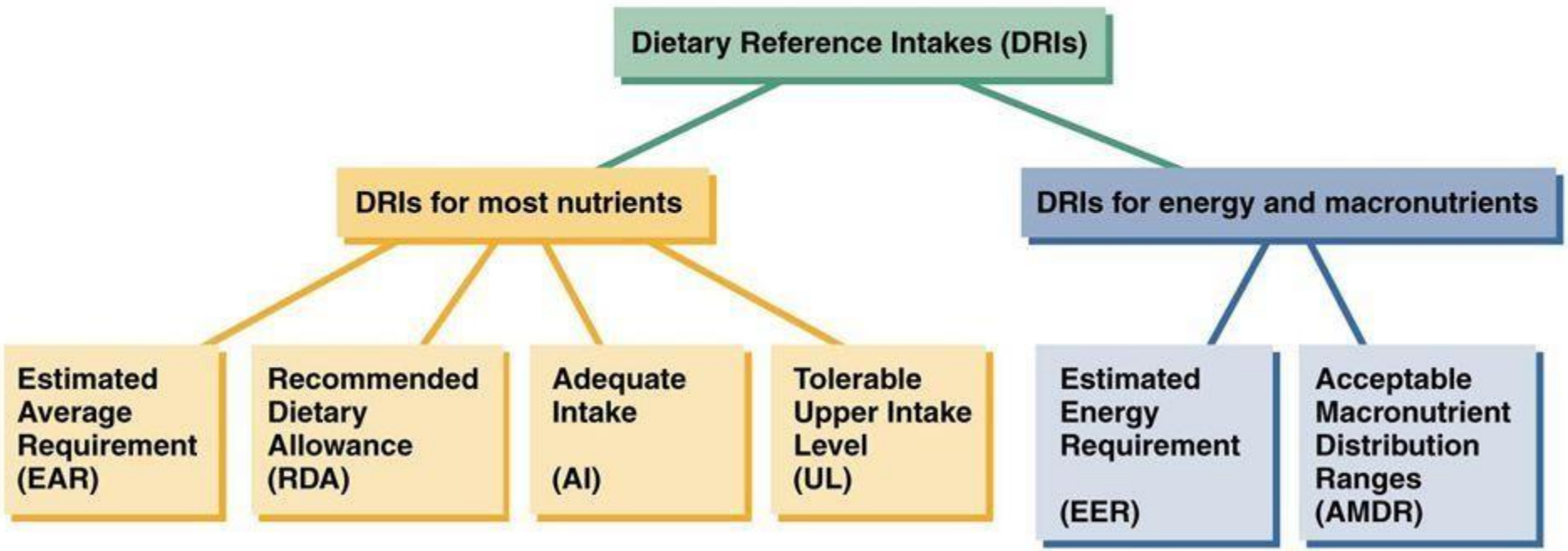
- Output more than input→ Body energy stores depleted

Determining Nutrient Needs

Dietary Reference Intakes (DRIs): updated nutritional standards.

- Expand on the traditional RDA values.
- Set standards for nutrients that do not have RDA values.

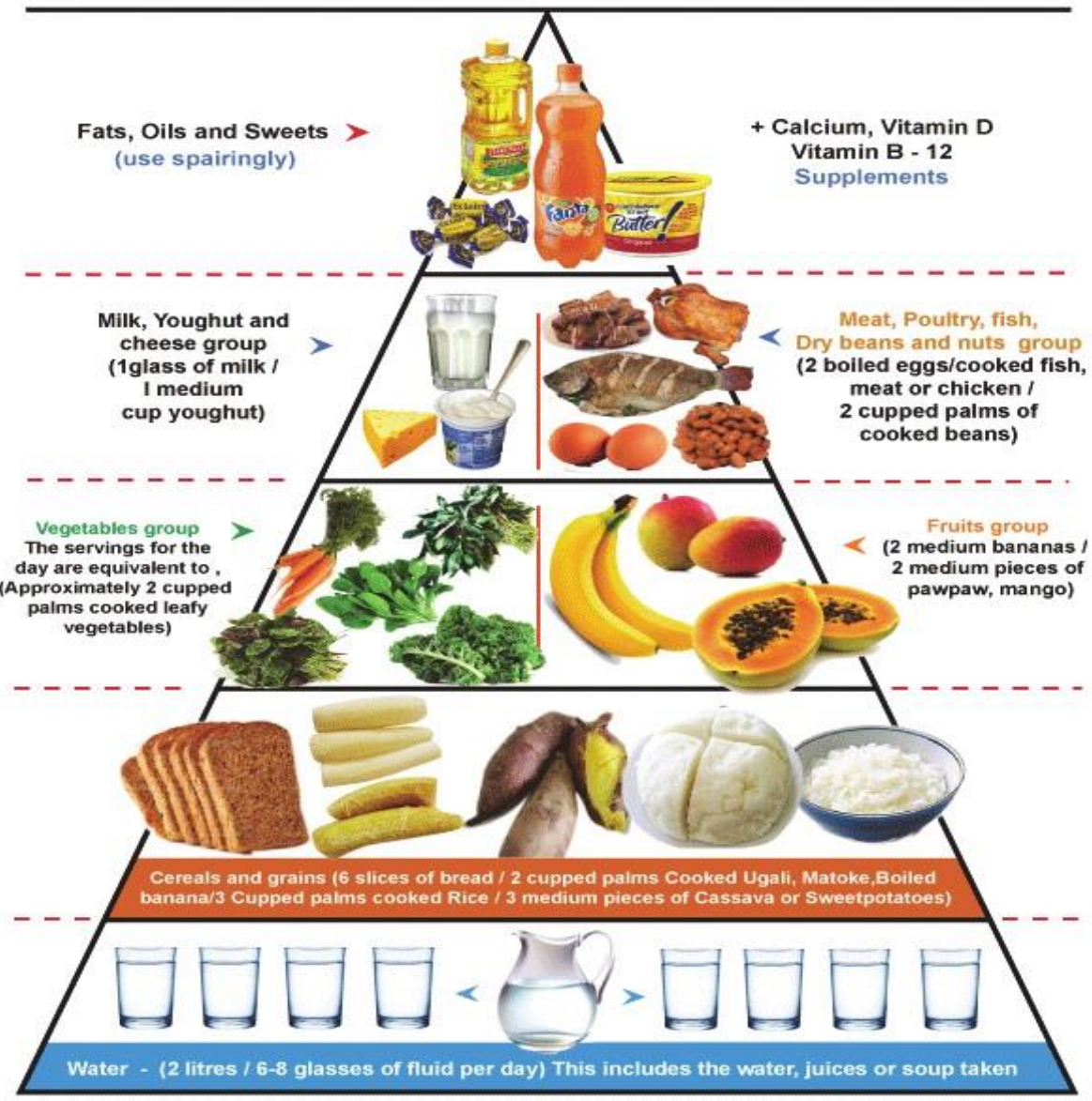
Determining Nutrient Needs



DRIs consist of 4 values

1. Estimated Average Requirement (EAR)
2. Recommended Dietary Allowances (RDA)
3. Adequate Intake (AI)
4. Tolerable Upper-Intake Level (UL)

Food Guide Pyramid



Estimated Average Requirement (EAR)

- The average daily intake level of a nutrient that will meet the needs of half of the people in a particular category.

- Used to determine the Recommended Dietary Allowance (RDA) of a nutrient.

Recommended Dietary Allowances (RDA)

The average daily intake level required to meet the needs of 97-98% of people in a particular category.

Adequate Intake (AI)

- Recommended average daily intake level for a nutrient.
- Based on observations and estimates from experiments.
- Used when the RDA is not yet established : calcium, Vitamin D, Vitamin K, fluoride.

Tolerable Upper Intake Level (UL)

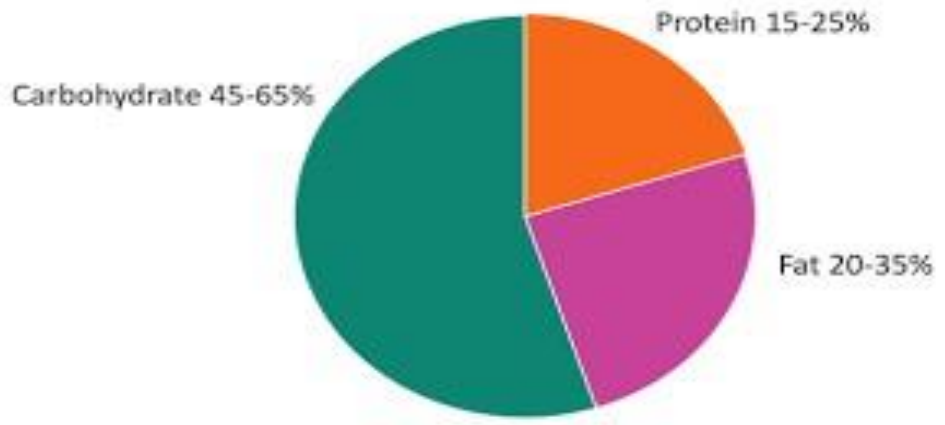
- Highest average daily intake level that is not likely to have adverse effects on the health of most people.
- Consumption of a nutrient at levels above the UL is not considered safe.

Estimated Energy Requirement (EER)

- Average dietary energy intake (kcal) to maintain energy balance.
- Based on age, gender, weight, height, level of physical activity.

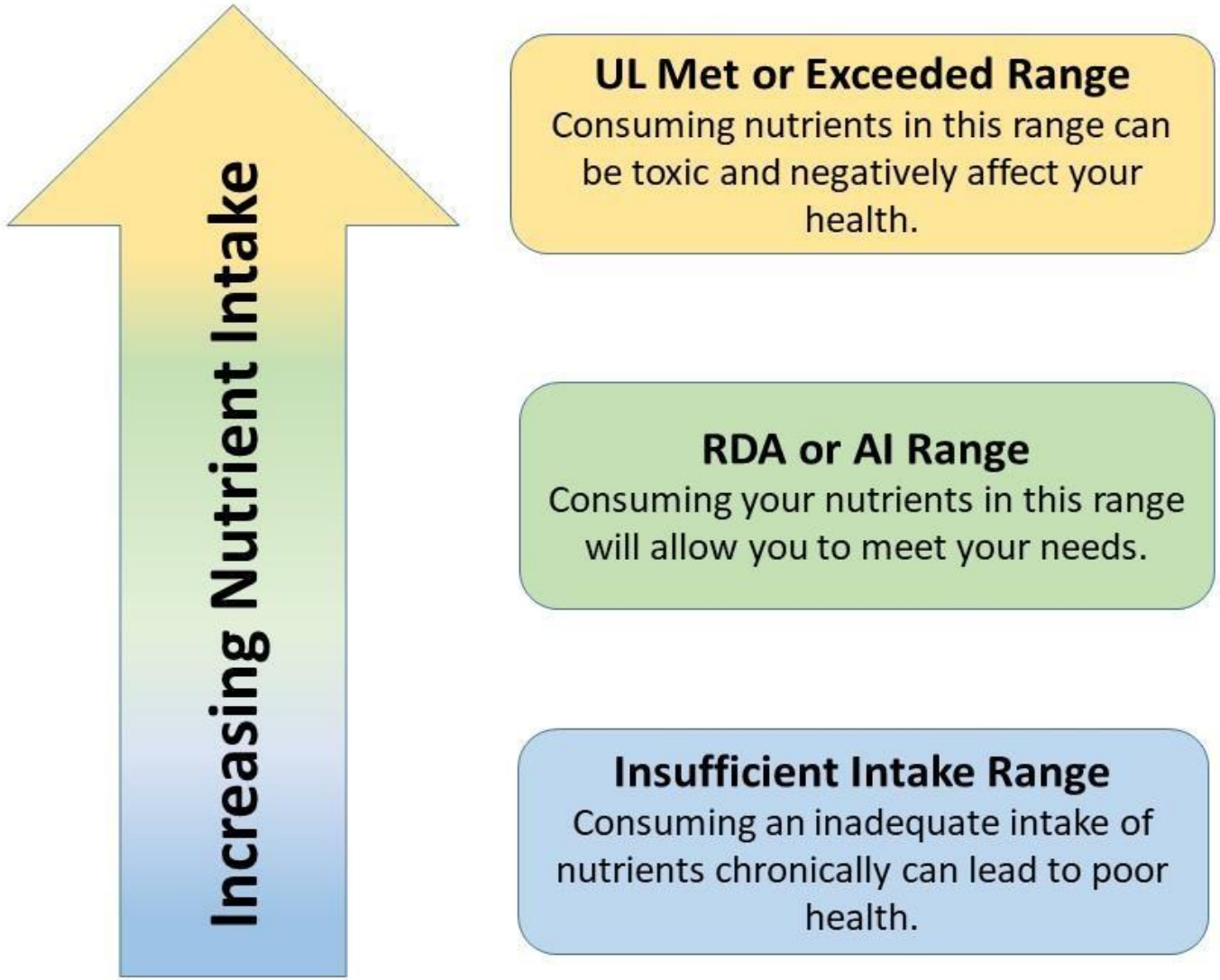
Acceptable macronutrient Distribution Ranges (AMDR)

- Describes the portion of the energy intake that should come from each macronutrient.



What percentage of calories should come from each of the three types of nutrients?

let's talk science


Increasing Nutrient Intake
UL Met or Exceeded Range
Consuming nutrients in this range can be toxic and negatively affect your health.
RDA or AI Range
Consuming your nutrients in this range will allow you to meet your needs.
Insufficient Intake Range
Consuming an inadequate intake of nutrients chronically can lead to poor health.