



# INTRODUCTION TO NUTRITION

PHAR-432

LECTURE: 1

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# Outlines

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- Nutritional biochemistry
- What do calorie mean?
- Energy expenditure
- Basal metabolic rate
- Thermic effect of food
- Physical activity



# Nutritional Biochemistry

- Nutritional biochemistry is the study of nutrition as a science which deals with the physiology, medicine, microbiology, pharmacology, chemistry and biology and uses these sciences for the study of health, diet, nutrition, disease and drug treatment.



# Nutritional Biochemistry

Nutritional biochemical therapy saves lives, reduces morbidity, improves health outcomes, and reduces healthcare costs and patients. Nutritional biochemistry examines the health benefits gained from eating organic fruits and vegetables.



# Definitions

**Foods:** products derived from plants or animals that can be taken into the body to give in energy for the maintenance of life & the growth & repair of tissues.

**Nutrient:** organic and inorganic compounds contained in food. (Ex:proteins, vitamins, minerals, ..etc).

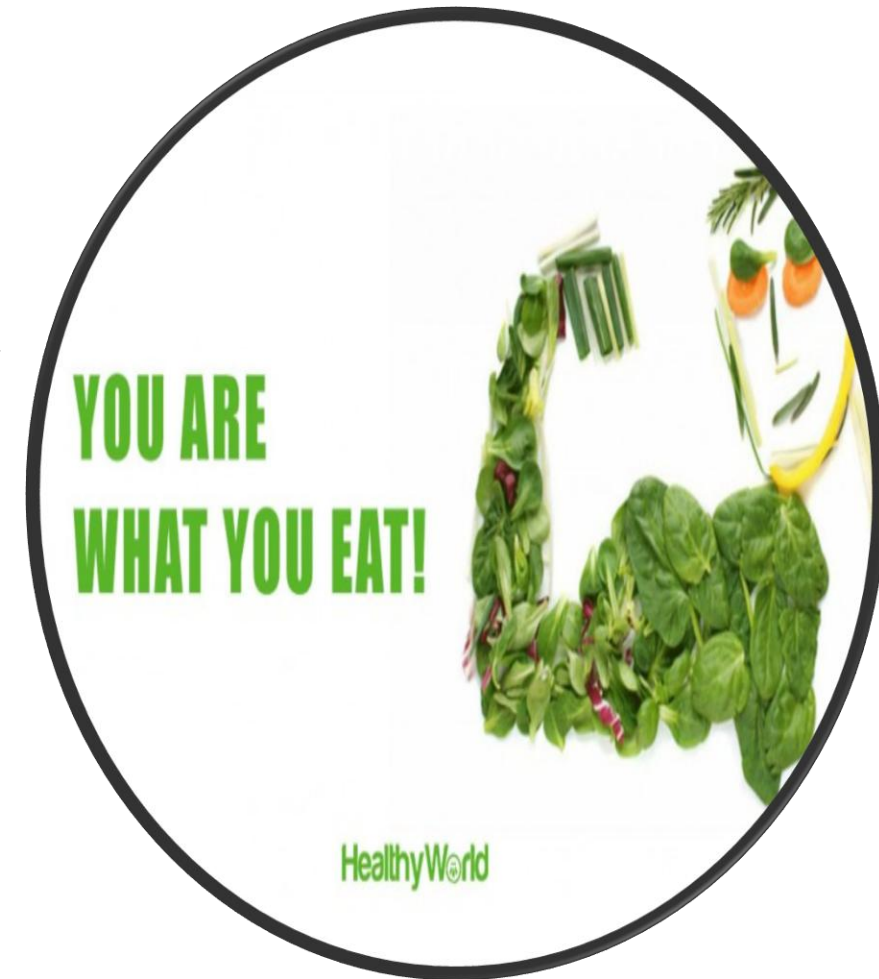
**Diet:** the foods & beverages a person eat & drinks.

Prescribed food is called diet.

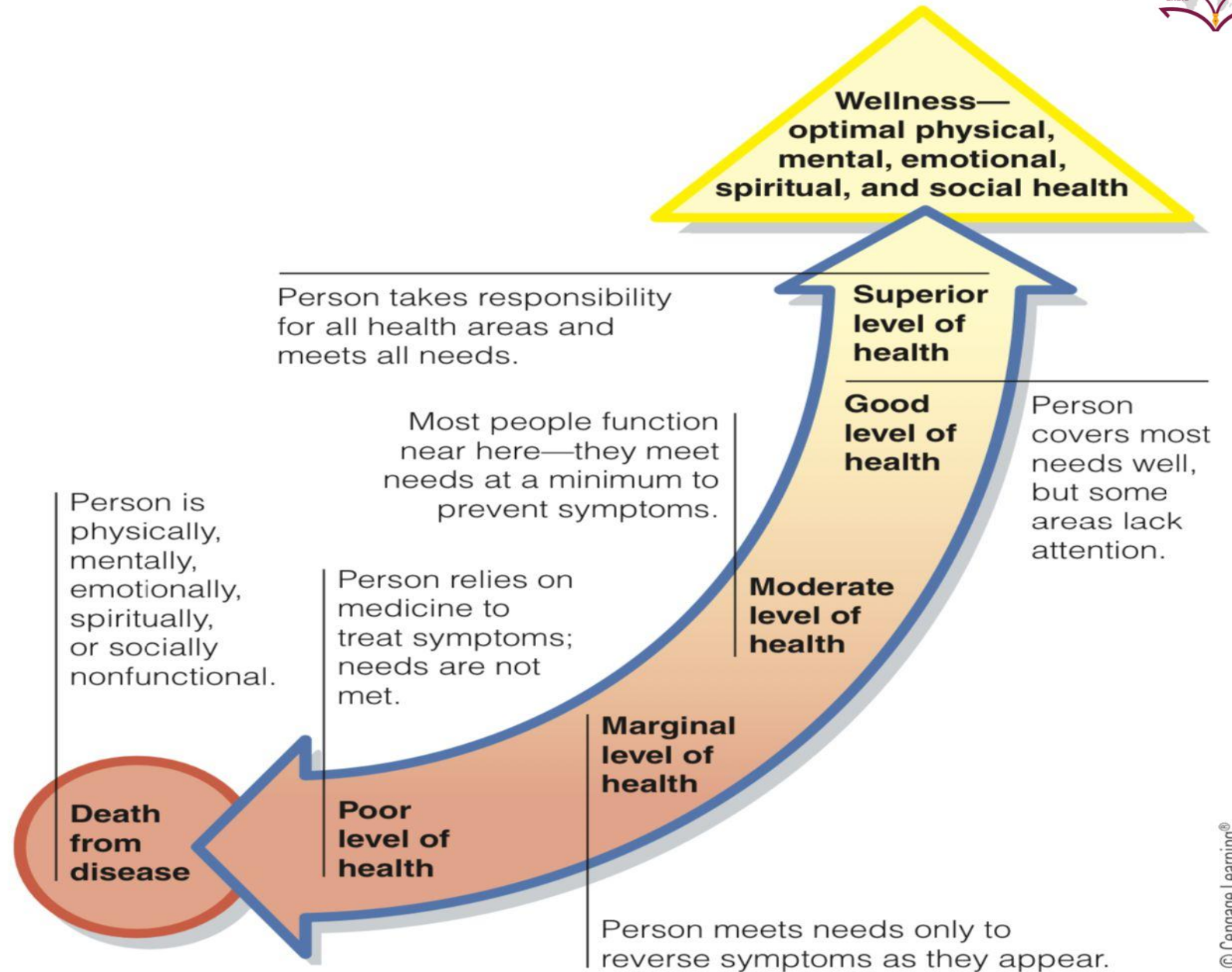
# Definitions

**Nutrition:** the science of foods & the nutrients & other substances they contain, & of their actions within the body (including ingestion, digestion, absorption, transport, metabolism, & excretion).

**Dietetics:** the practical applications of the principles of nutrition; it includes the planning of meals for the well & the sick.



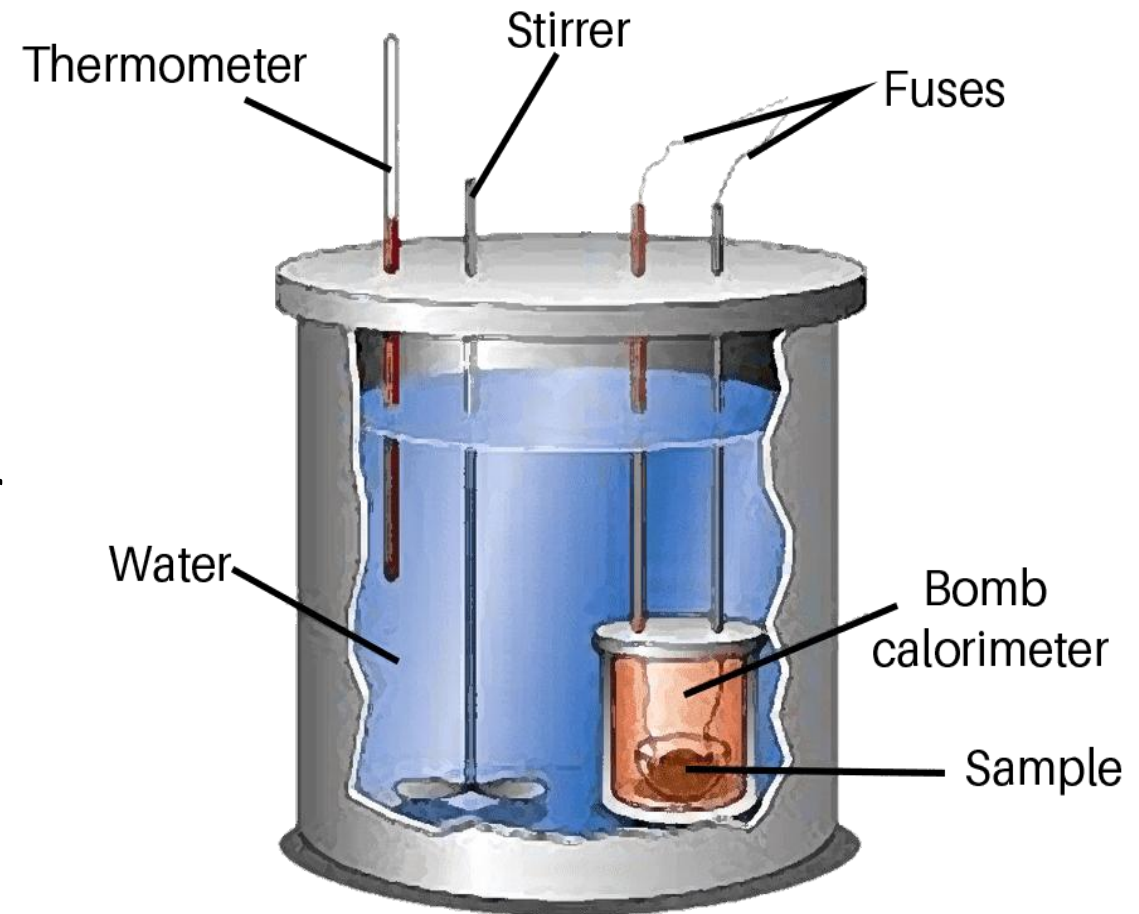
# The health line



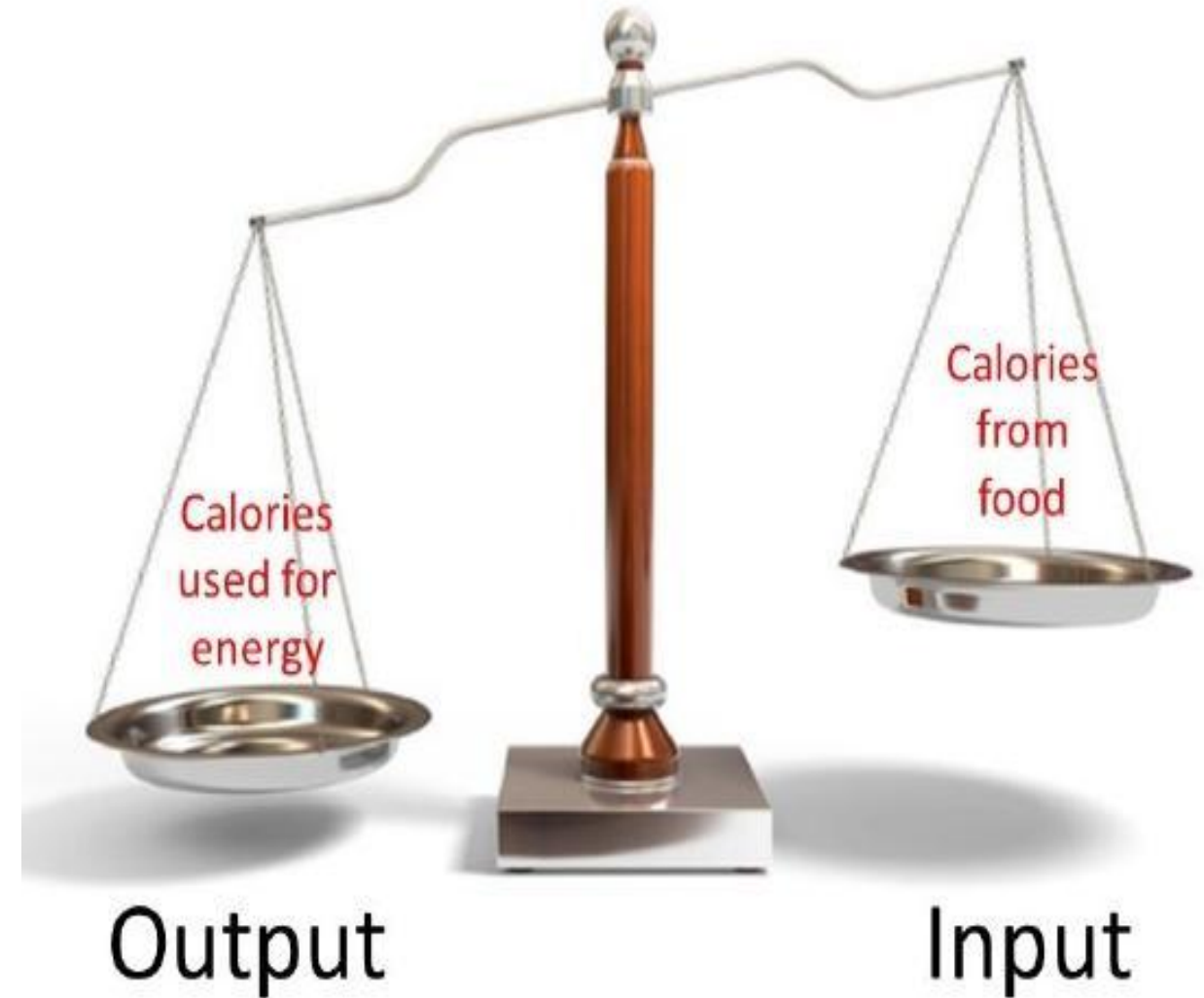
# What do calories mean?

Calorie (cal) is the amount of energy required to raise the temperature of 1 gram of water by 1° Celsius (° C)

Kilocalorie (Kcal) is the amount of energy required to raise 1 kilogram (kg) of water by 1° C.



Energy is a balance between energy input and energy output. When one exceeds the other you will lose or gain weight.



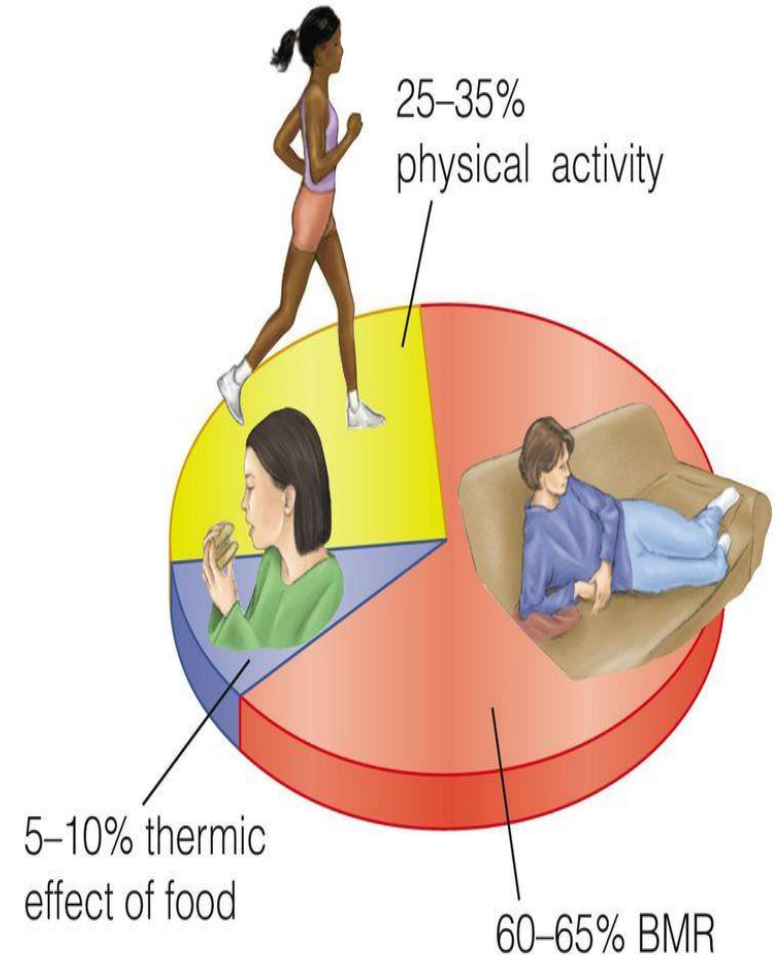
# Energy requirement

- Energy requirements are defined as the dietary energy intake that is required to maintain energy balance.
- Body weight reflects adequacy of energy intake, but it is not a reliable indicator of macronutrient or micronutrient adequacy

# Total energy expenditure (TEE)

- I. Basal Metabolic Rate (BMR).
- II. Thermogenic-effect of food.
- III. Daily physical activity and exercise.

## Energy Expenditure



# Basal metabolic rate

BMR is the amount of energy expressed in calories that a person needs to keep the body functioning at rest.

BMR measurements are made

- ✓ The subject must be on 12–14 h of caloric fasting and after a night of restful sleep.
- ✓ No strenuous activity must be allowed 1 h before the test and during the test.
- ✓ Temperature should be maintained at 25°C.

# Resting Metabolic Rate (RMR)

If any of the conditions for the BMR are not met, energy expenditure should be referred to RMR, which in most cases are higher than the BMR by 10% to 20%.

## Activities measured by RMR include:

- I. Pumping of ions across membranes (osmoregulation)
- II. Respiration and circulation
- III. Synthesis of organic compounds
- IV. Energy required by the central nervous system
- V. Maintenance of body temperature

Energy expenditure breakdown	
Liver	27%
Brain	19%
Skeletal muscle	18%
Kidneys	10%
Heart	7%
Other organs	19%

# Methods to calculate RMR

## 1. Direct method

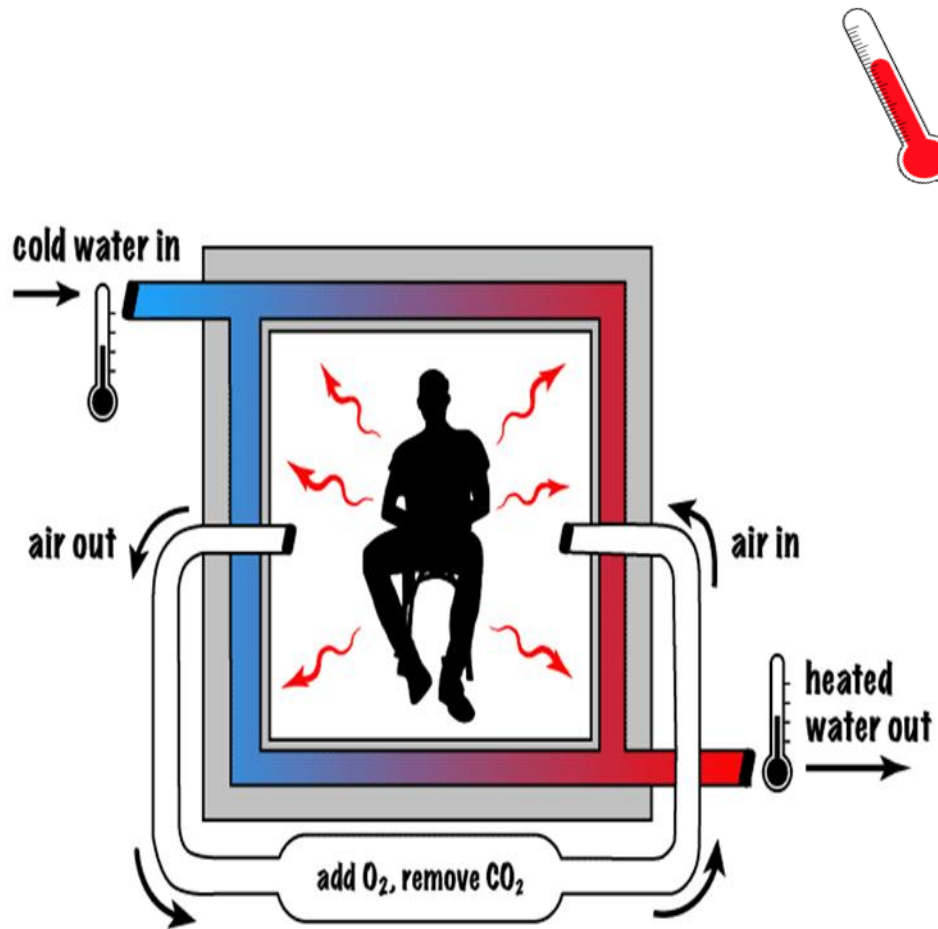
Measurement of the rate of heat losses from the body.

## 2. In direct method

Measurement of oxygen consumption and carbon dioxide production.

# Direct Calorimetry vs Indirect Calorimetry

## Direct Heat Measurement



## Indirect Heat Measurement

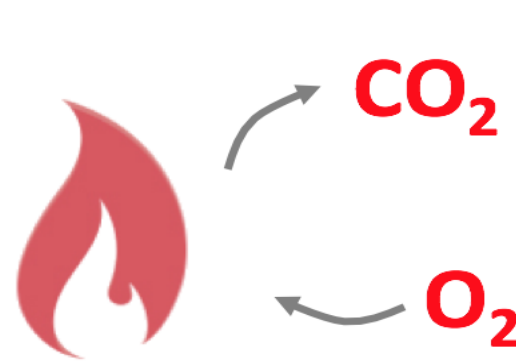


Figure 1. The IIM-IC-100 metabolic monitor.

# Factors affecting REE

Resting Energy Expenditure (REE): it is a 24 hr. RMR in adult

- Body Size

Larger people have high metabolic rates

- Body Composition.

Fat-free mass people have high resting metabolism

- Age

REE is highest during periods of rapid growth

- Sex

Women have metabolic rates that are approximately 5% to 10% lower than men

# Factors affecting REE

- Hormonal status:

Hyperthyroidism and hypothyroidism, which increase or decrease energy expenditure.

- Other factors.

- Caffeine, nicotine, and alcohol use stimulate metabolic rate.
- Fever.
- Hot weather.
- Cold weather.

# Thermic Effect of Food

Thermic effect of food (TEF) is the increase in energy expenditure associated with the consumption of food.

## Types of TEF

Obligatory thermogenesis: the energy required to digest, absorb, and metabolize nutrients.

Adaptive thermogenesis: reflects alterations in metabolism due to changes in ambient temperature, hormone production, emotional stress.

# Physical Activity

Activity thermogenesis (AT) is the energy expended during sports or fitness exercise ; the energy expended during activities of daily living is referred to as non-exercise activity thermogenesis (NEAT)

# Calculating food energy

- ✓ Calculate the caloric give in of a piece of bread (wt= 50 gm), if you know that the composition of 100 gm of bread is: 8 gm protein, 1.0 gm fat and 58 gm CHO?
- ✓ The energy value of one medium-size (50- g) egg calculated in terms of weight is derived from protein (13%), fat (12%)) and carbohydrate (1%)

# References

- Ferrier, Denise R. (2017). *Lippincott Illustrated Reviews: Biochemistry* (7th edition). Philadelphia, PA: Wolters Kluwer Health.
- Mahan, L. K., Escott-Stump, S., & Krause, M. V. (2008). **Krause's food & nutrition therapy**. 12th ed.
- Benjamin Caballero, Lindsay Allen, Andrew Prentice. (2005). *Encyclopedia of Human Nutrition, Second Edition* . Amsterdam: Elsevier. Gaya Chicago.
- Linda Kelly, WHITNEY, Ellie, PINNA, Kathry. (2012). *Nutrition & Diet Therapy Eighth Edition ( Edisi 8)* . USA: Cengage Learning.