Basal metabolic Rate (BMR)

Department of Physiology-Tabriz University of Medical Sciences

BMR

Basal metabolic rate

Definition: **The minimum amount of energy per unit of time that a person needs to keep the body functioning at rest.**

Unit: **Kcal/h/m^2**

The conditions for BMR measurement

1. The subject must be on 12 h of caloric fasting
2. Not using medicine for a week before, especially medicines affecting the thyroid function
3. Restful night sleep
4. No activity must be allowed 1 h before the test
5. Mental status
6. Laboratory temperature (20-27 °C)

Factors that affect BMR

- Growth Hormone
- Cortisol
- Weather
- Sleep
- Fever
- Malnutrition

- Exercise and physical activity
- Age
- Protein consumption
- Thyroid hormone
- Sympathetic stimulation
- Male sex hormones

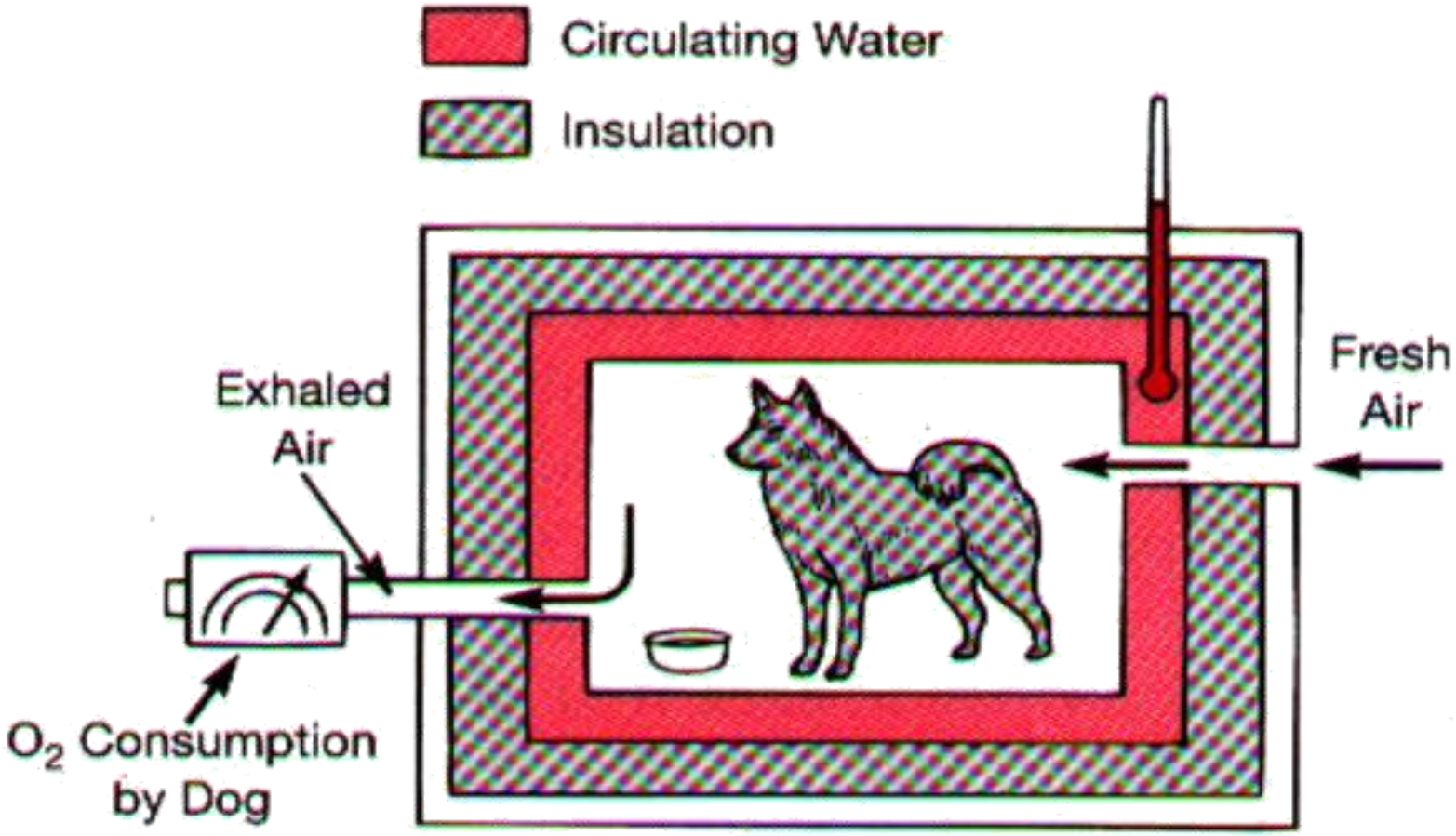
BMR measurement approaches

Direct calorimetry

Indirect calorimetry

- *Measurement in our laboratory is based on **indirect calorimetry** and O_2 consumption*

Direct calorimetry



Energy production

Anaerobic

Aerobic

$$C_6H_{12}O_6 + 6\ O_2 \rightarrow 6\ CO_2 + 6\ H_2O + \text{Energy (38 ATP)}$$

The uptake of 1 liter of oxygen is often converted into 4.825 kcal energy.

BMR measurement

1- Breathing in a spirometer and determining the amount of consumed oxygen volume (V) in a certain period of time (M)

2- Determining the room temperature, atmospheric pressure, height, weight and age of the individual.

BMR measurement

3- Using the following formula to convert laboratory conditions to conventional conditions and calculate V_0:

$$PV = P_0V_0(1+\alpha\ t)$$

P= Pressure of O_2

V= Volume of consumed O_2

P_0= 760 mmHg

V_0= O_2 volume at standard conditions

α = Gas volume expansion coefficient (1/273)

t = Room temperature

BMR measurement

4- Calculating the heat produced

O_2 1 lit 4/825 Kcal

V_0 X

$X = V_0 \times 4/825$ Kcal

BMR measurement

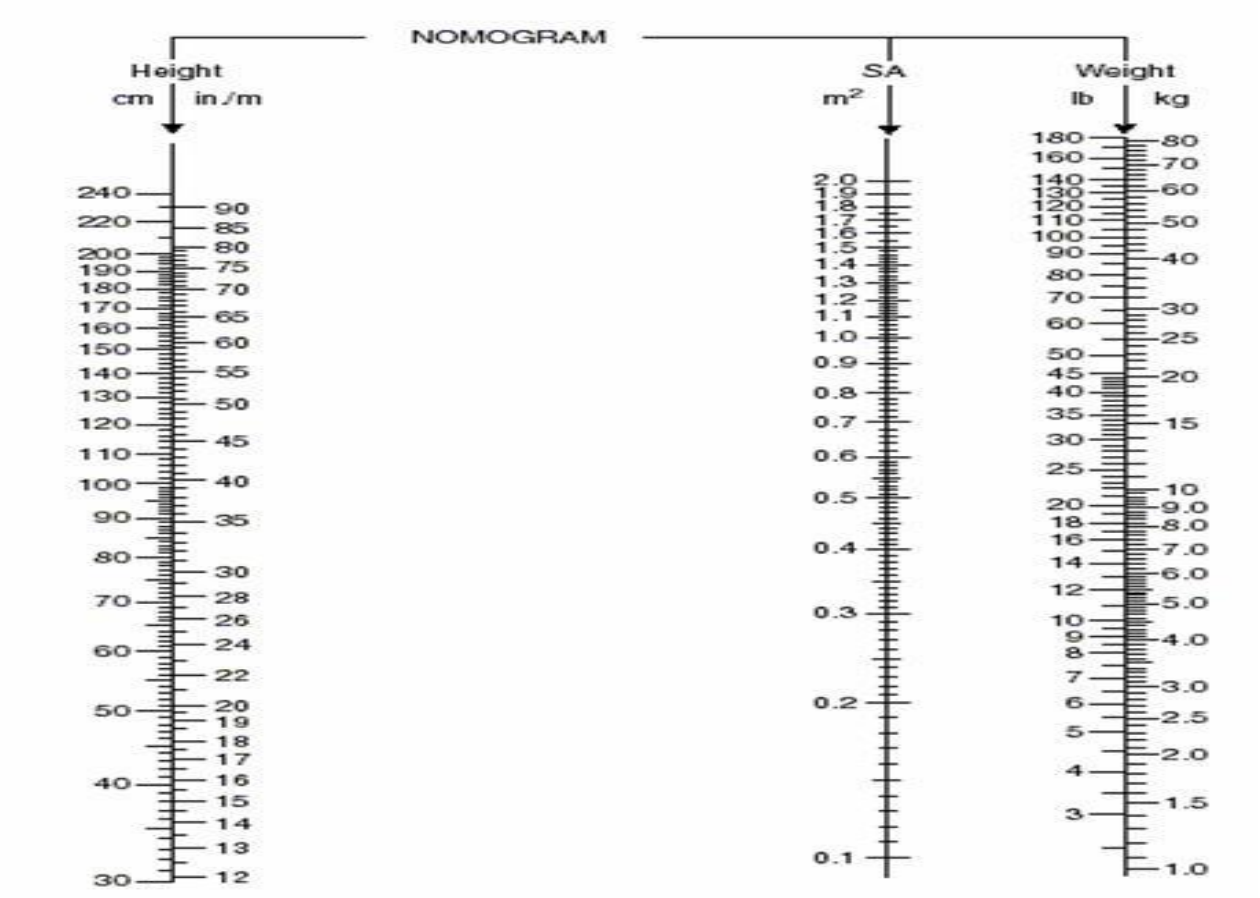
5- Calculation in one hour

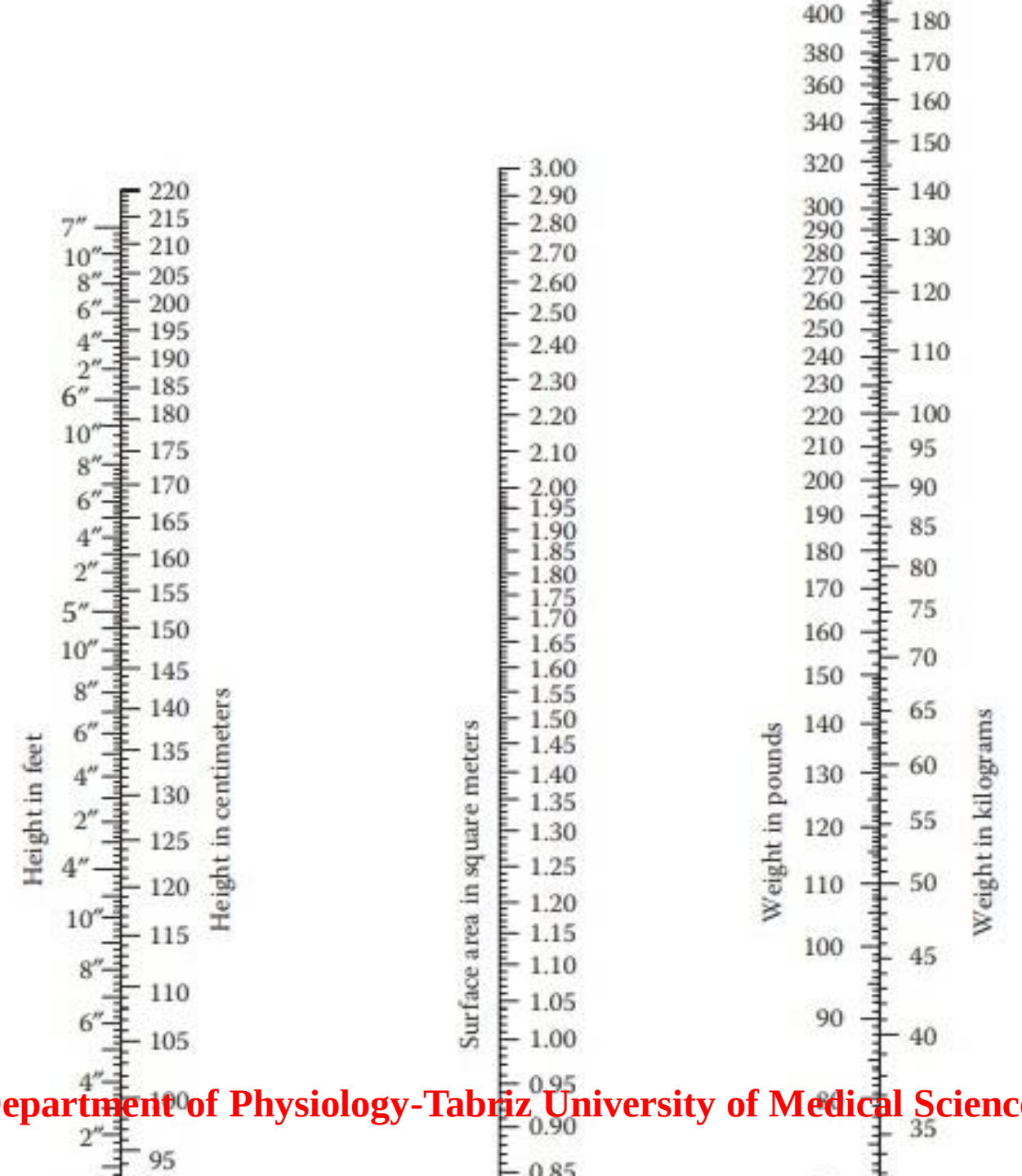
$$V_0 \times 4/825 \times 60\,min \quad Kcal/h$$

6- The obtained number/ Body surface in square meters = BMR

BMR measurement

7- Calculation of body surface area





BMR measurement

7- Calculation of BMR percentage

$$\frac{\text{Individual's BMR - Normal BMR}}{\text{Normal BMR}} \times 100$$

Normal BMR values

Basal Metabolic Rate - Ideal Values		
Age	Male (calories per hours)	Female (calories per hours)
20-29 Years	39.5	37.0
30-39 Years	39.5	36.5
40-49 Years	38.5	36.5
50-59 Years	37.5	35.0
60-69 Years	36.5	34.0
70-79 Years	35.5	33.0

www.sprintmedical.in

Kcal/h/m²

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An example test

Oxygen consumption = 1800 cc

Age = 30 years

Time = 5 minutes

Weight = 67 kg

Temperature = 17 °C

High = 165 cm

Pressure = 660 atm

Gender = Male

BMR?