


INTERNAL ENVIRONMENT AND HOMEOSTASIS





• Homeostasis

Dynamic equilibrium

- Homeostasis mean maintenance of nearly constant conditions in the internal environment.
 - Concept by Claude Bernard, French physiologist of 19th century
 - Name- American physiologist Walter B. Cannon.
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The diagram features a central white circle containing the title 'THE INTERNAL ENVIRONMENT'. To the left, three stacked boxes are connected by a vertical line. The top box is labeled 'The internal environment or milieu interieur', the middle box is 'Extracellular fluid', and the bottom box is 'Importance'. To the right of the central circle, there are two teal text boxes. The top one states 'Each organ has specific function that maintain homeostasis' and the bottom one states 'Some defects require more than one organ to achieve normal range'. The background is a dark teal color with a pattern of light teal circles and lines.

The internal environment or milieu interieur

Importance

Extracellular fluid

THE INTERNAL ENVIRONMENT

Each organ has specific function that maintain homeostasis

Some defects require more than one organ to achieve normal range

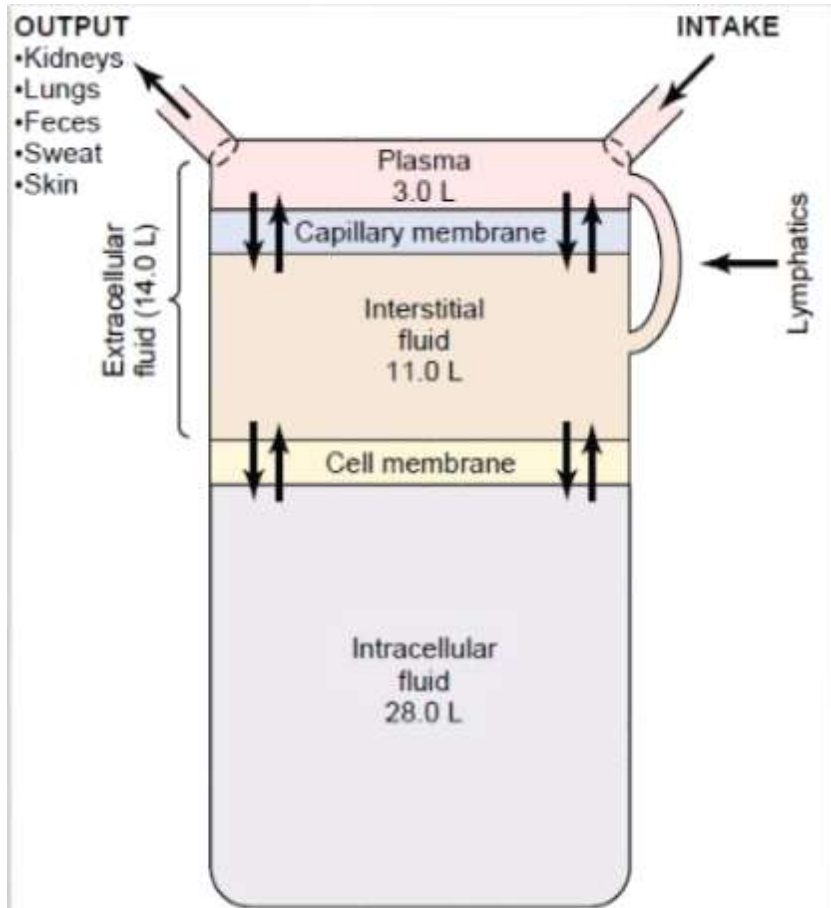


Figure 25-1

Summary of body fluid regulation, including the major body fluid compartments and the membranes that separate these compartments. The values shown are for an average 70-kilogram person.

Dynamic equilibrium : means constant move of substance in both direction

The body takes its need and throw the excess out of it

Extracellular fluid:

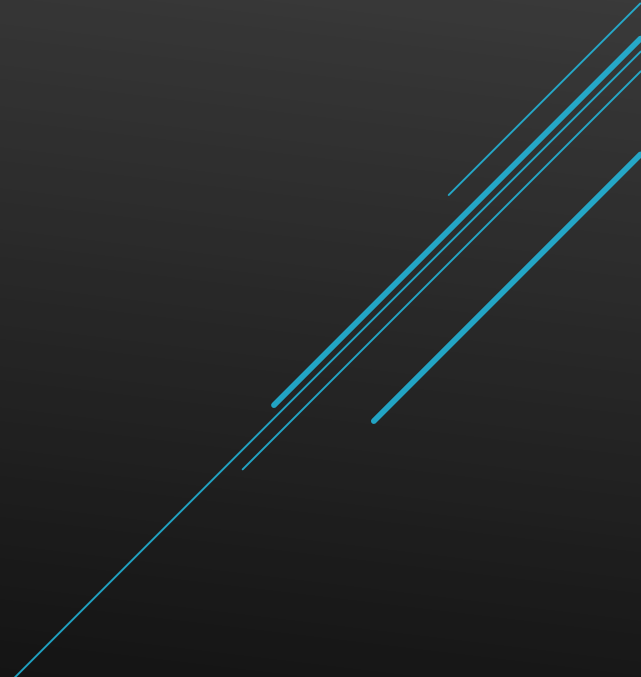
- Plasma
- Interstitial fluid

The substances that enter the cell are equal to the substances that leave the cell

The compartment inside the human body divided into into 3 parts :

- 1) Blood vessel (capillary membrane)
- 2) Interstitial fluid
- 3) Inside te cell of the organ (cell membrane)

THE MAJOR SYSTEMS

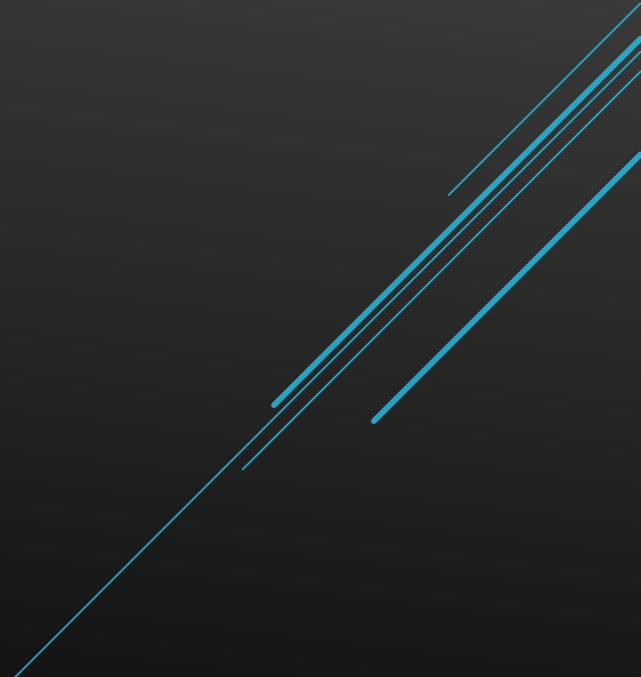
- ▶ **Cardiovascular system**
 - ▶ Transportation
 - ▶ O_2 , CO_2 , nutrients, waste products, hormones etc
 - ▶ **Digestive system**
 - ▶ Digestion, Absorption of nutrients, excretion of wastes
 - ▶ Transfer of materials from external environment to internal environment
 - ▶ **Respiratory System** : the increase of O_2 or CO_2 will affect the PH values
 - ▶ Supply O_2 of & elimination of CO_2
 - ▶ Acid base balance
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THE MAJOR SYSTEMS

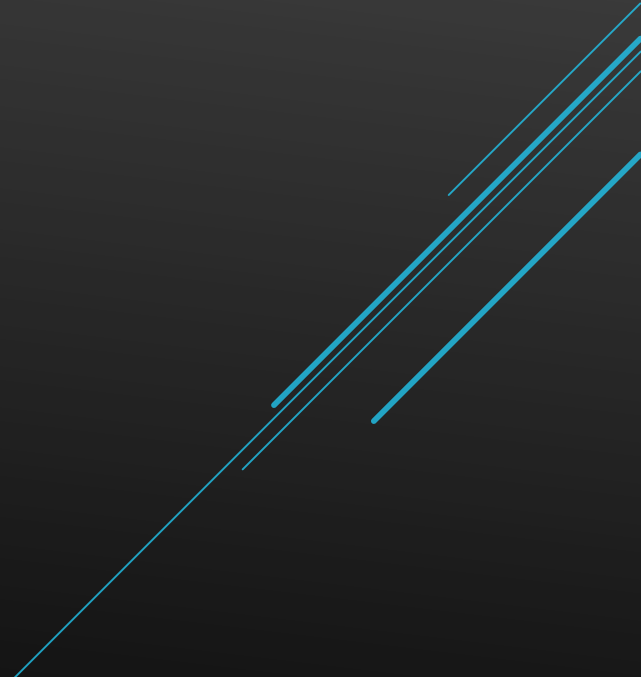
▶ Urinary System

- ▶ Elimination of waste products
- ▶ Water & electrolytes balance
- ▶ Acid base balance
- ▶ Blood pressure regulation

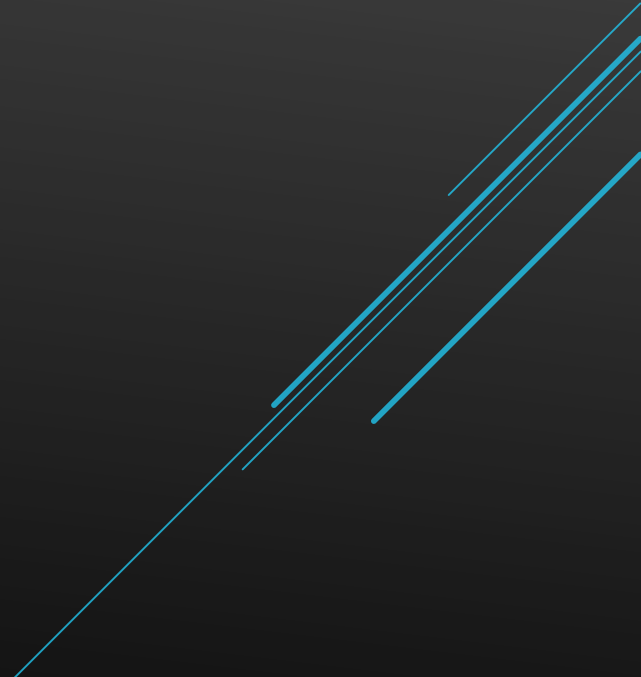
▶ Skeletal system

- ▶ Support & protection
 - ▶ Movement
 - ▶ Reservoir for calcium
- 
- A decorative graphic consisting of several parallel, diagonal cyan lines of varying lengths, located in the bottom right corner of the slide.

THE MAJOR SYSTEMS

- ▶ **Muscular system**
 - ▶ Movements towards or away from different elements
 - ▶ Most of the voluntary movements by skeletal muscles
 - ▶ **Integumentary system**
 - ▶ Protection
 - ▶ Temperature regulation
 - ▶ **Immune System**
 - ▶ Defense against foreign invaders
 - ▶ Defense against Cancer
- 

THE MAJOR SYSTEMS

- ▶ **Nervous System**
 - ▶ Control system of the body
 - ▶ Coordination of body activities
 - ▶ Quick response to stimuli
 - ▶ Consciousness, memory and intellectual functions
 - ▶ **Endocrine System : very slow reactions not like nervous system**
 - ▶ Another major control system
 - ▶ Control of metabolism
 - ▶ Control of nutrients supply, storage and utilization
 - ▶ **Reproductive system**
 - ▶ Reproduction – continuation of life
- 

CONTROL SYSTEMS

HOW EFFICIENT IS THE CONTROL SYSTEM IN KEEPING THE CONDITION CONSTANT?

➤ “GAIN”

$$\text{GAIN} = \frac{\text{CORRECTION}}{\text{ERROR}}$$

Gain of control system : the degree of the effectiveness with which a control system maintains constant conditions is determined by the gain of the negative feedback

Defect Specific organ Set point
Defects in acid base balance Respiratory system + urinary system acid base balance in normal range

$$\text{GAIN} = \frac{\text{CORRECTION (NEW VALUE - STIMULUS)}}{\text{ERROR (NEW VALUE - NORMAL)}}$$

In an exp the mean blood pressure of a rabbit was decreased from 100mmHg to 50 mmHg after 5 minutes the blood pressure came back to 75mm Hg.

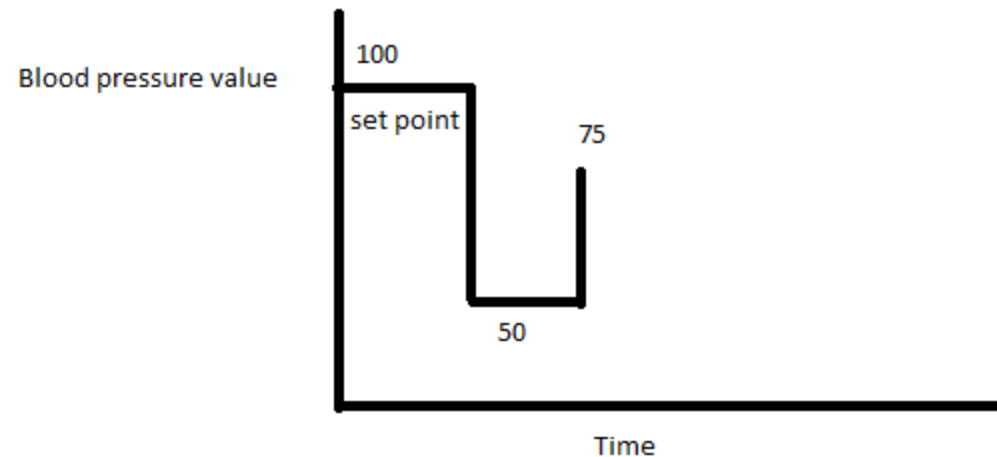
Calculate the gain of the control system involved

Gain= correction/ Error

$$= 75-50/75-100$$

$$= -1$$

The lower the error the higher the gain



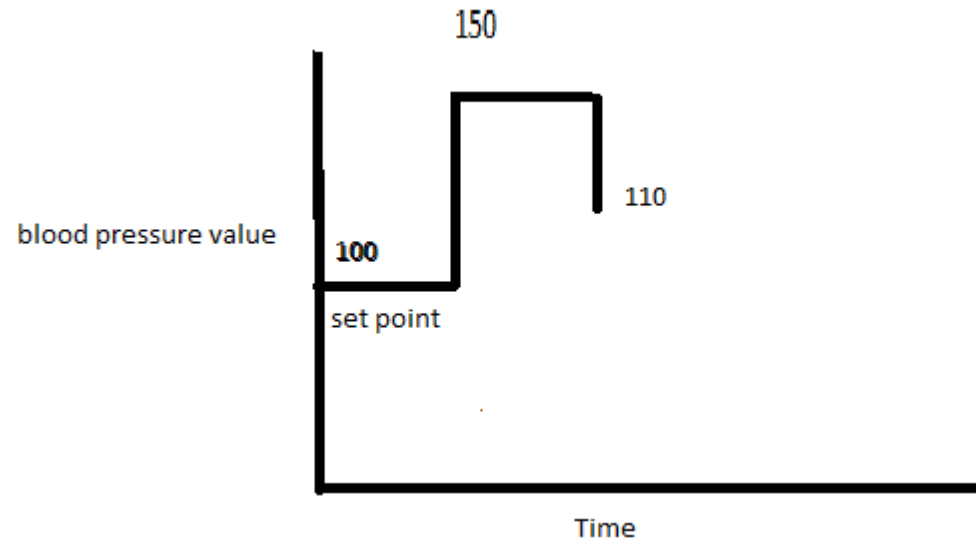
In an exp the mean blood pressure of an adult was increased from 100mmHg to 150 mmHg by drug .after 5 minutes the blood pressure came back to 110mm Hg.

Calculate the gain of the control system involved

Gain= correction/ Error

$$= 110-150/110-100$$

$$= -4 \text{ ignore the sign}$$



CONTROL SYSTEMS

**EXAMPLE: BLOOD PRESSURE, 100 mm Hg
DUE TO EXERCISE, 175 mm Hg
WITH REGULATION, 125 mm Hg**

$$\text{GAIN} = \frac{\text{CORRECTION}}{\text{ERROR}} = \frac{(125-175)}{(125-100)} = \frac{-50}{+25}$$

$$\text{GAIN} = -2$$

Questions :

Homeostasis :

1. refers to the unwavering control of a physiological setpoint.
2. refers to maintaining a stable internal environment.
3. refers to maintaining a stable external environment.
4. A and B.
5. A and C.

(2)

The concept of homeostasis

1. includes the concept of an error signal.
2. refers to maintaining physiological functions in a stable condition.
3. refers only to the regulation of body temperature.
4. A and B.
5. B and C.

(4)

The term "metabolism"

○

1. refers to all the chemical reactions that occur in the body.
2. includes the synthesis of complex molecules from simpler molecules.
3. includes the breakdown of complex molecules into simpler molecules.
4. includes anabolism and catabolism.
5. is described by all of the above.

(E)

After you eat lunch, nerve cells in your stomach respond to the distension (the stimulus) resulting from the food. They relay this information to. _____

- 1) a control center
- 2) a set point
- 3) effectors
- 4) Sensors

(1)

Stimulation of the heat-loss center causes

- 1. blood vessels in the skin to constrict
- 2. breathing to become slow and shallow
- 3. sweat glands to increase their output
- 4. All of the above

(3)

Which of the following is an example of a normal physiologic process that uses a positive feedback loop?

- 1. blood pressure regulation
- 2. childbirth
- 3. regulation of fluid balance
- 4. temperature regulation

(2)

Which of the following fluids constitutes a portion of the internal environment:

- 1.interstitial fluid
- 2.plasma
- 3.Both
- 4.Neither

(3)

Interstitial fluid is:

- 1.Larger in volume than the plasma volume
- 2.One of the extracellular fluids in the body
- 3.Part of the internal environment
- 4.The region found between cells
- 5.All of the above

(5)

If a decrease in blood pressure were the stimulus for a negative feedback control system, the response produced by the effector cells of the control system would :

1. Decrease blood pressure
2. Increase blood pressure
3. No change blood pressure

Select the response demonstrating homeostasis:

1. Blood sugar drops during starvation
2. Body temperature rises during fever
3. The acidity of the extracellular fluid remains the same as diet changes
4. An individual slips into irreversible shock

(3)