

PHYSIOLOGY



Lec: 1

Done by: *Selena Omari*

Physiology Lecture 1

The scope of physiology
The internal environment and
Homeostasis

Dr. Waleed R. Ezzat

Lecture Objectives:

- Understand the concept of homeostasis, external and internal environments.
- Explain how organ systems contribute to the maintenance of the internal environment.
- Explain the difference between steady state and equilibrium.
- Describe how homeostatic mechanism monitors a particular aspect of the internal environment.
- Be familiar with the coordination of body systems in regulation of body functions

علم
Why
+
How

تفسير الظواهر في الجاداء (الاجرام) physics
المنته

Physiology:

تفسير الظواهر في
الكائن الحي

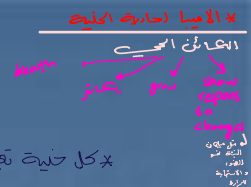
The science that explains the function of cells, tissues, and organs; and how they are integrated to maintain body optimal health and survival.

العلم الذي يحلل كيف تتم الامور بالشكل الطبيعي و الالية
وكيف بناه الجسم لكي يحيا و يقدواه .

cell membrane
هو الغشاء البلازمي
الـ internal و الـ
external environment

تحت الجلد

حتى تعيش (حياة) يجب ان تكونه عناصر اكلية والغذاء متوفرة وتجدد



The internal environment (Extracellular fluid-ECF)

في السائل الذي تعيش فيه الخلية

لكل خلية تعيش في سائل يحتوي العناصر الغذائية وهو يسمى بـ بار

- Also called milieu interieur by the French physiologist Claude Bernard (1813-1878). The **internal environment** is the fluid environment in which the cells live. Note that the external environment is outside the body.

السائل الذي خارج الخلية يشكل one third بينما الجزء داخل الخلية (البلازمي) تشكل two thirds

The ECF constitutes **one third** of body fluid. ECF consists of the **blood plasma** and **interstitial fluid**.

او جيبها تتوسط 50L من السائل ECF 20L وال 40L داخل الخلايا تقسيم

The ECF is in constant motion. It is rapidly transported in the circulating blood and then mixing between the blood and tissue fluids occurs by diffusion through the capillary walls. (الادوية السريعة الامور)

مثال للتوضيح الخلية التي يكونه جوفها السائل ثابتة ولكن الخلية من فوقه متحركة تاحاطية مثل الخلية

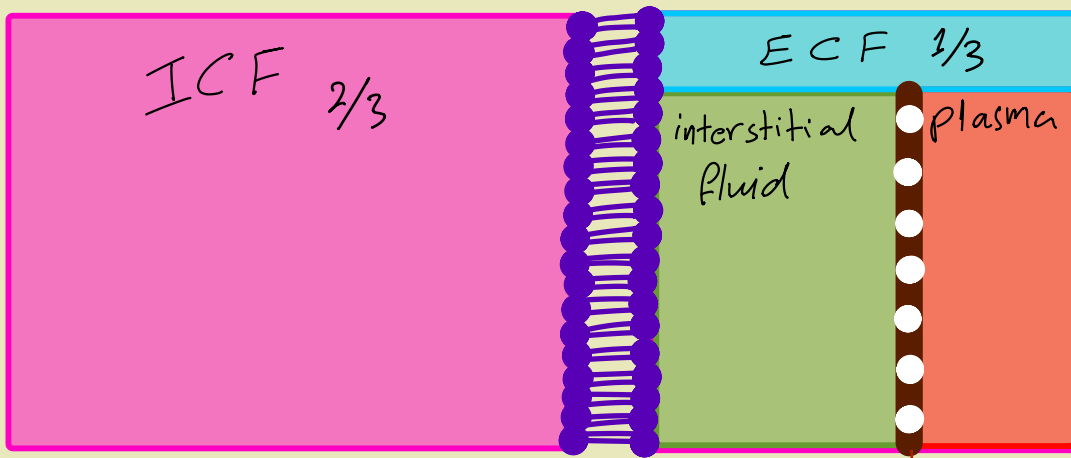
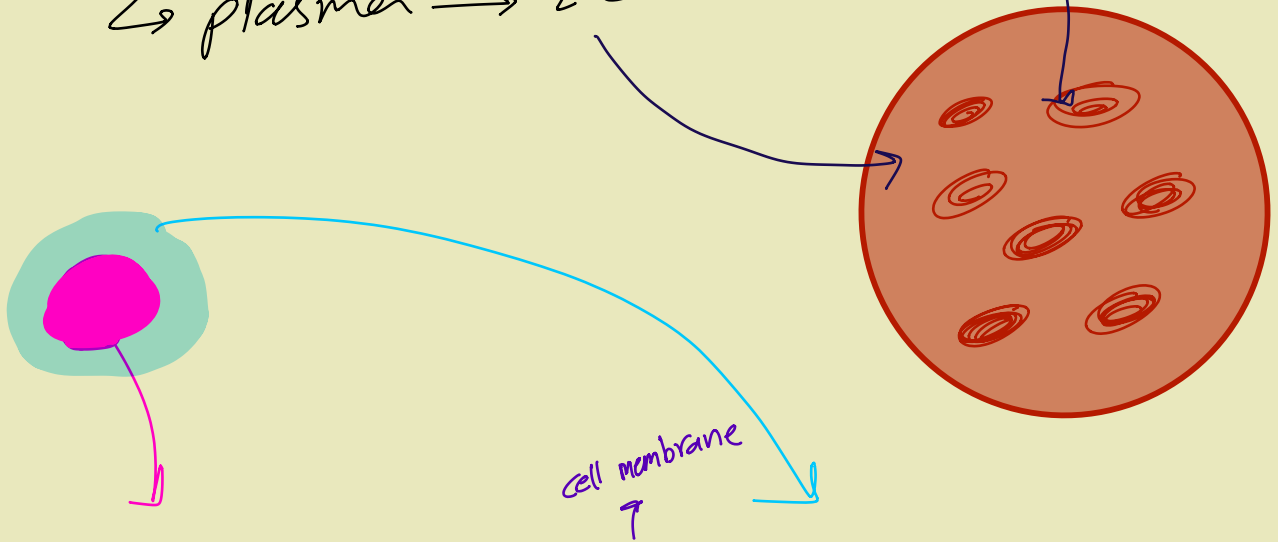
في لانه الخلية تأخذ غذاء وتطلق فضلات فاذا كانه ECF ساكن لا يتحرك رح يتكونه بالفضلات وتوت بعض الخلايا لكنه من يتحرك جيبها سائل جديد يحتويه غذا جديد ومغبول من الفضلات

- The composition of the ECF is maintained by **body systems**
- It contains the ions and nutrients needed by the cells for maintenance of cellular life. It also contains CO₂ plus other cellular waste products

- glucose
- amino acids
- fatty acids
- vitamins

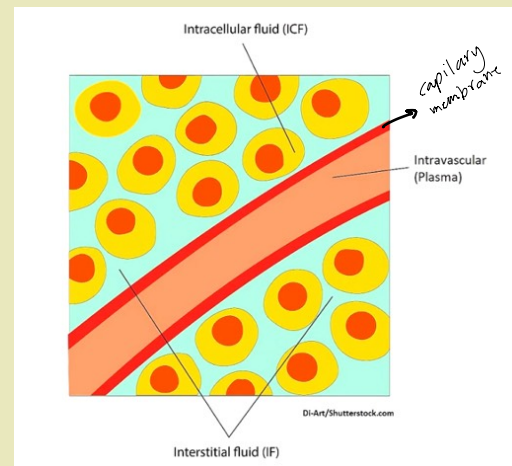
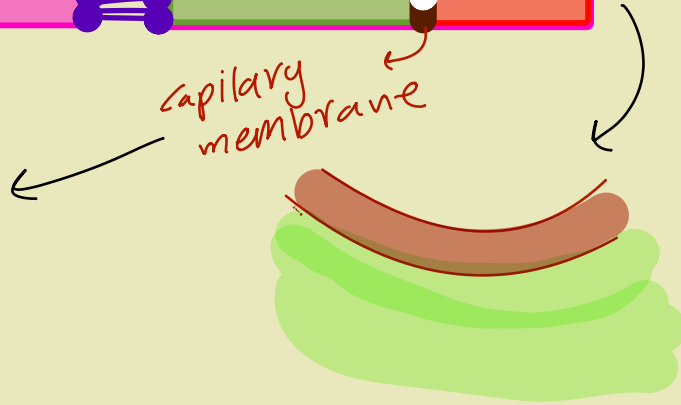
Blood → cells → ICF
 Blood → plasma → ECF

اي داخل خلايا الدم الحمراء

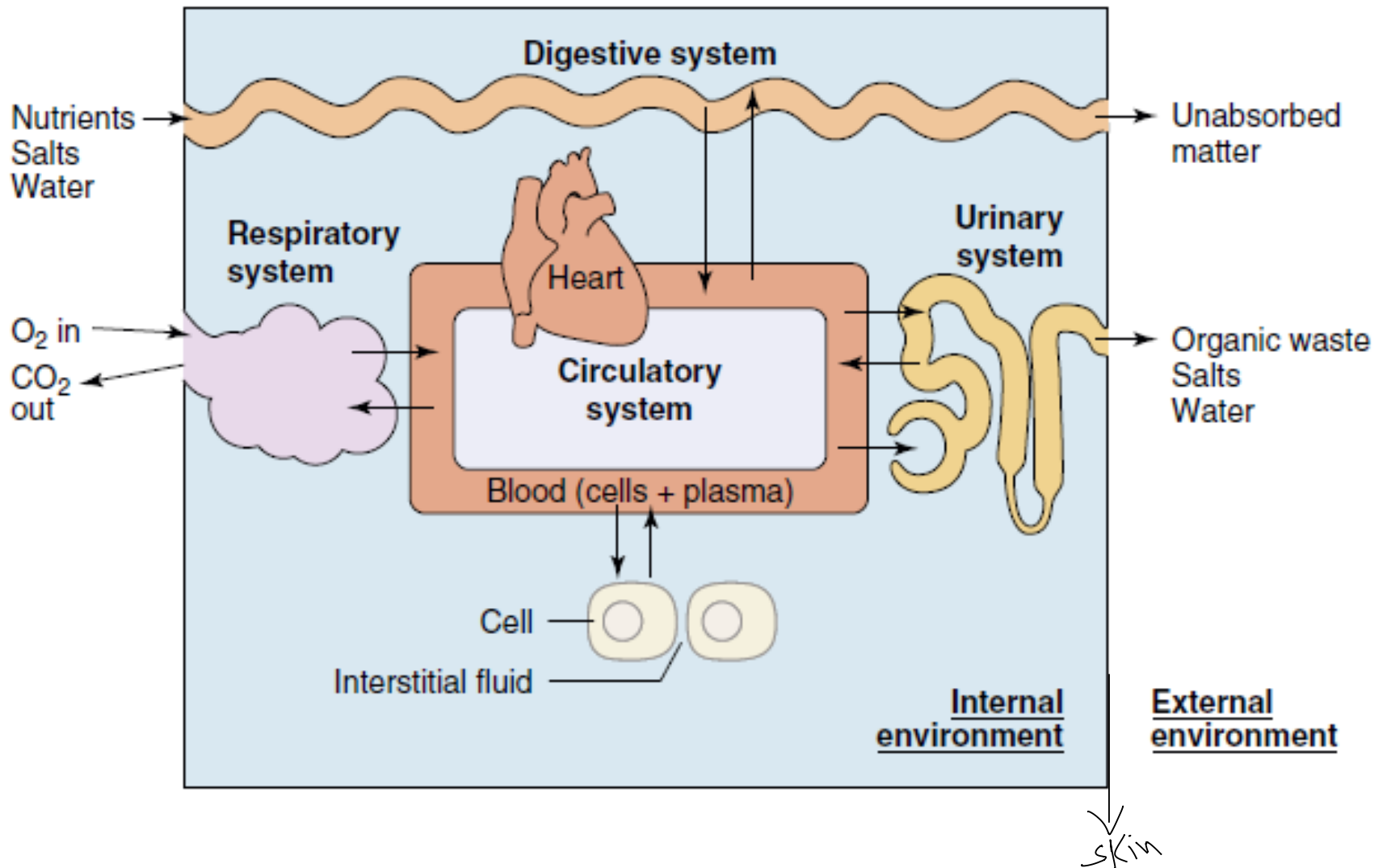


Fluid from the plasma gets filtered through the capillary membrane to form the interstitial fluid

Constant motion



90% من السائل خارج من plasma يرجع
 10% يتبقى lymph fluid



The internal environment (Cont.)

V. imp
■ The level and concentrations of O_2 , glucose, different ions, water, pH, amino acids, fatty substances, and other constituents are **held relatively constant** in this internal environment so as cells are capable of living, growing, and performing their special functions

V.V. imp
■ The concentration of ions and other substances in the extracellular fluid may differ from that of the intracellular fluid (e.g. high Na^+ , Cl^- , and HCO_3^- ions extracellularly)

لا يوجد توازن بين داخل الخلية وخارجها والسبب في ذلك Cell membrane
■ Intracellular fluid (ICF) has higher concentration of K^+ , Mg^{2+} , and phosphate ions. The composition of the ICF is maintained by the cell membrane which has special mechanisms for transporting of ions and molecules through it by diffusion, osmosis, active transport, and vesicular transport

ICF → Cell membrane
ECF → Body Systems

انتبه!

كيفية المحافظة

internal environment ← كيفية يتم المحافظة على استقرار الـ

مثلا كيفية احافظ على الفوكوز
يظل بين 110-70

Homeostasis

عشان النسب مش رقم مصدر بل range (منه الى)

■ Is the maintenance of the ECF and the ICF composition (and their temperature) relatively stable in a **steady-state condition**, distinct from **equilibrium**, by a variety of regulatory processes called homeostatic mechanisms.

المحافظة على حالة التوازن

العفون اللاتيني

■ Homeo means "the same"; stasis means "to stand or stay". Homeostasis is not a rigid, fixed state but a dynamic steady-state in which the changes that do occur are minimized by the homeostatic mechanisms.

■ Maintenance of a steady-state occurs when water and a number of important solutes **input** into the body equals **output** from the body.

Steady State الـ المحافظة على الـ input بتزود الـ output والعكس

حالة الـ equilibrium

■ Disease or death is often the result of dysfunction of homeostatic mechanisms.

(equilibrium = Disease / Death)

مثلا بين تأكل بزيادة الفوكوز بايهم فايهم يتحلل homeostatic mechanism لتزود الفوكوز وتستهلك ما يفوق الفوكوز ادى سته وتستهلك الفوكوز والعكس اذا انقص الفوكوز يتحلل الجسم homeostatic mechanism لتزود الفوكوز الـ output قبل الفوكوز الـ input للمحافظة على حالة التوازن

شو انا ايجت حمار بالphysiology الـ الـ الـ الـ

■ The discipline of **pathophysiology** explains how the various physiological processes are altered in diseases or injury.

■ The effectiveness of homeostatic mechanisms varies over a person's lifetime.

ما يتقدم الانسان بالعمر الـ mechanisms تتغير (لا تبقى بنفس القوة تماما ممكنة تبرا مضمينة وبغيرن تقوية او العكس)

مثلا الطفل الصغير بقدرته يتحكم بالتبول به كل ما كبر كل ما صار يقدر / التجار بالهرا لا يتحملونه البرودة مثل تحمل الشباب لها.

Contributions of the Body Systems to Homeostasis

- Role of **CVS** in homeostasis (mixing the plasma and extracellular fluid, thereby it maintains complete homogeneity of these fluids throughout the body).
التجديف
- Role of **respiratory system** in homeostasis (supply of O_2 and removal of CO_2).
- Role of **GIT** in homeostasis (absorption of carbohydrates, fatty acids, and amino acids into the extracellular fluid).
- Role of **liver and other organs** in homeostasis (metabolic function, e.g. changing chemical composition, modifying the absorbed substances, and storing).
- Role of **kidneys** in homeostasis (excretion of waste products such as urea, uric acid, excesses of ions and water).

Contributions of the Body Systems to Homeostasis (cont.)

- Role of **musculoskeletal system** in homeostasis (provides **support** and protection for the soft tissues and organs; and enables **movement** toward food or away from threats).
- Role of **nervous system** in homeostasis (instant regulatory functions by its sensory part, central nervous system or integrative part, and the motor part). The autonomic system operates at a **subconscious** level to control many organs such as the heart pumping, GIT movement, glandular secretion, etc. The nervous system controls mainly the muscular and secretory activities.
- Role of **endocrine system** (hormonal system) in homeostasis (delayed and prolonged regulatory function; e.g. thyroid hormones, insulin hormone, parathyroid hormone, etc.). This system regulates mainly metabolic functions.

دون الوعي

Contributions of the Body Systems to Homeostasis (cont.)

- Role of the **immune system (white blood cells, the thymus, and lymph nodes)** in homeostasis is the protection from pathogens. This function is achieved by distinguishing body own cells from harmful foreign cells and substances; and by destroying the invader by **phagocytosis** or by **antibodies**.
- The role of the **integumentary system (skin and its various appendages)** is to cover, cushion, and protect the deeper tissues and organs. This system is also important for **temperature regulation** and excretion of wastes, and it provides a sensory interface between the body and the external environment.
- Role of **reproductive system** is to maintain homeostasis (maintains continuity of life by generating new beings to replace those that are dying).

Test Question:

Q. Which statement regarding homeostasis is incorrect?

- A. The term "homeostasis" describes the maintenance of nearly constant conditions in the body.
- B. In most diseases, homeostatic mechanisms are no longer operating in the body.
- C. The body's compensatory mechanisms often lead to deviations from the normal range in some of the body's functions.
- D. Disease is generally considered to be a state of disrupted homeostasis.
- E. The concept of homeostasis includes the concept of an error signal.