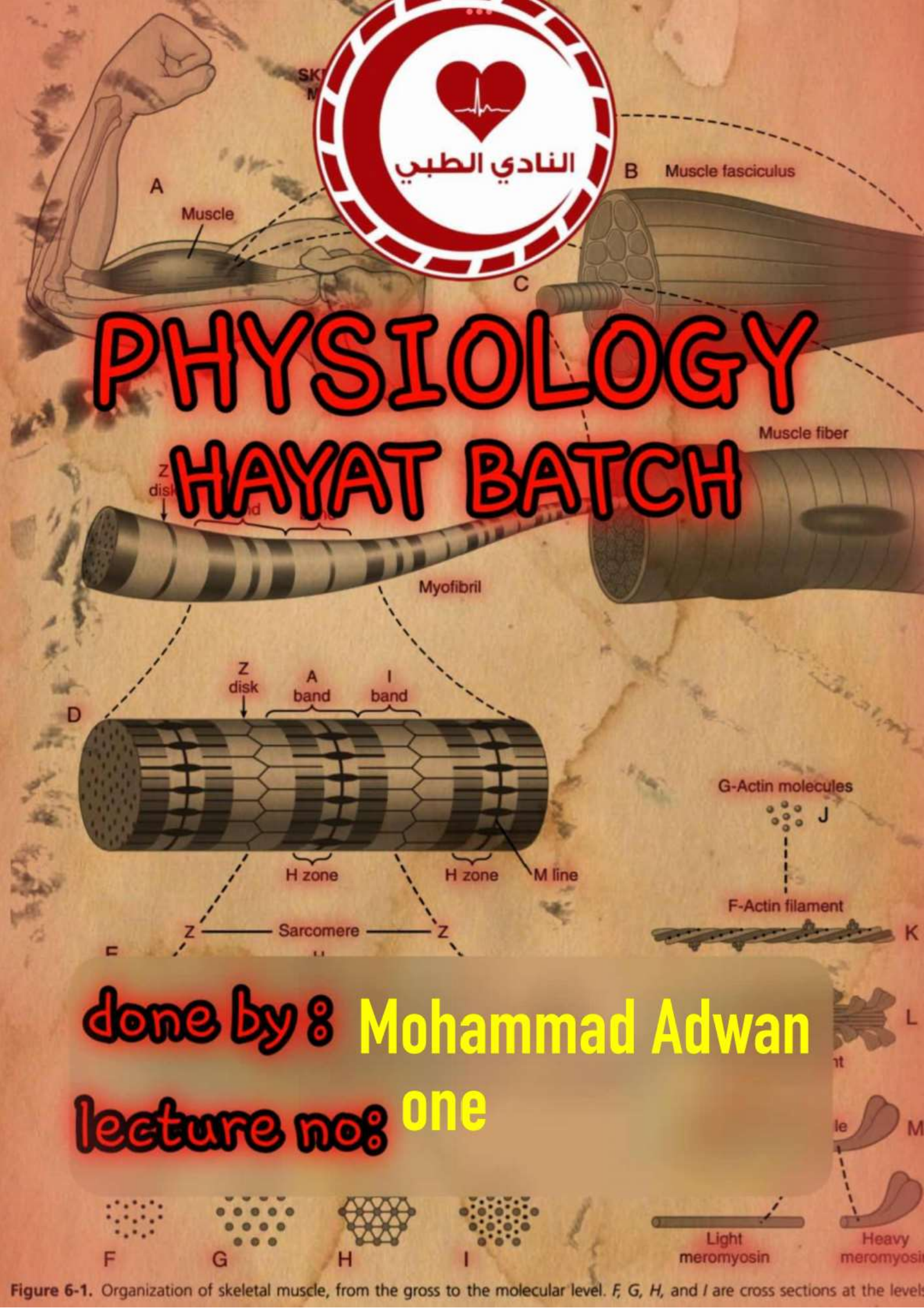


**Figure 6-1.** Organization of skeletal muscle, from the gross to the molecular level. *F, G, H,* and *I* are cross sections at the level

# Physiology Lecture 1

# The internal environment and Homeostasis

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نطلع فاهمين النقاط هاي

## Lecture Objectives:

- Understand the concept of homeostasis, external and internal environments.
- Differentiate between the extracellular and intracellular fluid compartments.
- Recognize the role of body systems in homeostasis
- Be familiar with the coordination of body systems in regulation of body functions

Book name : Gyton physiology

الدكتور بحدد شو المواضيع
الي بنحتاجها من الكتاب
أي سؤال بنقدر نسأل الدكتور من على الـ "Teams"

# Physiology:

هدفنا من ال physiology مش بس نعرف كيف كل عضو بشتغل، هدفنا النهائي فهم كيف كل عضو بساعد الآخر للحفاظ على الصحة و الحياة

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

متكاملين — الحفاظ

## The internal environment (Extracellular fluid-ECF)

internal environment = Extracellular fluid

السائل الي يحيط بالخلايا بنسميه extracellular fluid أو internal environment. الكائنات الحية احادية الخلية مثل الاميبا بتعيش في الماء(بنقدر نسميه extracellular fluid) . عشان تضل الاميبا عايشة بالماء مقومات الحياة لازم تتوفر من مواد غذائية و عدم تراكم الفضلات بالماء

- 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.

اسم العالم

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

حركة دائمة — من وظيفة CVS

الشعيرات الدموية بتجدد المواد الغذائية و بتشيل الفضلات

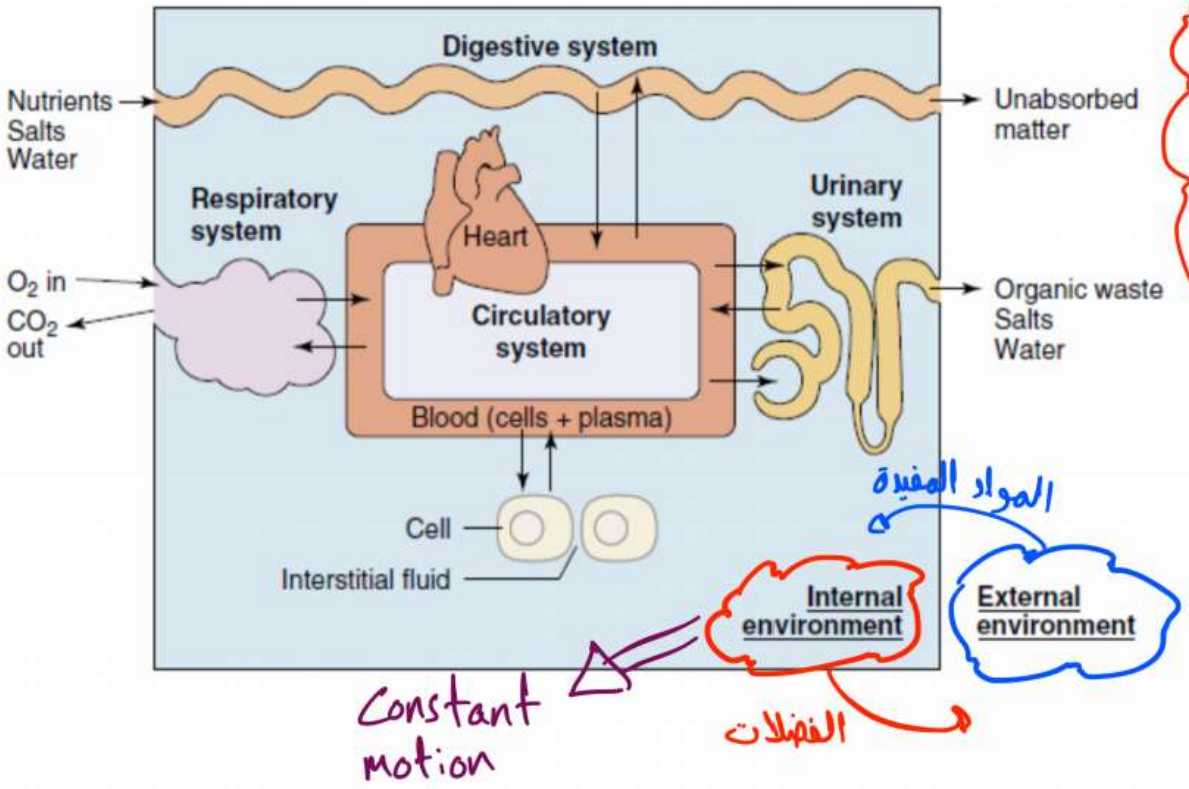
- The composition of the ECF is maintained by **body systems**
- It contains the ions and nutrients needed by the cells for maintenance of cellular life. It also contains $CO_2$ plus other cellular waste products

بالنسبة للكائنات متعددة الخلايا، كل خلية منها لازم تكون محاطة بسائل (extracellular fluid) عشان تحافظ على نفسها و تقدر تستهلك الغذاء و تتخلص من الفضلات(خلايا الكائنات متعددة الخلايا بتتشابه بالية العمل مع الكائنات احادية الخلايا عشان هيك بنحتاج ال(extracellular fluid)

مش كل الماء في جسمنا يعتبر Extracellular fluid ، فقط ثلث الماء عبارة عن internal environment و الباقي بدخل الخلايا و بنسميه intracellular fluid بالنسبة.

2 : 1

intracellular fluid — Extracellular fluid




الهدف من هاي الصورة هو نفهم كيف اجهزة الجسم بتحافظ على internal environment عن طريق سحب المواد المفيدة و التخلص من الفضلات .

شرح النقطة 4 من السلايد الماضي .

## The internal environment (Cont.)

- The concentrations of $O_2$, glucose, different ions, 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

⇒ الجسم يحاول ان يحافظ على internal environment relatively في حدود range معين؛ و هذا سبب كلمة

- 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 $HCO3^-$ ions extracellularly) مع تركيزهاي العناصر على خارج الخلية

⇒ تركيز المواد خارج الخلية يختلف عن داخل الخلية ؛ و المسؤول عن هذا الاختلاف هو الـ 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**

طرق ادخال و اخراج المواد

# Homeostasis

- How to keep the internal environment in a steady-state

- Is the maintenance of the ECF and the ICF composition in a **steady-state** condition, distinct from **equilibrium** by a variety of regulatory processes called homeostatic mechanisms

ما حكينا equilibrium لأنو قلنا تركيز المواد داخل الخلية يختلف عن خارج الخلية و هذا عكس الـ equilibrium

- Disease or death is often the result of dysfunction of homeostatic mechanisms

تعريف الـ disease

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

- pathology is the abnormal physiology

- The effectiveness of homeostatic mechanisms varies over a person's lifetime ⇒

فعالية اعضاء و اجهزة الانسان تختلف مع العمر :

Stress : مثل بس الضغط النفسي ، هو كمان نقص بعض المواد داخل جسمنا.

## 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).
- 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).
- 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 (العقل المتحكم) 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.

- Metabolism in our body produces our internal environment

- Some organs produce temprature more than other organs. However, because of Blood circulation The temprature is same in all regions of our body ⇒ و هذا نوع من التعاون

ترتيب اعضاء الطرح :
1. Urinary system
2. liver → get rid of lipid waste with a feature called "Conjugation" to pile → to kidney

## Contributions of the Body Systems to Homeostasis (cont.)

- 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
- 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).

- 70% - 80% of temprature loss is by radiation.

# 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. => بتكون شغالة و لكن بفعالية منخفضة.

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.