

Lesson 3: Homeostasis, Hormones and the Endocrine System

Terminology:

Homeostasis: The tendency towards a relatively stable equilibrium between interdependent elements, especially as maintained by physiological processes. In short, your body tries to maintain a constant environment.

Hormones: A regulatory substance produced in an organism and transported in tissue fluids such as blood or sap to stimulate specific cells or tissues into action.

What are the factors maintained by Homeostasis?

Homeostasis makes sure the body maintains proper:

- Temperature
 - Water
 - Oxygen
 - Carbon Dioxide
 - Blood Sugar (Glucose)
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Internal vs External Conditions

Homeostasis works even if conditions on the outside of the body is effected.

Automatic Control Systems

1. Receptors - Detect of change
 2. Coordination centres - interpret that change
 3. Effectors - Carry out the change or glands that release hormones.
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Endocrine System vs Nervous System

Nervous System:

- Very fast responses + Precise
- Electrical Impulses
- Respond quickly

Endocrine System:

- Hormones (Bloodstream)
 - Entire body
 - Slow, longer lasting and more generalised
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Reference Range

Conditions inside your body need to be kept within a narrow reference range. Most factors have an ideal value that the body will try to maintain using Automatic Control Systems. This is referred to as the set point.

Why is Homeostasis important?

For survival! Eg. You sweat to bring down your body temperature when you run. If your body temperature goes above 41°C proteins may start to break down, enzymes stop working, chemical reactions (such as cellular respiration don't work).

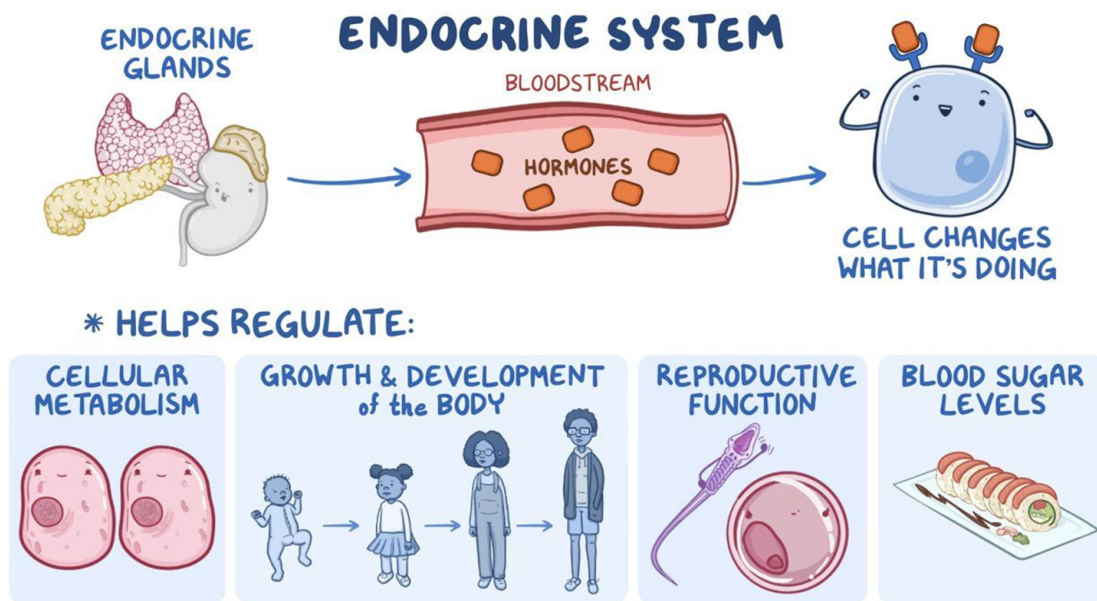
How is homeostasis maintained?

Homeostasis is maintained by the nervous system and the endocrine system.

What is a hormone?

Hormones are chemical messengers used in the body in the endocrine system. The endocrine system is defined as the system in the body that produces hormones.

Hormones In the Body



Hormone	Source gland	Target	Main effects
adrenaline	adrenal	whole body	<ul style="list-style-type: none">• increases heart rate• shuts down digestion• makes energy available to muscles
thyroxine	thyroid	whole body	<ul style="list-style-type: none">• makes cells consume more oxygen and nutrients• increases body temperature
thyroid-stimulating hormone	pituitary	thyroid	<ul style="list-style-type: none">• stimulates thyroid hormone production
follicle-stimulating hormone	pituitary	gonads (ovaries or testicles)	<ul style="list-style-type: none">• stimulates egg production in females• stimulates sperm production in males

Summary (Remember This!)

Homeostasis is the body's natural tendency to maintain a relatively stable equilibrium, especially through physiological processes, ensuring that internal conditions stay within a narrow reference range. It keeps vital factors like temperature, water, oxygen, carbon dioxide, and blood sugar (glucose) under control.

Hormones are regulatory substances produced in an organism and transported in tissue fluids, such as blood, to stimulate specific cells or tissues into action.

Homeostasis operates in response to both internal and external conditions, ensuring stability even when external factors affect the body.

Automatic Control Systems in the body involve three key components:

1. **Receptors:** Detect changes in the environment.
2. **Coordination Centres:** Interpret these changes.
3. **Effectors:** Carry out responses or release hormones to maintain equilibrium.

The **Nervous System** delivers very fast and precise responses through electrical impulses, while the **Endocrine System** uses hormones circulated in the bloodstream, affecting the entire body. The endocrine system's responses are slower, longer-lasting, and more generalized.

Conditions within the body are maintained within a narrow reference range to ensure optimal functioning. This reference range is often called the **set point**.

Homeostasis is crucial for survival, as it prevents extreme conditions that can lead to protein breakdown, enzyme dysfunction, and the disruption of chemical reactions.

It's maintained by the **nervous system** and the **endocrine system**, with the latter relying on chemical messengers called **hormones** to regulate various bodily functions.

Questions to Reassess your understanding

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1. What are the factors maintained by Homeostasis?
 2. How does Homeostasis work even when external conditions affect the body?
 3. What are the three components of Automatic Control Systems in the body?
 4. Explain the differences between the Nervous System and the Endocrine System in terms of response speed and precision.
 5. What is the purpose of maintaining conditions within a narrow reference range, and what is this range often referred to as?
 6. Why is Homeostasis important for survival? Provide an example.
 7. How is Homeostasis maintained in the body, and which body systems play a role in this maintenance?
 8. Define what a hormone is and its role in the endocrine system.
 9. What's the key difference between the Nervous System and the Endocrine System in terms of the method they use to deliver signals to target cells or tissues?
 10. How do Receptors, Coordination Centers, and Effectors contribute to maintaining Homeostasis in the body?