

HOMEOSTASIS

Main Entry: **ho·meo·sta·sis**

Pronunciation: "hO-mE-O-'stA-s&s

Function: noun

: a relatively stable state of equilibrium or a tendency toward such a state between the different but interdependent elements or groups of elements of an organism, population, or group

"Homeostasis" is derived from the Greek words for "same" and "steady."

(1) Dynamic self-regulation.

(2) The condition of a system when it is able to maintain its essential variables within limits acceptable to its own structure in the face of unexpected disturbances.

(3) Homeostasis is the regulation of a system's internal environment so as to maintain a stable state. The term most often refers to biological homeostasis in [humans](#) and [animals](#), but can apply to any system. All homeostasis is geared to this end - maintaining the optimum internal environment for cellular life within the body!

In 1865 Claude Bernard noticed, in his Introduction to Experimental Medicine that the "constancy of the internal milieu was the essential condition to a free life." But it was necessary to find a concept that would make it possible to link together the mechanisms that effected the regulation of the body. The credit for this concept goes to the American physiologist Walter Cannon. In 1932, impressed by "the wisdom of the body" capable of guaranteeing with such efficiency the [control](#) of the physiological equilibrium, Cannon coined the word homeostasis from two Greek words meaning "to remain the same." Walter Cannon is author of book - The Wisdom of the Body (1932).

The main function of the hypothalamus is homeostasis, or maintaining the body's status quo. Factors such as blood pressure, body temperature, fluid and electrolyte balance, and body weight are held to a precise value called the set-point. Although this set-point can migrate over time, from day to day it is remarkably fixed.

Once the hypothalamus is aware of a problem, it has two avenues of output for fixing the problem

1. - neural signals to the autonomic system - the (lateral) hypothalamus projects to the (lateral) medulla, where the cells that drive the autonomic systems are located. These include the parasympathetic vagal nuclei and a group of cells that descend to the sympathetic system in the spinal cord. With access to these systems, the hypothalamus can control heart rate, vasoconstriction, digestion, sweating, etc.
2. - endocrine signals to/through the pituitary - recall that an endocrine signal is a chemical signal sent via the bloodstream (hormone). Large hypothalamic cells around the third ventricle send their axons directly to the posterior pituitary, where the axon terminals release oxytocin and vasopressin into the bloodstream. Smaller cells in the same area send their axons only as far as the base of the pituitary, where they empty releasing factors into the capillary system of the anterior pituitary. These releasing factors induce the anterior pituitary to secrete any one of at least six hormones, including ACTH and thyroid-stimulating hormone (TSH).

Ultimately the hypothalamus can control every endocrine gland in the body, and alter blood pressure (through vasopressin and vasoconstriction), body temperature, metabolism (through TSH), and adrenaline levels (through ACTH).

To maintain homeostasis the body has to control the concentrations of about six substances:

carbon dioxide

urea

water

sugar

various ions

oxygen

This control is achieved with various organs and glands in the body which are all ultimately controlled by the hypothalamus: The hypothalamus monitors water content, carbon dioxide concentration, and blood temperature, sending nerve impulses to the pituitary gland and skin.

The pituitary gland synthesizes ADH (anti-diuretic hormone) to control water content in the body. The muscles can shiver to produce heat if the body temperature is too low. Warm-blooded animals (homeotherms) have additional mechanisms of maintaining their internal temperature through homeostasis.

The pancreas produces insulin to control blood-sugar concentration.

The lungs take in oxygen and give out carbon dioxide.

The kidneys remove urea and adjust ion and water concentrations