

Homeostasis

Homeostasis (homeo- meaning "the same" and -stasis meaning "to stay") literally means to stay the same. The human body functions best under controlled conditions and so it works to maintain constant temperature, pH, water content, and many other variables.

For example, human body temperature needs to remain at approximately 37°C to function properly. If a person's body temperature moves outside of that narrow range of temperatures, hypothermia or hyperthermia can result, putting that person at risk of illness and potentially death. Therefore, the body monitors its temperature and warms and cools it as needed to maintain the proper temperature.

Parts of a Homeostatic System

How does the body maintain this balance? No matter what variable is being maintained, all homeostatic systems have the same three general component parts:

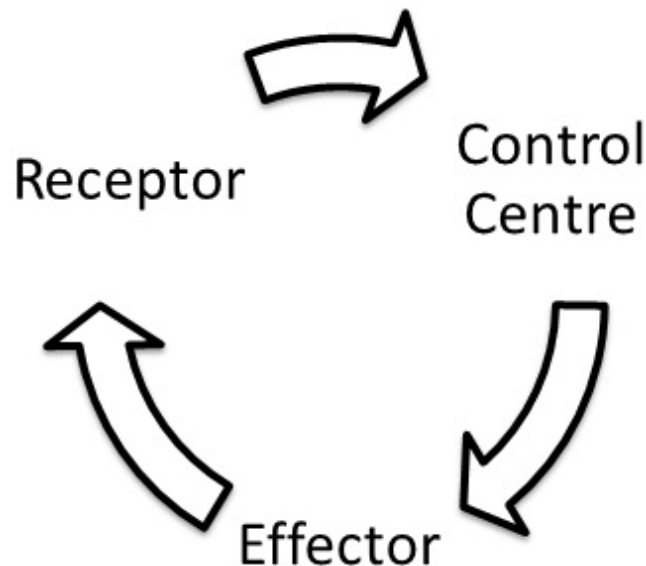


Figure 1. General structure of a homeostatic system.

The following examples will give an idea of two actual homeostatic systems.

The first is meant to provide a generalized, non-biological example and the second will provide an actual biological example. Note, that both systems have the three components of a homeostatic system: a receptor, control centre, and an effector.

Example 1. A Non-Biological Example: Temperature regulation of a building.

One example of a homeostatic system is the temperature regulation of a building (Figure 1). Note, that even within this system there are the three components of a homeostatic system: a receptor, control centre, and an effector. The receptor is a sensor in the thermostat that receives information about the temperature of the building; the control centre is the computer found within the thermostat; and the effector is the furnace itself.

The image shows two loops to the homeostatic system, this is used to indicate the two outcomes of the control centre's comparison of the receptor information to the set point, the desired temperature, either to heat the room or cool the room.

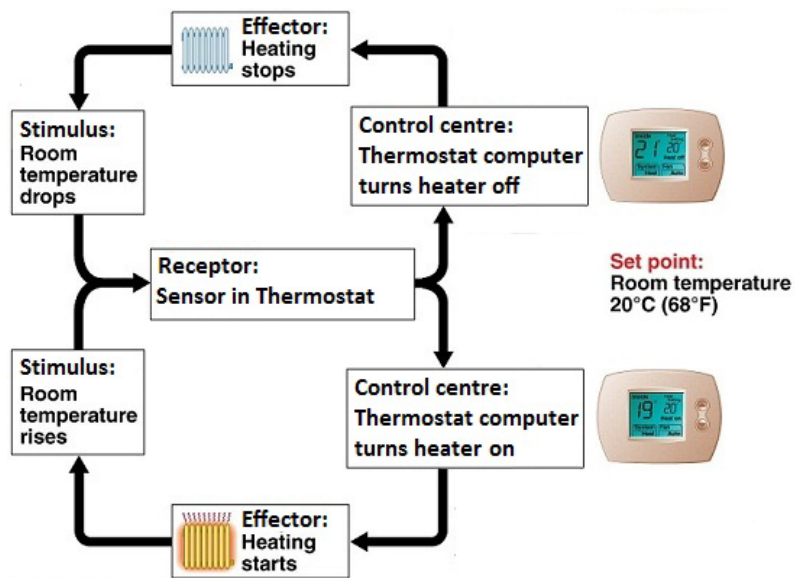


Figure 1. A non-biological homeostatic system: the thermostat and furnace system used to heat a building (adapted from Simon, Dickey, and Reece 2013).

Example 2. A Biological Example: Human Temperature Regulation

Just as in the temperature regulation of a house (Figure 1) the regulation of body temperature (Figure 2) uses the same three components: a receptor, control centre, and an effector. In most human cases: the receptors are specialized nerves, in this case monitoring body temperature; the control centre is the brain, which compares the body temperature to the set point, the desired temperature; and the effectors are various tissues and organs in the body, in this example the skin and muscle.

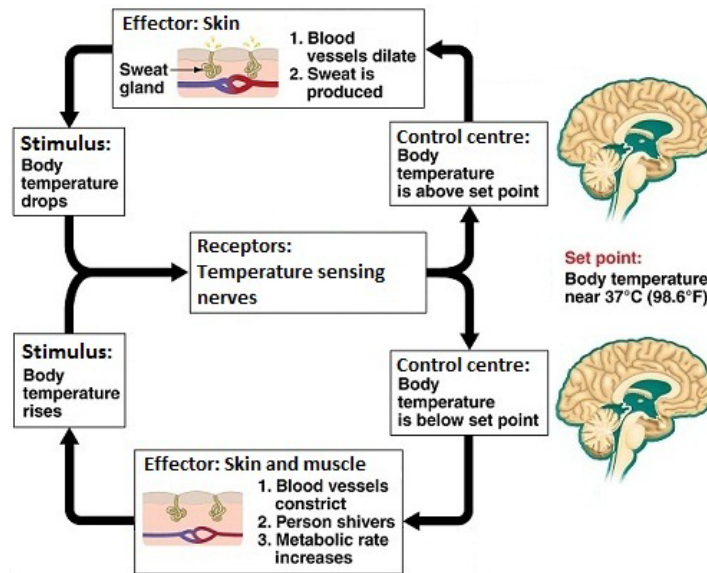


Figure 2. A biological system homeostatic system: temperature regulation in humans (adapted from Simon, Dickey, and Reece 2013).

References

Simon, E., Dickey, J. & Reece, J. (2013). *Essential biology with physiology* (4th ed.). Philadelphia: Pearson Education Inc. ISBN: 978-0-321-77260-2