Homeostasis worksheet anatomy

At the end of this section, you can: Discuss the role of homeotase in healthy functioning Contrast negative and positive feedback, giving a physiological example of each mechanism Maintaining homeotase requires the body to continuously monitor its internal conditions. From body temperature to blood pressure to levels of certain nutrients, each physiological condition has a particular set point. A starting point is the physiological value around which the normal range fluctuates. A normal range is the restricted set of values that is ideally healthy and stable. For example, the starting point for the normal temperature of the human body is approximately 37°C (98.6°F) Physiological parameters, such as body temperature and blood pressure, tend to fluctuate within a normal range a few degrees above and below that point. Control centers in the brain and other parts of the body monitor and react to deviations from homeotase using negative feedback. Negative feedback is a mechanism that reverses a deviation from the starting point. Therefore, negative feedback keeps body parameters within their normal range. The maintenance of homeotase by negative feedback happens throughout the body all the time, and the understanding of negative feedback is therefore fundamental to the understanding of human physiology. A negative feedback system has three basic components (Figure 1a). A sensor, also referred to as a receiver, is a component of a feedback system that monitors a physiological value. This value is reported to the control center. The control center is the component in a feedback system that compared the value to the normal range. If the value deviates too much from the starting point, then the control center activates an effect. One effect is the component in a feedback system that causes a change to reverse the situation and return the value to the normal range. Figure 1. Negative feedback loop. In a negative feedback loop, a stimulus —a deviation from a set point—is resisted through a physiological process that returns the body to homeotase. a A negative feedback loop has four basic parts. b Body temperature is regulated by negative feedback. To get the system moving, a stimulus must conduct a physiological parameter beyond its normal range (i.e., beyond homeotase). This stimulus is heard by a specific sensor. For example, in blood glucose control, specific endocrine cells in the pancreas detect excess glucose (the stimulus) in the bloodstream. These pancreatic beta cells respond to increased blood glucose level by releasing hormonal insulin into the bloodstream. Insulin signals skeletal muscle fibers, fat cells (adipocytes) and liver cells to take excess glucose by removing it from the bloodstream. As the concentration of glucose in the bloodstream decreases, the decrease in concentration — actual negative feedback — is detected by pancreatic, and the release of insulin stops. This prevents blood sugar levels from blood to fall below the normal range. Humans have a similar temperature regulation feedback system that works by promoting heat loss or heat gain (Figure 1b). When the brain's temperature regulation center receives data from sensors indicating that the body temperature exceeds its normal range, it stimulates a cluster of brain cells referred to as the center of heat loss. This stimulation has three main effects: the blood vessels of the skin begin to dilate allowing more blood from the body's core to flow to the surface of the skin allowing heat to radiate into the environment. As blood flow to the skin increases, sweat glands are activated to increase their production. As sweat evaporates from the surface of the skin to the surrounding air, it takes heat with it. The depth of breathing increases, and a person can breathe through an open mouth instead of through the nasal passages. This further increases the heat loss of the lungs. In contrast, activation of the brain's heat gain center by exposure to cold reduces blood flow to the skin, and blood returning from the limbs is diverted to a network of deep veins. This arrangement holds heat closer to the core of the body and restricts heat loss. If the heat loss is severe, the brain triggers an increase in random signals to skeletal muscles, causing them to contract and produce tremors. Muscle tremor contractions release heat as they use ATP. The brain triggers the thyroid gland in the endocrine system to release thyroid hormone, which increases metabolic activity and heat production in cells throughout the body. The brain also signals the adrenal glands to release epinephrine (adrenaline), a hormone that causes glycogen to break down in glucose, which can be used as an energy source. The decomposition of glycogen in glucose also results in increased metabolism and heat production. Watch this video to learn more about the concentration of water in the body. The concentration of water in the body is fundamental for proper functioning. A person's body maintains very strict control over water levels without conscious control on the part of the person. Watch this video to learn more about the concentration of water in the body. Which organ has primary control over the amount of water in the body? Positive feedback intensifies a change in the body's physiological condition rather than reversing it. A deviation from the normal range results in more changes, and the system moves further away from the normal range. Positive feedback on the body is only normal when there is a set endpoint. Childbirth and the body's response to blood loss are two examples of positive feedback loops that are normal but are activated only when needed. Term delivery is an example of a situation in which maintaining the state of the existing body is not desired. Changes in the mother's body are necessary to expel the baby at the end of pregnancy. And the events of childbirth, once started, must progress rapidly to a conclusion or the mother and baby are at risk. Extreme muscle labor and delivery are the result of a positive feedback system (Figure 2). Figure 2. Positive feedback loop. Normal childbirth is driven by a positive feedback loop. A positive feedback cycle results in a change in body status rather than a return to homeotase. The first contractions of labor (the stimulus) push the baby towards the cervix (the lower part of the uterus). The cervix contains stretch-sensitive nerve cells that monitor the degree of stretching (the sensors). These nerve cells send messages to the brain, which in turn causes the pituitary gland at the base of the brain to release the hormone oxytocin into the bloodstream. Oxytocin causes stronger contractions of the smooth muscles in the uterus (the effects), pushing the baby further down the birth canal. This causes an even greater lengthening of the cervix. The stretching cycle, oxytocin release and increasingly strong contractions only stop when the baby is born. At this point, stretching the cervix to, preventing the release of oxytocin. A second example of positive feedback focuses on reversing extreme damage to the body. After a penetrating wound, the most immediate threat is excessive blood loss. Less blood circulation means lowering blood pressure and reducing perfusion (blood penetration) in the brain and other vital organs. If the infusion is severely reduced, vital organs will be shut down and the person will die. The body responds to this potential catastrophe by releasing substances into the wall of injured blood vessels that initiate the process of blood clotting. As each stage of coagulation occurs, it stimulates the release of more clotting substances. This speeds up the clotting and sealing processes of the damaged area. Coagulation is contained in a local area based on the well-controlled availability of coagulation proteins. This is an adaptive and life-saving cascade from events. Homeotase is the activity of cells throughout the body to maintain physiological state within a narrow range that is compatible with life. Homeotase is regulated by negative feedback loops and, much less often, by positive feedback loops. Both have the same components as a stimulus, sensor, control center and effector; however, negative feedback loops work to avoid excessive response to the stimulus, while positive feedback loops intensify the response until an endpoint is reached. The concentration of water in the body is fundamental for proper functioning. A person's body maintains very strict control over water levels without conscious control on the part of the person. Watch this video to learn more about the concentration of water in the body. Which organ has primary control over the amount of water in the body? the control center comms with its normal range; deviations cause the activation of an organ effect or effect that can cause a change in a homeostatic mechanism of negative value feedback that tends to a disturbance in the physiological condition of the body, preventing an excessive response to a stimulus, typically as the stimulus is removed normal range of values around the set point that do not cause a reaction by the control center's positive feedback mechanism that intensifies a change in the body's physiological condition in response to a stimulus sensor (also , receiver) reports a monitored physiological value for the control center to define the ideal value for a physiological parameter; the level or small range within which a physiological parameter such as blood pressure is stable and ideally healthy, i.e. within its parameters of homeostasis homeostasis