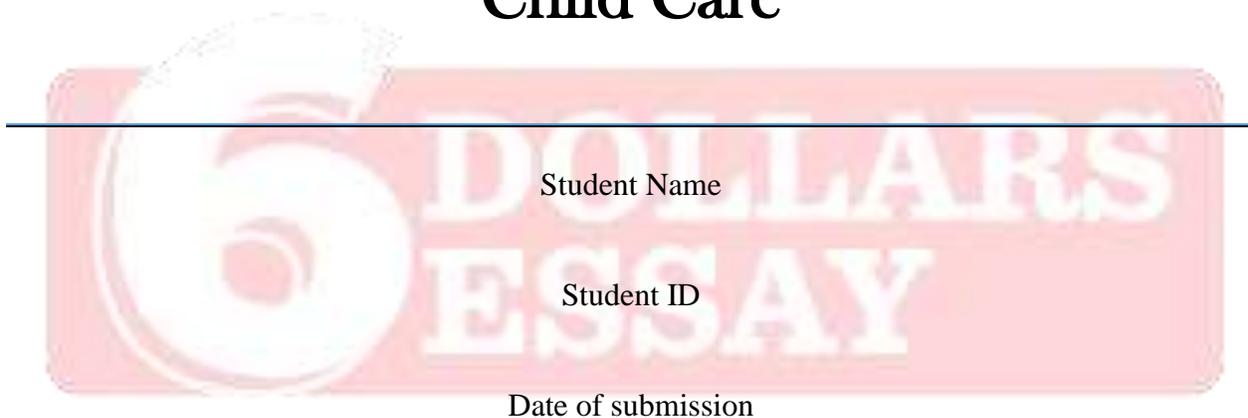


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1. UNDERSTANDING THE PRINCIPLES OF HOMEOSTASIS

Homeostasis is basically concerned with the preservation of a steady internal environment as a reaction to a change in the external environment. The role of hormone is predominantly significant in this system. These constitutes of protein that are released by the glands in the body into the bloodstream, where they get to the targeted cells. A specific hormone that fits a specific receptor protein brings the change in the cell. Overall, the homeostatic is basically concerned with the internal consistency.

1.1 Principles of homeostasis in humans

The basic principles of homeostasis are to maintain a constant condition in case it deviates from the set point or norm, the corrective measures to bring back the set norm is regulated by the entity. In the same way, the homeostasis controls various factors in order to keep them constant such as water, body temperature, blood pressure, nutrients such as glucose and ions, and PH despite the changes in the external environment or the activities of the body (Pang et al., 2014).

The homeostasis system is designed to function by identifying the changes that are occurring in the set points or norms and initiate the corrective measures to offset the changes occurring.

The system incorporates in it the sensor which becomes active when the system actual condition deviates from the desired condition; it serves as a device which assists in reducing the difference in the conditions for which it uses and effector for taking the desired action. For instance, if the amount of water within the body differs from the set level, it can cause disruptions in the metabolism. Similarly, if the temperature level changes from the set point, the structure of proteins, as well as enzyme, get affected which result can be disastrous and more.

1.2 Relationships between homeostasis, growth, and development

The homeostasis shares a prime relationship with the growth and development. The homeostasis involves each system in the body for fulfilling the basic needs of the individual. For instance, the energy required for maintaining a normal body function for homeostasis is provided by foods and the oxygen. The energy supply in the assistance for carrying out the functions that are essential for the growth and development of the body. For example, the growth and development in the child may be affected if he is not provided with the required food, the condition results in malnutrition which reduces his capacity for tackling the infections and diseases which results in failure for them to thrive.

1.3 Homeostasis challenges

The human body is a biological system that always faces some challenges in its growth despite the continuous perturbations in its external and internal environment. For eradicating all the challenged it has evolved or formed a different mechanism that maintains the environment within the certain limits to ensure homeostasis. If the homeostasis is not maintained, then the body can be lead to a state of disease (Lim, Grinstein and Roth, 2017). The state of disease and cellular malfunction can result in two ways. First, the cells may not be receiving what they need which results in deficiency and second when cells are receiving an excess of something that is causing disruption in their functioning which results in toxicity.

The changes in homeostasis can worsen or correct the problem depending on the influences. In case of genetic influences, the disruptions can be caused by the external influences such as an individual's lifestyle choice and exposure to a certain type of environment. These factors

persuade the ability of the body in the maintenance of the homeostasis balance. For instance, in case medical condition where a person has diabetes, the endocrine system responsible for maintaining the set level of glucose faces difficulty because a constant check of blood glucose level is required for monitoring the daily consumption of sugar. Another environmental condition where the person is dehydrated the body temperature will not be able to regulate properly which will undermine homeostasis. Other challenges that cause disruptions in maintaining consistent internal condition may include nutritional imbalances, disorders in hormones, cancer, infections and more that can make an individual rapidly ill and weak (Yu, Zhao and Guan, 2015).

2. MECHANISM AND FEEDBACK LOOPS OF HOMEOSTATIC MAINTENANCE

For the homeostasis maintenance, a mechanism is required for the detection of the changes that deviated from the central point.

2.1 Detectors, control center, and effectors

The detectors for the maintenance of the homeostasis are the receptors (or sensors) which possess the capability for detecting the changes in the internal environment. The control center is the place in the body that takes the corrective measures for the changes that are occurring in the body undermining homeostasis. The effectors in the body implement the corrective measures. For instance, the preliminary interruptions in the parameters of the physiology are detected by the receptors. They convey the information about the interruption to the homeostatic control center which analysis, interprets, and determine the magnitude of the deviation. The effectors

execute the corrective measures for maintaining the balance after which the response is stopped. If the temperature of the body deviates from the set point, the receptors in the skin communicate it to the brain (control center) which the blood vessels and the sweat glands (effectors) then control it.

2.2 Negative and positive mechanism

The role of the endocrine system is crucial in the maintenance of the balance of homeostasis because of its regulation of hormones in the activity of the cells in the body (Chiras, 2013). The stimulus is responsible for controlling the activities of the hormones in the blood as it cause the increase and decrease in the hormones secreted; this may change the conditions of the body. This is a self-adjusting mechanism called feedback regulation. This takes place when the stimulus-response has some influence on the original stimulus. Two types of feedback mechanism define the response of the system in the presence of the effector.

2.2.1 Negative Feedback Systems

The negative feedback results when the changes in the controlled conditions are brought back to their original points, i.e. it reverse the changes and brings the balance of the body back. For instance, when the temperature of the body increases, the sweat glands are activated by the hypothalamus to release the body temperature in the form of sweat. Similarly, when the body temperature decreases negative feedback is send to the hypothalamus to cease the activated glands which bring back the temperature to the normal.

2.2.2 Positive Feedback Systems

The positive feedback system is responsible for increasing the changes in the controlled conditions. This system operates to amplify the changes that have occurred in the body for some time until a negative feedback is activated by the stimulus to take over. It is created to augment the infrequent process that is created so that a whole new product is formed. Such as the process of childbirth in the mammals, the hormone stimulates the uterine contractions in it is the oxytocin is the effector, the contraction causes the release of more oxytocin which causes more contractions, this positive feedback loop continues until the baby is born. The positive feedback is the reaction to a specific state which is psychological stress mostly.

2.3 Relationship between body systems and homeostatic maintenance

Various body systems play a role in the maintenance of the homeostasis in the body. These body systems include the integumentary system is related with skin, nails, hair and glands, a muscular system with the functioning of the skeletal, cardiac and smooth muscles, a lymphatic system with the protection of the body from the unknown invasion. The endocrine system which affects the growth and development of the body in the adults and children, the circulatory system for supplying oxygen in the body and eliminating the waste from the body and the nervous system for controlling the body organs and glands in the body. These all systems are required for the proper functioning of the body which maintains the stable internal condition. If the body systems stop, functioning properly the homeostasis is imbalanced which can also result in the death of the individual. Therefore, it is essential for the survival that all the system functions properly.

3. STRUCTURE AND FUNCTION OF THE CIRCULATORY AND RESPIRATORY SYSTEM

The body is controlled by various systems for the maintenance of the balance in its environment. The respiratory system enables the individual to breathe whereas a circulatory system is responsible for the distribution of the oxygen to the tissues of the body. The structure and function of both the systems differ.

3.1 STRUCTURE AND FUNCTION OF CIRCULATORY SYSTEM

The circulatory system is also called cardiovascular system. It comprises of the heart, blood vessels, and blood. The system consists of two circuits which are responsible for carrying the blood to the various parts of the body. The small circuit is a pulmonary circuit which is between the heart and the lungs whereas the larger circuit is a systemic circuit that is in the peripheral tissues and heart. Due to the large size of the systematic circuit, the left ventricle of the heart is stronger than the right.

The circulatory circuit provides the body tissues with the nutrients and oxygen which are transported in the blood. The pulmonary circuit carried the deoxygenated blood in the lungs for the exchange of oxygen and carbon dioxide. The oxygen replaces the carbon dioxide in the blood. The hemoglobin in the red blood cells which has iron allows the oxygen to bind and transport. Once the exchange has occurred the heart then pumps the blood to the systematic circuit if the body which provides the tissues with the oxygenated blood and collects the deoxygenated blood from it. The deoxygenated blood is then again sent back to the heart. The waste products in the blood are removed by the processing done in the liver. The blood is

systematic circuit travels through aorta which small arteries branching off from it. The arteries branch becomes capillaries for providing blood to every cell in the brain.

3.2 STRUCTURE AND FUNCTION OF RESPIRATORY SYSTEM

The respiratory system comprises of the lungs, the airways, the central nervous system which controls the muscles for respiration and the chest wall. The muscles in it include the diaphragm, abdominal muscles, intercostals muscles, and the rib cage. It is basically divided into two parts one is upper respiratory tract that is composed of mouth, nose, and the start of the trachea, all these are situated in the chest cavity. The second lower part includes the lower trachea, bronchi, the bronchiole, and the lungs

The function of the respiratory system is to use the oxygen available in the external environment and deliver it to the cells for the removal of carbon dioxide in the body that is generated in it by the cellular metabolism. The system involves the exchange of gases, maintenance of acid-base balance, defense of pulmonary and metabolism, phonation and the management of the bioactive materials.

3.3 RELATIONSHIP BETWEEN GAS EXCHANGE AND NUTRIENT TRANSPORTATION TO HOMEOSTASIS

Homeostasis requires the functioning and support of two or more organs for proper working. The gas exchange and nutrients transportation are integral in its working. The gas exchange occurs in the respiratory system where the exchange of oxygen and carbon dioxide takes place. The circulatory system is essential because it transports the dissolved gasses and nutrients in the body. The digestive system which breaks down the food and absorbs nutrients and further

eliminates the solid waste dissolves the nutrients. These are required for cellular respiration because it requires nutrients and oxygen. If these exchanges do not occur in the gas and the nutrients are not provided there will be a shortage of glucose in the body, further without the gas exchange carbon dioxide will not be eradicated from the system of the body which disturbs the whole working of the human body. These are important for the homeostasis which is essential for the survival of the humans.

4. STRUCTURE AND FUNCTIONS OF THE MUSCULOSKELETAL AND CENTRAL NERVOUS SYSTEM

The body needs a system for movement and assistance of the tissues and the organs that it comprises. These systems are essential for providing the ability to move which allows the individual to seek and gather food and shelter. The nervous system is also essential because it instructs the muscular system to harden the rib case around muscles in case carbon dioxide level gets high.

4.1 STRUCTURE AND FUNCTIONS OF THE MUSCULOSKELETAL

The musculoskeletal is related to the skeleton and muscular system of the body. The system of skeleton comprises if the skeleton bone, cartilages, ligaments, and tissues that are responsible for maintaining a connection with the bones. The bones and muscles function together to support the body weight, assist body position, and control its movement. The musculoskeletal is essential if we want to move and function.

The skeleton bones are composed of two forms of tissue; one is the dense type of bone (found at the external surface of the bone) and the other a cancellous type (the bone that is inside the bone). A periosteum membrane covers the bone in the inside of the body. The joints are there in the bone to aid in the movements of the body, ligaments to attach the bones and tendons to attach muscles to the bone. The muscle involves are of three type one is smooth that is found in internal organs, cardiac which is found only in heart and skeletal which is in the whole body.

The musculoskeletal is responsible for the three type of function. One involves the protection, other the production of blood cells and third the storage of the minerals. The protection function of the musculoskeletal is responsible for the protection of the body organs such as brain, and lungs. The blood cell production produces cells, i.e. red, white and plasma in the bone marrow that is released in the bloodstream and lasts the mineral storage function stores a large amount of calcium and phosphorus that are required for bone strengthening and rigidity. This calcium is used to fill in the deficiency of calcium in the diet which then weakens the bone. The musculoskeletal is essential for maintenance of the homeostasis because it keeps the blood moving around the body required for the exchange of oxygen and carbon dioxide essential for the smooth functioning of the internal functions.

4.2 STRUCTURE AND FUNCTIONS OF THE CENTRAL NERVOUS SYSTEM

The nervous system is divided into parts; one is a central nervous system, and the other is the peripheral nervous system. The peripheral nervous system comprises all the things except for the brain and the spinal cord which are the parts of the central nervous system. The structure and function is described below

In the central nervous system, the spinal cord is connected to the part of the brain which is called brainstem in which cranial nerves exist. The spinal cord exists on both the sides of the body the nerve roots. Brain and spinal cord are encircled by the cerebrospinal fluid which circulates in the ventricles cavity of the central nervous system. The cerebrospinal fluid flows between meningeal layers also known as pia matter and the arachnoid, which thick layer called dura matter works as a shield. The leptomeninges also surrounds the brain and the spinal cord.

The central nervous system is responsible for performing the bodily functions which include awareness about the surrounding, sensations, thoughts, movements, speech, and memory. The spinal cord is responsible for carrying the brain message to the peripheral parts. The functioning of the brain occurs through the nerve cells which convey the brain message to each part of the body through the spinal cord. The myelin is coated on the nerve cells for improving the communication which is a fatty material.

4.3 ROLE OF THE MUSCULOSKELETAL AND CENTRAL NERVOUS SYSTEM IN HOMEOSTASIS

The musculoskeletal and central nervous systems are essential for maintenance of the homeostasis in the body. The demonstration of it is when the human body feels cold and starts to shiver. The skeletal muscles generate heat for ceasing the shivering in the body. The body shivering is an illustration that the temperature has dropped from the average temperature of 37°. Similarly, it also relates to the central nervous system because the neurons are responsible for the communication of the message to the brain so that homeostasis can take place. In addition, the heart cannot function without brain which assists it in producing and maintaining homeostasis.

Not only the muscles need homeostasis but the whole body for the survival which requires the balance in the internal and external environment.



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