Abstract

Homeostasis is a self-adjustment process by which biological systems tend to maintain stability while adjusting to conditions are optimal for survival. The liver being a large organ with a rich supply of blood, plays an important role of maintaining stability while adjusting to environment, homeostasis. The liver play an important role of maintaining the level of blood sugar, the level of amino acids and toxins in the body, bile production, formation and destruction of red blood cells and even heat production when the body is exposed to cold temperature. The liver is able to perform these functions as a result of hormones such as insulin, glycogen, enzyme catalase and adrenaline.

**Homeostatic functions of the Liver in Mammals**

Liver is a large reddish-brown glandular organ located in the abdomen just below the diaphragm. It is the second largest organ in the body and has a rich supply of blood most of being supplied by the hepatic portal vein. The liver is an important organ and performs hundreds of functions but we are restricting to the various homeostatic functions.

**Regulation of blood sugar**

When we eat carbohydrates, the starch will be hydrolysed into glucose, during digestion, and diffuses into the blood through diffusion hence, if you eat a lot of carbohydrates, the concentration of glucose in the body increases hence one experiences hyperglycemia.

If homeostasis does not function properly it lead to diabetes mellitus, but if homeostasis functions properly it bring about a negative feedback mechanism.

The high concentration of glucose in the blood is detected by the glycoreceptors in the hypothalamus in the brain. An impulse is then transmitted to the pancreas to stimulate Beta-langerhans cells to secrete insulin. Insulin thus increases the permeability of glucose into cells thus increasing the rate of respiration in the cells. Some excess glucose are also converted into glycogen since insulin also increases the rate of glycogenesis. This enables the glucose level in the blood to reduce to normal.

When we do not eat or when we have a meal with less carbohydrates, the concentration of glucose in the blood reduces hence one experiences hypoglycemia. The glycoreceptors in the hypothalamus in the brain also detect hypoglycemia and thus transmit an impulse to the pancreas to stimulate the alpha-langerham cells to secrete glucagon. The glucagon will in turn increase the rate of glycogenolysis in the cell, which includes the breaking down stored glycogen into glucose, hence the glucose diffuses into the blood thus increasing the concentration of glucose in the blood back to normal.

If the concentration of glucose is not fully back to normal, the glucagon secreted will increase the rate of gluconeogenesis, which is the use of fatty acids/amino acids to generate energy thus enables the concentration of glucose to return to normal in the blood

**Deamination**

Deamination is a process that involves the removal of amino group of a molecule .Proteins the body are hydrolyse into amino acids during digestion. In the body, there are a total of twenty amino acid where nine are essential while eleven are non-essential. The non-essential amino acids are also important for our survival but they can be synthesized by the liver since there is no mechanism in the body for their storage.

The amino acid is divided into the ammonia group, which is basic, and the keto acid end, which is acidic. Keto acid is composed of carbon, hydrogen and oxygen hence can be re-used in the body to carry out gluconeogenesis. The ammonia group is synthesized into nitrogenous bases that are from the purine group. Excess ammonia in the body can increase toxic levels in the body hence the liver converts the excess ammonia to urea which is safer substance and can be excreted out of the body. Urea is produced in the liver through the ornithine cycle where ammonia is reacted with carbon dioxides. The urea is later transported to the kidney where it is dissolves in water together with other minerals to form urine.

**Detoxification**

Detoxification is a process in the liver where toxic substances in the body are converted

In to less toxic substances hence they are able to be stored or re-used in the body. These toxins can come from outside the body and are called excotoxins and they include drugs, alcohol, agricultural chemicals and pollution while toxins that are produced by the body are called endotoxins. They are produces as a result of end products of metabolic reactions happening in the body and also from bacteria present in the body.

These toxins are brought in to the liver through the hepatic portal vein. They are transported in the lipid since they are lipid soluble and are also stored in adipose (fats). The liver is able to remove these toxins by making them polar, soluble in water, and less soluble in lipid hence they are converted into less toxic substance.

For instance; hydrogen peroxide, which is a byproduct of many chemical reactions occurring in the body, is highly toxic. It transported into the liver where it is broken down to hydrogen and oxygen by an enzyme catalase which is highly concentrated in the cells of the liver.

Liver also manufactures the proteins that are usually found in the plasma from amino acids derived from the digestion. These plasma proteins include: albumins, globulins and fibrinogen.

**Formation of red blood cells**

The liver manufactures red blood cells in the foetus. However, as the baby grows and develops the bone marrow, it later on takes over while the liver becomes the graveyard for the red blood cells, where worn out red blood cells are destroyed.

**Breaking down of haemoglobin**

When the red blood cells are old and worn out, they are transported to the liver and also the spleen where they are destroyed by the phagocytic. In the process of breaking down haemoglobin, haem and globin are released. The globin is further broken down to amino acid while in the haem part, the non-iron part is broken down to form biliverdin which is used to manufacture bile juice and also gives faeces its brownish collour.

**Heat production**

During extreme cold conditions, the liver increases its metabolic reaction as a result of stimulation of adrenaline and thyroxine. These increased metabolic reaction result to production of heat which is then transported throughout the body and thus the body temperature is maintained.