

LESSON NOTE FOR WEEK THREE (3)

SUBJECT TEACHER: Mr. Princewill Wilson (BIOLOGY TEACHER)

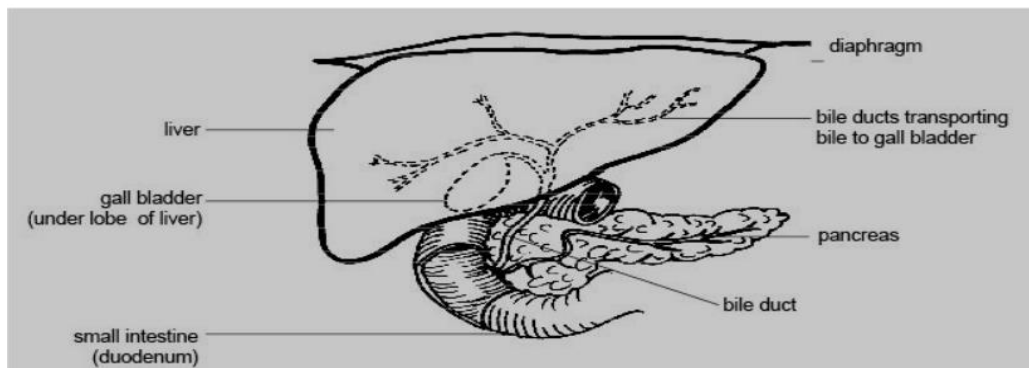
TOPIC: Liver & Skin: Structure, Functions, Diseases and Care

OBJECTIVES

In today's class, we will be talking about liver & skin: structure, functions, diseases and care. Enjoy the class!

Structure of the liver

The liver is the largest organ in the body of a mammal with a weight of about 1.25kg. It is reddish brown, soft with two lobes and it is located below the diaphragm on the right side of the abdomen. It partly overlaps the stomach and has bile duct connecting it to the duodenum. The duct is attached to the gall bladder.



Functions of the liver

1. Regulation of blood glucose level by converting excess glucose to glycogen under the control of the hormone insulin. With low glucose level, glycogen is converted to glucose under the influence of hormone, glucagon. Both insulin and glucagon are produced by the pancreas.
2. Regulation of blood protein. The body cells cannot store excess amino acids in the body. The liver therefore delaminates excess amino acids by breaking them down into amino group (converted to urea for excretion) and carboxyl group (converted to carbohydrates which are stored as glycogen).
3. Manufacture of essential blood proteins like fibrinogen, prothrombin, globulus etc which are involved in blood clotting.
4. Regulation of lipids by converting them to glucose.
5. Production of bile for emulsification of fats. The bile is stored in the gall bladder. (bile is 98% water and 2% bile salts, bilirubin, inorganic salts and cholesterol)
6. Storage of vitamins and minerals like iron, zinc, copper and potassium.
7. Storage of blood (up to 1,500 cm³ of blood) and regulation of blood volume and pressure in general circulation.
8. Formation of red blood cells (RBC) in foetus and breakdown of RBC in adults.

9. Detoxification of poisonous and toxic materials like drugs, food preservatives and pollutants in air and water.
10. Production of heat as a by-product of its numerous metabolic activities.

Diseases of the liver

These include diabetes, viral hepatitis, gall stones, cancer of the liver, and cirrhosis of the liver. Jaundice is a disease that may be due to the liver disease or some other causes.

1. **Diabetes:** This is caused by inability of the liver cells to convert excess glucose in the blood to glycogen due to the failure of the pancreas to produce the hormone insulin
2. **Viral Hepatitis:** This is inflammation and destruction of the liver cells by viruses.
3. **Gall Stones:** These are stony masses formed in the gall bladder or bile duct. These are mostly precipitation of cholesterol. The gall stones obstruct the flow of bile, subjecting the gall bladder to infections.
4. **Cancer of the liver:** This is uncontrollable outgrowth of liver cells which prevents liver from carrying out its normal functions.
5. **Cirrhosis of the liver:** This is a disease condition in which the damaged liver cells become replaced by useless fibrous tissues, making the liver firm and irregular. This can be caused by excessive drinking of alcohol and hepatitis.
6. **Jaundice:** caused by increase in the blood bilirubin level due to excessive breakdown of red blood cells observed in sickle cells or chronic malaria patients and obstruction of bile duct by gall stones or diseases of the liver. The symptom of jaundice is yellowing of skin or eye white.

General effects of liver diseases

1. Weakness
2. Jaundice
3. Slight fever
4. Oedema
5. High blood pressure

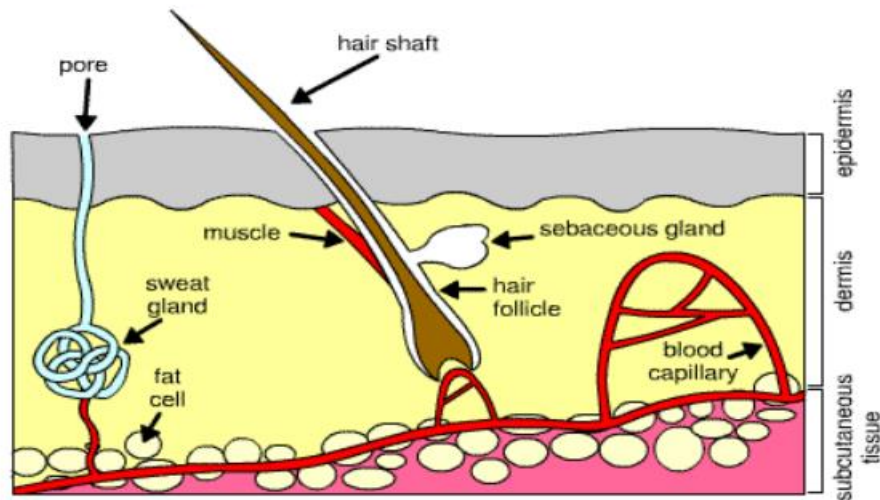
Remedy

The liver cells have the natural capacity of regenerating (dividing and producing new cells). The liver can therefore heal itself with the aid of the following procedures:

1. A long period of bed rest
2. Low fat controlled diet
3. Avoiding drinking alcohols.
4. Removing the cause of the disease e.g. gall stones.
5. Liver transplant can be done in progressive liver cirrhosis and cancer of the liver. A lobe of the liver can be donated while the remaining one soon regenerates.

Structure of the skin

The skin is the largest organ of the body which covers its entire surface. It is composed of an outer epidermis, an inner layer of dermis and a layer of subcutaneous fat under the skin (below the dermis). An average skin is between 1-2 mm thick.



Epidermis

It is the outer upper part of the skin which consists of three layers, namely;

1. Cornified layer
2. Granular layer
3. Malpighian layer

Cornified (Horny) layer:

This is the outermost layer of the epidermis which consists of fats, dead cells and keratin. Keratin makes the layer tough, flexible and water-proof; it prevents microbial entrance as well as reduces water loss from the body. The cornified layer is constantly wearing away and replaced from the granular layer below.

Granular layer:

It consists of living cells produced by the malpighian layer. These cells are continuously converted to cornified layer cells and keratin is deposited inside them and they lose their nuclei and become flattened in shape.

Malpighian layer:

This is constantly dividing to produce new epidermis. Sweat glands, sebaceous glands and hair follicles are also produced from the epidermis. It contains the pigment melanin, which gives colour to the skin. It also has keratin, a protein which is responsible for the toughness and flexibility of the skin.

Dermis

It is composed mainly of connective tissues. These include;

1. **Blood capillaries:** which supply food and oxygen and remove waste.
2. **Hair follicles:** The malpighian cells at the base of the skin keep dividing to produces long cylindrical hairs. When the hair is touched, the nerve endings in the follicle respond.
3. **Erector muscle:** attached to each hair follicle. Its contraction and relaxation makes the hair to stand upright and flattens respectively when regulating the body temperature.
4. **Sebaceous gland:** which secretes sebum which repels water and also prevents microbes from multiplying.
5. **Sweat gland:** which continues as sweat duct and opens outside as the sweat pore. It absorbs water and salts from the surrounding capillaries which when release outside evaporate and cools the body.
6. **Sensory nerve endings** (skin, being a sense organ)
7. **Subcutaneous fat (adipose tissue):** which act as a long term food store and an insulating layer preventing heat loss from the body.

Functions of the skin

1. **Protection:** The skin protects the body against dehydration, invading microbes, mechanical damages and poisonous chemicals.
2. **Sensitivity:** It controls receptors sensitive to heat, cold, touch and pressure in response to stimuli.
3. **Temperature regulation:** through vasodilation and vasoconstriction.
4. **Excretion:** It removes excess water and nitrogenous waste (urea) from the body
5. Production of vitamin D using ultra-violent rays of the sun.
6. **Storage:** store fats in the adipose tissues which forms an insulating layer

Diseases

The diseases of the skin may be caused by viruses, bacteria, protozoa or fungi. These include chicken pox, measles, pimples, skin rashes, eczema, boil etc.

Care of the skin

1. Taking bath regularly.
2. Eating balanced diet especially with vitamin A and B.
3. Use of deodorants and anti-perspirants which may control excessive sweating and unpleasant odour.
4. Regular exercise.
5. Wearing clean clothes.
6. Exposure to fresh air and UV rays (vitamin D)

Temperature regulation

Mammals like human maintain a constant body temperature. This allows them to live in any type of weather, “arctic” or “tropic”. Heat gained or loss from the body caused a rise or fall from the normal body temperature which is approximately 37°C.

Hypothalamus monitors, receives information and stimulates processes for balance.

The rise in body temperature

It may be caused by hot weather, vigorous exercise, high fever or exposure to solar radiation. An increase in body temperature stimulates temperature receptors in the hypothalamus to send nerve impulses to the skin. These impulses stimulate processes that get rid of excess body heat. These processes include:

1. **Vasodilation:** The expansion (dilation) of blood capillaries beneath the skin epidermis and relaxation of capillaries in deep layer of the skin. This allows more blood flow near the surface and heat is lost through the epidermis into the air by convection and radiation, thus reducing the temperature.
2. **Sweating:** Sweat glands are stimulated by nerve impulses to secrete large amount of sweat which evaporates and cools the body. Other mammals lose heat by (panting) i. e. evaporation of water through the mouth, nose and tongue.
3. **Decreasing metabolic rate:** This minimizes heat production within the body.
4. **Lowering of hairs:** Erector muscles relax keeping the hair flat on the skin surface.

Fall in body temperature

Due to cold weather, the following processes occur:

1. **Vasoconstrictions:** The narrowing or contraction of the blood capillaries beneath the skin surface and expansion of those ones in deep layers. Less blood flows near the surface of the skin. Therefore, less heat is lost by convection and radiation, thus making the person looks pale and blue.
2. **Shivering:** rhythmic contractions of skeletal muscles to produce heat.
3. **Increasing metabolic rate:** The thyroid gland is stimulated by the hypothalamus to produce hormone thyroxine which increases the metabolic rate, hence more heat is produced especially by the liver.
4. **Raising of hairs:** Erector muscles contract to raise the hairs to trap air which is a bad conductor of heat.

Evaluation

1. Describe four ways through which the skin can control a rise in body temperature.
2. List five liver diseases and state four remedy of the liver diseases
3. Describe the structure of a liver
4. State six functions of the liver