Physiology II Summer Theory

Final term paper (50 marks)

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Q1.write a note on ABO blood group system?

ABO blood group system, the classification of human blood based on the inherited properties of red blood cells (erythrocytes) as determined by the presence or absence of the antigens A and B, which are carried on the surface of the red cells. Persons may thus have type a, type B, type O, or type AB blood. The A, B, and O blood groups were first identified by Austrian immunologist Karl Landsteiner in 1901.

Blood containing red cells with type A antigen on their surface has in its serum (fluid) antibodies against type B red cells. If, in transfusion, type B blood is injected into persons with type A blood, the red cells in the injected blood will be destroyed by the antibodies in the recipient's blood. In the same way, type A red cells will be destroyed by anti-A antibodies in type B blood. Type O blood can be injected into persons with type A, B, or O blood unless there is incompatibility with respect to some other blood group system also present. Persons with type AB blood can receive type A, B, or O blood.

The ABO and Rh groups in transfusion

system	recipient type	donor red cell type	donor plasma type
ABO	A	A* or O	A or AB
ABO	B	B or O	B or AB
ABO	O	O only	O, A, B, or AB
ABO	AB	AB*, A*, B, or O	AB
Rh	positive	positive or negative	positive or negative

The ABO and Rh groups in transfusion			
system	**recipient type**	**donor red cell type**	**donor plasma type**
Rh	negative	negative or positive**, ***	negative or positive**

**Not if the patient's serum contains anti-A1 (antibody to common type a red cell in subgroup a patients).*

***Not if the patient is a female less than 45 years old (childbearing possible), unless life-threatening hemorrhage is present and transfusion of Rh-positive blood is lifesaving.*

****Not if the patient's serum contains anti-D (antibody to positive red cells), except under unusual medical circumstances*

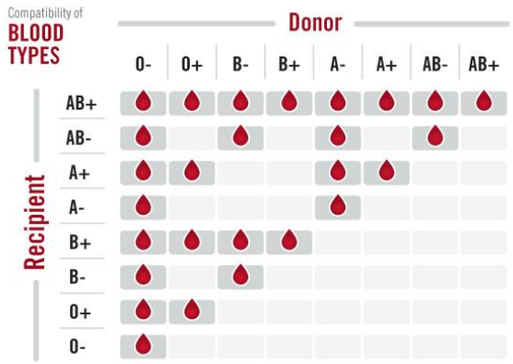
Blood group O is the most common blood type throughout the world, particularly among peoples of South and Central America. Type B is prevalent in Asia, especially in northern India. Type A also is common all over the world; the highest frequency is among Australian Aboriginal peoples, the Blackfoot Indians of Montana, and the Sami people of northern Scandinavia.

The ABO antigens are developed well before birth and remain throughout life. Children acquire ABO antibodies passively from their mother before birth, but by three months of age infants are making their own; it is believed that the stimulus for such antibody formation is from contact with ABO-like antigenic substances in nature. ABO incompatibility, in which the antigens of a mother and her fetus are different enough to cause an immune reaction, occurs in a small number of pregnancies. Rarely, ABO incompatibility may give rise to erythroblastosis fetalis (hemolytic disease of the newborn), a type of anemia in which the red blood cells of the fetus are destroyed by the maternal immune system. This situation occurs most often when a mother is type O and her fetus is either type A or type B.

Q2. A patient is AB +, he need blood, which blood group people can give blood to him?

AB+ blood has both A and B antigens at the surface of the red blood

cells, while other blood groups (A and B) only have one, or lack them altogether (group O). Because of this unique combination, AB+ donors' blood can only be given to others with AB+ blood. However, AB+ is the universal recipient blood type, meaning that patients with AB+ blood can receive blood from donors of any blood type if they require a transfusion.



Q3.write a detail note on CVS with diagram?

The human cardiovascular system is composed of a heart which pumps blood through a closed system of blood vessels. The heart is composed mostly of cardiac muscle, or myocardium. Its primary function is to transport nutrients, water, gases, wastes, and chemical signals throughout the body. More information on the heart as a pump, blood flow and control of blood pressure, and components of blood will be discussed in related pages.

The cardiovascular system transports materials throughout the body:

1. Materials entering the body, such as oxygen via the lungs and nutrients and water via the intestinal tract, are carried to all cells.

2. Materials moved from cell to cell (intercellular communication) including:

a) Wastes products from some cell cells to the liver for processing;

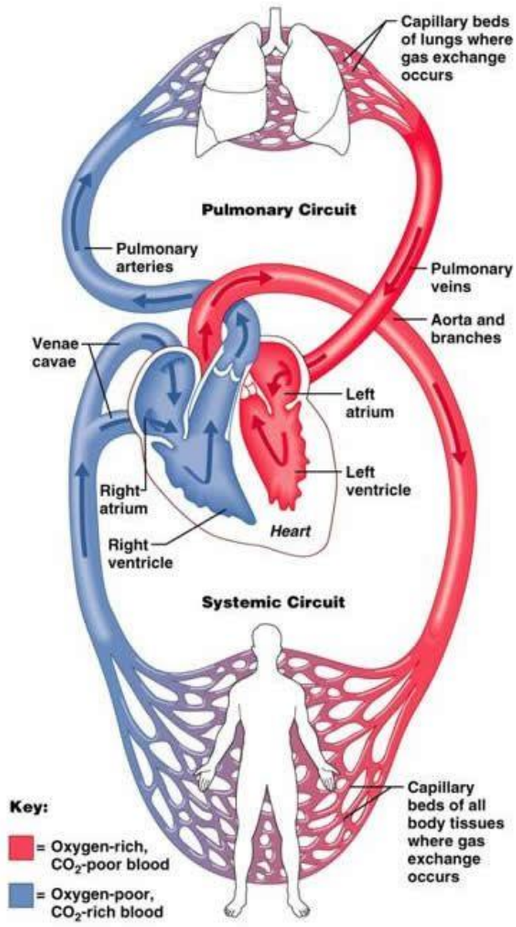
b) Immune cells that are present in the blood continuously for other cells,

c) Hormones from endocrine cells to their target cells

d) Stored nutrients from liver and adipose tissue to all cells.

3. Materials that are expelled from the body, such as metabolic wastes, heat, and carbon dioxide that are removed via the kidneys, skin, and lungs, respectively.

As a general overview, the cardiovascular system is composed of the heart, the blood vessels (or vasculature), and the cells and plasma of the blood.



1. Arteries are blood vessels that carry blood away from the heart and veins return the blood to the heart. A system of valves in the heart and veins ensures that the blood flows in one direction.

2. The heart is anatomically divided into two halves by a central wall, or septum, into left and right halves. Each half is composed of an atrium which receives blood returning to the heart and a ventricle that pumps the blood out into the blood vessels that serve the body. The atria and ventricles and exiting blood vessels are separated by closable valves. Functionally, the heart serves as a pump in series that generates pressure to propel the blood through the system.

3. The lungs are were oxygen is picked up and carbon dioxide is expelled. The pulmonary circulation goes from the right side of the heart (deoxygenated blood) and returns it to the left side of the heart, with oxygenated blood.

4. The systemic circulation consists of the vessels that go from the left side of the heart to the tissues and back to the right side of the heart.

The systemic circulation and the pulmonary circulation can be traced together:

Deoxygenated blood returning from body enters the heart in the right atrium. From the right atrium the blood passes through the tricuspid valves to enter the right ventricle. The blood is then pumped into the pulmonary arteries, passing the pulmonic valves, where it goes to the lungs. After becoming oxygenated in the lung's capillaries, the blood is carried by the pulmonary veins to the left atrium. It then passes through

the bicuspid or mitral valves into the left ventricle, where it is pumped into the aorta through the aortic valves. The aorta branches into smaller and smaller arteries that finally lead to capillary beds in the tissue. Here oxygen is exchanged for carbon dioxide and returned via veins which join into the inferior vena cava (veins coming from the lower body) and superior vena cava (from the upper body). The IVC and the SVC empty into the right atrium.

Q4.what is the difference between active and passive immunity?

S.N.	Characteristics	Active Immunity	Passive Immunity
1.	Definition	The protective immunity in which the individual's own immune system is stimulated to produce antibodies and lymphocytes.	The immunity in which a person receives antibodies or lymphocytes that have been produced by another individual's immune system.
2.	Exposure to Antigen	Requires exposure to a pathogen or to the antigen of a pathogen.	Does not require exposure to an infectious agent or its antigen.
3.	Immune system involvement	The immune system of the individual is actively involved in the process.	The immune system of the individual is not actively involved but rather passive.
4.	Natural acquirement	Arise naturally when an individual is exposed to an antigen or pathogen (clinical infection).	Arise naturally when a fetus receives antibodies from the mother across the placenta or when a breast-feeding infant ingests antibodies in the mother's milk.
5.	Artificial acquirement	Conferred artificially by means of vaccines.	Conferred artificially by administration of preformed antibodies.

6.	Immunity type	Involves both humoral and cell mediated immunity.	The immunity is conferred only by readymade antibodies.
7.	Components	T cells (cytotoxic T cells, helper T cells, memory T cells, and suppressor T cells), B cells (memory B cells and plasma cells), and antigen-presenting cells (B cells, dendritic cells, and macrophages).	No immune cells are involved as antibody is performed.
8.	Antibody production	Involves antibody production which is induced by infection or immunogen.	No antibody is produced, but directly transferred.
9.	Memory cell formation	Active immunity results in the formation of long-lasting memory cells.	Memory immune cells are not formed.
10.	Secondary response	The first exposure leads to primary response and in case of a subsequent exposure to same pathogen later, a much faster and stronger secondary response is established.	Absence of a secondary response.
11.	Durability	The protection offered is long-lived.	The protection is only transient.
12.	Response time	The protective response takes time to establish as a lag period is present.	No lag period hence the protection is instant.
13.	Reactivation	Reactivated by recurrence of	Frequent re-administration needed for renewed protection.

		infection or by revaccination.	
14.	Booster effect	Subsequent doses with antigens cause booster effect.	Subsequent doses are less effective due to immune elimination.
15.	Suitability	Active immunity is not suitable for protection of immuno-compromised or immuno-deficient individuals.	Passive immunity is useful in cases of immuno-compromised, immuno-deficient or severe combined immunodeficiency.
16.	Use	Very effective for prophylaxis of diseases.	Artificial passive immunity is effective as a post-exposure remedy.
17.	Effectiveness of Protection	Provides effective protection.	Protection rendered is less effective and may not be complete.
18.	Adverse effect	It can be implicated in autoimmune diseases and allergies, but generally does not have side effects.	A condition called serum sickness can result from exposure to antisera.
19.	Examples	**Natural** – Producing antibodies in response to exposure to a pathogenic infection such as measles or cold. **Artificial** – Producing antibodies in response to the controlled exposure to an attenuated pathogen (i.e. vaccination).	**Natural** – Receiving antibodies from another organism (e.g. to the foetus via the colostrum or a newborn via breast milk). **Artificial** – Receiving manufactured antibodies via external delivery (e.g blood transfusions of monoclonal antibodies).

Q5.write a note on lymphatic system in detail?

HISTORY:-

Hippocrates, in the 5th century BC, was one of the first people to mention the lymphatic system. In his work On Joints, he briefly mentioned the lymph nodes in one sentence. Rufus of Ephesus, a Roman physician, identified the axillary, inguinal and mesenteric lymph nodes as well as the thymus during the 1st to 2nd century AD.[38] The first mention of lymphatic vessels was in the 3rd century BC by Herophilos, a Greek anatomist living in Alexandria, who incorrectly concluded that the "absorptive veins of the lymphatics," by which he meant the lacteals (lymph vessels of the intestines), drained into the hepatic portal veins, and thus into the liver.[38] The findings of Ruphus and Herophilos were further propagated by the Greek physician Galen, who described the lacteals and mesenteric lymph nodes which he observed in his dissection of apes and pigs in the 2nd century AD

STRUCTURE:-

The lymphatic system consists of a conducting network of lymphatic vessels, lymphoid organs, lymphoid tissues, and the circulating lymph.

Primary lymphoid organs

the primary (or central) lymphoid organs generate lymphocytes from immature progenitor cells. The thymus and the bone marrow constitute the primary lymphoid organs involved in the production and early clonal selection of lymphocyte tissues.

Bone marrow

Bone marrow is responsible for both the creation of T cells and the production and maturation of B cells, which are important cell types of the immune system. From the bone marrow, B cells immediately join the circulatory system and travel to secondary lymphoid organs in search of pathogens. T cells, on the other hand, travel from the bone marrow to the thymus, where they develop further and mature. Mature T cells then join B cells in search of pathogens. The other 95% of T cells begin a process of apoptosis, a form of programmed cell death.

LYMPHATIC SYSTEM

The lymphatic system, or lymphoid system, is an organ system in vertebrates that is part of the circulatory system and the immune system. It is made up of a large network of lymphatic vessels, lymphatic

or lymphoid organs, and lymphoid tissues. The vessels carry a clear fluid called lymph (the Latin word lympha refers to the deity of fresh water, "Lympha") towards the heart.

Unlike the cardiovascular system, the lymphatic system is not a closed system. The human circulatory system processes an average of 20 litres of blood per day through capillary filtration, which removes plasma from the blood. Roughly 17 litres of the filtered plasma is reabsorbed directly into the blood vessels, while the remaining three litres remain in the interstitial fluid. One of the main functions of the lymphatic system is to provide an accessory return route to the blood for the surplus three litres.

The other main function is that of immune defense. Lymph is very similar to blood plasma, in that it contains waste products and cellular debris, together with bacteria and proteins. The cells of the lymph are mostly lymphocytes. Associated lymphoid organs are composed of lymphoid tissue, and are the sites either of lymphocyte production or of lymphocyte activation. These include the lymph nodes (where the highest lymphocyte concentration is found), the spleen, the thymus, and the tonsils. Lymphocytes are initially generated in the bone marrow. The lymphoid organs also contain other types of cells such as stromal cells for support.Lymphoid tissue is also associated with mucosas such as mucosa-associated lymphoid tissue (MALT).

Fluid from circulating blood leaks into the tissues of the body by capillary action, carrying nutrients to the cells. The fluid bathes the tissues as interstitial fluid, collecting waste products, bacteria, and damaged cells, and then drains as lymph into the lymphatic capillaries and lymphatic vessels. These vessels carry the lymph throughout the body, passing through numerous lymph nodes which filter out unwanted materials such as bacteria and damaged cells. Lymph then passes into much larger lymph vessels known as lymph ducts. The right lymphatic duct drains the right side of the region and the much larger left lymphatic duct, known as the thoracic duct, drains the left side of the body. The ducts empty into the subclavian veins to return to the blood circulation. Lymph is moved through the system by muscle contractions. In some vertebrates, a lymph heart is present that pumps the lymph to the veins.

The lymphatic system was first described in the 17th century independently by Olaus Rudbeck and Thomas Bartholin.

CLINICAL SIGNIFICANCE

The study of lymphatic drainage of various organs is important in the diagnosis, prognosis, and treatment of cancer. The lymphatic system, because of its closeness to many tissues of the body, is responsible for carrying cancerous cells between the various parts of the body in a process called metastasis. The intervening lymph nodes can trap the cancer cells. If they are not successful in destroying the cancer cells the nodes may become sites of secondary tumours.

Enlarged lymph nodes

Lymphadenopathy refers to one or more enlarged lymph nodes. Small groups or individually enlarged lymph nodes are generally reactive in response to infection or inflammation. This is called local lymphadenopathy. When many lymph nodes in different areas of the body are involved, this is called generalised lymphadenopathy. Generalised lymphadenopathy may be caused by infections such as infectious mononucleosis, tuberculosis and HIV, connective tissue diseases such as SLE and rheumatoid arthritis, and cancers, including both cancers of tissue within lymph nodes, discussed below, and metastasis of cancerous cells from other parts of the body, that have arrived via the lymphatic system.

Lymphedema

Lymphedema is the swelling caused by the accumulation of lymph, which may occur if the lymphatic system is damaged or has malformations. It usually affects limbs, though the face, neck and abdomen may also be affected. In an extreme state, called elephantiasis, the edema progresses to the extent that the skin becomes thick with an appearance similar to the skin on elephant limbs.

Causes are unknown in most cases, but sometimes there is a previous history of severe infection, usually caused by a parasitic disease, such as lymphatic filariasis.

Lymphangiomatosis is a disease involving multiple cysts or lesions formed from lymphatic vessels.[relevant to this paragraph? – discuss]

Lymphedema can also occur after surgical removal of lymph nodes in the armpit (causing the arm to swell due to poor lymphatic drainage) or groin (causing swelling of the leg). Conventional treatment is by manual lymphatic drainage and compression garments. Two drugs for the treatment of lymphedema are in clinical trials: