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A Brief Note on Blood Plasma

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Editorial Note

Plasma, also known as blood plasma, has a light yellowish or straw-colored appearance. It acts as the liquid foundation for whole blood. Plasma is made up of whole blood minus erythrocytes (RBCs), leukocytes (WBCs), and thrombocytes (platelets). Serum, which is sometimes mistakenly confused with plasma, is plasma devoid of fibrinogen. Plasma is composed of 91 to 92 percent water and 8 to 9 percent solids. It is primarily composed of coagulants, primarily fibrinogen, which aid in blood clotting. Plasma proteins like albumin and globulin help keep the colloidal osmotic pressure around 25 mmHg. Electrolytes such as sodium, potassium, bicarbonate, chloride, and calcium aid in the maintenance of blood pH.

Extraction of Plasma

It can be separated from whole blood using centrifugation, which involves spinning whole blood with an anticoagulant in a centrifuge. The lighter plasma forms the upper yellowish layer, while the denser blood cells form the bottom. The plasma is frozen within 24 hours to preserve the functionality of the various clotting factors and immunoglobulins; it is thawed before use and has a one-year shelf life. Interestingly, while O- is the preferred universal donor for blood, plasma from AB blood groups is the most preferred because it does not contain antibodies, making it safe for everyone.

Plasma, like whole blood, is initially tested to ensure recipient safety. According to FDA regulations, the collected plasma is subjected to a battery of tests to identify transmissible diseases, primarily hepatitis A, B, and C, as well as syphilis and HIV. Individual plasma proteins are separated during the fractionation process.

Plasma-related disease

TTP is a type of microangiopathic hemolytic anaemia characterised by fever, thrombocytopenia, hemolytic anaemia, renal dysfunction, and neurologic dysfunction. All five criteria may or may not be present in every patient. It is frequently caused by a lack of or inhibition of ADAMTS13, a metalloproteinase that disassembles large von Willebrand factor (vWF) multimers. These large vWF multimers are not broken down in TTP, resulting in increased platelet adhesion and thrombosis. Anemia, thrombocytopenia, schistocytes on peripheral smear, increased LDH, increased creatinine, and increased bleeding time are common lab findings with normal PT and PTT. Plasma exchange with fresh frozen plasma, steroids, and splenectomy are the most common treatments. Platelets should not be given because they promote thrombosis. Plasma exchange improves the prognosis of TTP patients.

Clotting problems: The main treatment for children with severe haemophilia is prophylactic transfusion of a factor VIII or factor IX-concentrate; however, this leads to the formation of antibodies against these factors over time.

Von Willebrand disease is caused by a deficiency or abnormal von Willebrand Factor (vWF), which is the most common bleeding disorder and is inherited in an autosomal dominant manner. vWF is required for the protection of factor VIII, which is essential for secondary hemostasis. The primary function of vWF is to facilitate platelet-subendothelial interaction and platelet-to-platelet aggregation. The amount of bleeding seen in patients is directly related to the severity of vWF and factor VIII deficiency. Bleeding from mucocutaneous surfaces is common (gingiva, menstrual bleeding and easy bruising). Because factor VIII is only mildly reduced, symptoms like intramuscular hematomas and hemarthrosis are uncommon. In terms of lab abnormalities, platelet count is normal, bleeding time is increased, Prothrombin Time (PT) is normal, and Activated Partial Thromboplastin Time (APTT) is normal. For diagnosis, the VWF-ristocetin cofactor activity assay is used. The Von Willebrand ristocetin cofactor assay measures a plasma sample's ability to agglutinate platelets in the presence of Ristocetin. The amount and activity of the von Willebrand factor are directly proportional to the rate of ristocetin-induced agglutination.

Immunodeficiency: Antobodies are also known as immunoglobulins play an important role in the immune system's ability to fight infections.

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