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BLOOD PLATELETS AND THE EFFECT OF MAGNETIC FIELD ON BLOOD PLATELETS

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Abstract: Platelets play an important role in the vessel. Platelets are cell fragments produced from megakaryocytes. Platelets exist in circulation for 5–7 days and primarily function as regulators of hemostasis and thrombosis. Following vascular insult or injury, platelets become activated in the blood resulting in adhesion to the exposed extracellular matrix underlying the endothelium, formation of a platelet plug, and finally, formation and consolidation of a thrombus consisting of both a core and shell.. A higher than a normal number of platelets can cause unnecessary clotting, which can lead to strokes and heart attacks(cardiovascular Diseases); however, thanks to advances made in antiplatelet therapies, there are treatments available to help prevent these potentially fatal events. Conversely, lower than normal counts can lead to extensive. Blood normally contains 1, 50,000 – 4,00,000 per µl or cubic millimeter (mm^3). If this value should drop much below 20,000 / µl, there is a danger of uncontrolled bleeding.In pathological conditions, platelets are essential for the formation of occlusive thrombus formation and as a result, are the primary target for the prevention of arterial thrombus formation. In addition to the regulation of hemostasis in the vessel, platelets have also been shown to play an important role in innate immunity as well as the regulation of tumor growth and extravasations in the vessel. These primary functions of the platelet represent its normal function and versatility in circulation.

Keywords: Hemostasis, Thrombosis, Immunity, Bleeding, Cardiovascular disease

Introduction: Blood is the vital fluid of the human body. Blood has four main components RBCs, WBCs, Platelets, and Plasma. Blood performs many functions such as transporting nutrients and oxygen to the lungs and tissues, forming blood clots to prevent excess blood loss, carrying cells and antibodies that fight infection, bringing waste products to the kidneys and liver, which filter and clean the blood, regulating body temperature. The blood that runs through the veins, arteries, and capillaries is known as whole blood, a mixture of about 45 percent blood cellsand 55 percent plasma. About 7 to 8 percent of your total body weight is blood.

Unlike red and white blood cells, platelets are not actually cells but rather small fragments of cells. Platelets help the blood clotting process (or coagulation) by gathering at the site of an injury, sticking to the lining of the injured blood vessel, and forming a platform on which blood coagulation can occur. This results in the formation of a fibrin clot, which covers the wound and prevents blood from leaking out. Fibrin also forms the initial scaffolding upon which new tissue forms, thus promoting healing. Therefore platelets are helpful in healing a wound.

STRUCTURE OF BLOOD PLATELETS Blood platelets are granular non-nucleated fragments of cytoplasm in the form of oval discs. A platelet consists of two parts, a clear outer ground substance occupying the greater part of the platelet and a central part that contains granules.

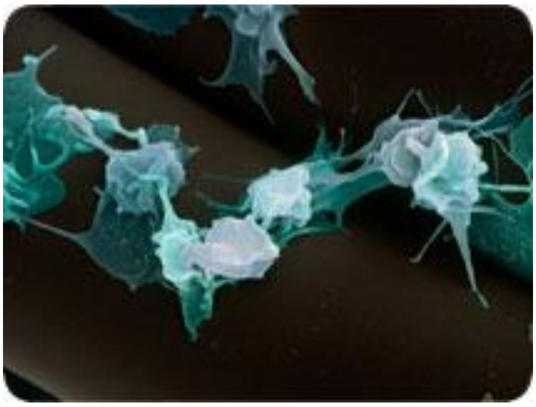

Figure 1Diagram of Platelets

FUNCTIONS OF BLOOD PLATELETS Main function of platelets is blood clotting. Process of formation of blood clot is known as blood coagulation. The process of checking (stopping) of bleeding is known as haemostatis. The normal time of blood clotting is 3 to 8 minutes. In blood vessels, blood clotting is checked by presence of anticoagulant. Some anticoagulants are:-

1. Heparin: - which is formed in liver and mast cells.
2. Hirudin: - This is found in leach.

Both heparin &hirudin are animal origin anticoagulant.

Outside the body in test tube blood coagulation is checked by citrates & oxalates e.g. Sodium citrate and oxalate of Al^{+++}& potassium.

3. EDTA: - Ethylene Di-amine Tetra Acetic Acid which is used to check blood clotting in test tube.

IMPORTANT COMPONENTS OF BLOOD CLOTTING:-

1. **Fibrinogen** – Fibrinogen is a high molecular weight protein that occurs in the plasma in quantities of 100 to 700 mg/dl. Fibrinogen is formed in the liver and liver disease occasionally decreases the concentration of circulating fibrinogen
2. **Prothrombin**– it is also formed in liver.Prothrombin is a plasma protein an $alpha_2$ -globins having a molecular weight of 68,700. It is present in normal plasma in a concentration of about 15 mg/dl. It is an unstable protein that can split easily into smaller compounds, one of which is thrombin which has molecular weight of 33,700 approx. one half that of prothrombin. Prothrombin is formed continually by the liver and it is continuously being used thought the body for blood clotting. If the liver fails to produce prothrombin its concentration in the plasma falls too low to provide normal blood coagulation within one to several days.
3. **Thromboplastin** – it is produced by broken Platelets. Thrombin is a protein enzyme with Protelolytic capabilities. It acts on fibrinogen to remove four low molecular weight peptides from each molecule of fibrinogen forming a molecule of fibrin monomer that has the automatic capability of polymerizing with other fibrin monomer molecules. Therefore many fibrin monomer molecules polymerize within seconds into long fibrin fibers that form the reticulum of the clot.
4. **Calcium ions(ca^{++})**
5. **Vitamin k** – It influence the formation of prothrombin in liver. It is required by the liver for normal formation of prothrombin as well as four other clotting factors

PLATELETS RELATED DISORDER

Platelets, also known as thrombocytes, are blood cells. They form in your bone marrow, a sponge-like tissue in your bones. Platelets play a major role in blood clotting. Normally, when one of your blood vessels is injured, you start to bleed. Your platelets will clot (clump together) to plug the hole in the blood vessel and stop the bleeding. You can have different problems with your platelets:

- If your blood has a **low number of platelets**, it is called thrombocytopenia. This can put you at risk for mild to serious bleeding. The bleeding could be external or internal. There can be various causes. If the problem is mild, you may not need treatment. For more serious cases, you may need medicines or blood or platelet transfusions.
- If your blood has **too many platelets**, you may have a higher risk of blood clots.
- When the cause is unknown, this is called thrombocythemia. It is rare. You may not need treatment if there are no signs or symptoms. In other cases, people who have it may need treatment with medicines or procedures.
- If another disease or condition is causing the high platelet count, it is thrombocytosis. The treatment and outlook for thrombocytosis depends on what is causing it.
- Another possible problem is that your **platelets do not work as they should**. For example, in Von Willebrand Disease, your platelets cannot stick together or cannot attach to blood vessel walls. This can cause excessive bleeding. There are different types of in von Willebrand Disease; treatment depends on which type you have.

METHODOLOGY

Our study is an in-vitro study. To determine the effect of magnetic field on blood parameters, we have taken blood of group B^{+ve}. Blood was anticoagulant with Ethyl -diamine tetra acetic acid (EDTA). All experiments use whole blood. In order to investigate the effect of magnetic field on blood parameters, a static magnetic field of different values is applied on the blood flow. To determine the effect of magnetic field on blood flow, we have taken a capillary tube in which we can flow the blood at constant pressure difference. The external axial magnetic field is applied on the capillary tube containing B^{+ve} blood. The magnetic field is produced by a solenoid of length 23cmlong and having 1000 no. of loops. The value of magnetic field may vary by changing the no. of turns in the solenoid. The values of magnetic field on different current are calculated. These are 27.30gauss, 49.15gauss, and 65.63 gauss. The capillary tube of length 25cm and radius .070cm is used in this experiment. The pressure is maintained constant. Whenthe blood flows in the capillary tube, the magnetic field generated by the solenoid and the flow of blood is noted. At last unexposed and repeatedly exposed blood sampleswith the magnetic field will be investigated pathologically.

RESULT:

TABLE: EFFECT OF MAGNETIC FIELD ON PLATELET COUNT

MAGNETIC FIELD	**0 Gauss**	**27.30 Gauss**	**49.15 Gauss**	**65.63 Gauss**
PLATELETS COUNTS	**2.8 lacs/mm^3**	**2.6 lacs/mm^3**	**2.6 lacs/mm^3**	**2.4 lacs/mm^3**

Normal Value of Platelets 1.5-4.0 lacs/mm^3

CONCLUSION

If you have too many platelets, it can increase your risk for clotting. But often your cardiovascular risk has more to do with platelet function than platelet number. For example, you could have a healthy number of platelets, but if they're sticking together too much it can increase your chance of having a heart attack or stroke.Too many platelets, too few platelets, abnormally functioning platelets, and related conditions such as blood clots, strokes, and heart attacks can be inherited. Above results shows that as we increase the strength of magnetic field, the number of platelets decreases. So we conclude that the effect of magnetic field on patients having cardiovascular diseases is beneficial in heart attack or stroke.

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