

# **Technical Answers for Real World Problems (TARP)**

**CSE - 3999**

## **Assignment - 7**

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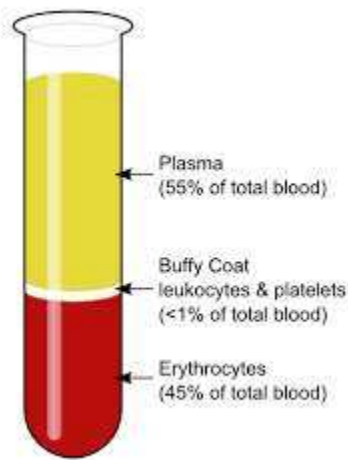
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## Applications of Centrifugation of Blood



### Introduction:

Centrifugation is one of the initial steps in testing a patient's blood. The blood is collected in tubes or bags, depending on the prescribed test from the doctor.

The role of a centrifuge in testing blood is to separate whole blood into its various components. Each component of blood has a specific use in the body and therefore a different test may be required for each component. Blood can be centrifuged in a bottle, tube or bag. Blood collected from blood donors are collected in bags. Blood collected at a hospital or testing lab is collected in tubes. Blood collection in a bottle is for microbiological testing and contains transport media to preserve the micro-organism.

### Parts of Blood retrieved after fractioning Blood:

#### Blood is separated in bags and blood tubes into it's various components:

- Red Blood Cells (RBC), erythrocytes, carries oxygen from the lungs to the rest of the body.
- White blood cells (WBC), or leucocytes, aid the immune system in fighting infections. There are five types of WBC: lymphocytes, monocytes, eosinophils, basophils, and neutrophils (granulocytes).
- Plasma is a yellowish component in which the blood is normally suspended. Plasma contains proteins, glucose, clotting factors, hormones, and carbon dioxide.

On the basis of particle size or density, we can separate components of a mixture using centrifuge. The separation of blood into cells and either serum (from blood collected without an anticoagulant) or plasma (from blood collected with an anticoagulant such as EDTA) is the most

common application in the clinical laboratory. Each application requires a specific centrifugal force and a defined time period.

Although it is common to see centrifugation instructions specify the revolutions per minute (rpm) to be used, the only time this is valid is if the centrifuge and its rotor head radius are also listed. The more valid parameter is the relative centrifugal force (rcf).

### Plasma protein fractionation

Plasma proteins are detached by using the intrinsic complexities of each protein. Fractionation incorporates changing the states of the pooled plasma (e.g., the temperature or the causticity) so proteins that are normally separated in the plasma fluid wind up insoluble, forming vast clusters, called accelerate. The insoluble protein can be gathered by centrifugation. One of the greatly convincing routes for finishing this procedure is the expansion of alcohol to the plasma layer pool while at the same time cooling the pool. This procedure is all over called cool liquor fractionation or ethanol fractionation. It was depicted by and bears the eponym of Dr Edwin J. Cohn. This methodology is finished in a progression of steps with the objective that a solitary pool of plasma yields a couple of distinctive protein things, for instance, egg whites and invulnerable globulin. Human serum egg whites organized by this methodology is used as a part of a few antibodies, for treating consume casualties, and other helpful applications.

Whole Blood		Major Fractions of Blood		Fractions of Major Blood Fractions		Specificity mentioned as acceptable KM 2006 Nov
	% of whole blood		% of whole blood		% of whole blood	
Blood	100%	Plasma	55.5%	Water	50.5%	
				Albumin	2.2%	
				Immunoglobulins	1.7%	
				Clotting Factors	0.3%	
				Other - Vitamins, Waste, Hormones	0.8%	
		Red	41.0%	Hemoglobin	14.4%	
				Hemin	0.8%	
		White	3.00%	Other	25.8%	
				Interferons	0.0%	
		Platelets	0.50%	Other	3.0%	
				Platlet fractions	0.5%	
No	100%	No	100%	Yes	100.0%	

### Haemoglobin related problems:

Diminished levels of hemoglobin, with or without the accompanying lessening in RBCs, can cause anaemia. Iron insufficiency is one reason for anaemia, as it straightforwardly influences the capacity to create heme molecules, yet there are a few different causes for anaemia. There can likewise be other ailment profiles related with anomalies in hemoglobin, referred to for the

most part as haemoglobinopathies, and additionally anomalies affecting the production of heme molecules, known as porphyrias. Sickle Cell Anaemia

1. Thalassaemia
2. Porphyria
3. Carbon Monoxide Poisoning

## **Clotting Factors:**

A bleeding issue is a condition that influences the way your blood normally clumps. The thickening procedure, otherwise called coagulation, changes blood from a fluid to a solid. When you're injured, your blood ordinarily starts to cluster to prevent a gigantic loss of blood. Once in a while, certain conditions keep blood from clotting properly, which can bring about heavy or prolonged bleeding.

Bleeding disorders can cause abnormal bleeding both outside and inside the body. Some disorders can drastically increase the amount of blood leaving your body. Others cause bleeding to occur under the skin or in vital organs, such as the brain.

1. Hemophilia A and B are conditions that occur when there are low levels of clotting factors in your blood. It causes heavy or unusual bleeding into the joints. Though hemophilia is rare, it can have life-threatening complications.
2. Factor II, V, VII, X, or XII deficiencies are bleeding disorders related to blood clotting problems or abnormal bleeding problems.
3. Von Willebrand's disease is the most common inherited bleeding disorder. It develops when the blood lacks von Willebrand factor, which helps the blood to clot.

## **Antibody Deficiency with Normal or Elevated Immunoglobulins**

These patients have severe infections like patients with CVID, but their immunoglobulin levels are normal or raised. They have diminished immune response levels to most vaccine antigens, both protein and polysaccharide, which separates them from patients with selective antibody deficiency.

## Conclusion:

Centrifugation of blood has a lot of important applications in medical sector, primarily in curing haemoglobin and clotting related problems. The best thing about this technique is its convenience of use. This technique provides the best of method for many blood tests which are very cheap and convenient to test.

## References:

- [1] Godolphin W, Bodtker K, Uyeno D, Goh L-O. Automated blood sample handling in the clinical laboratory. Clin Chem 1990;36:1550-1555.
- [2] Estey CA, Felder RA. Clinical trials of a novel centrifugation method: axial centrifugation. Clin Chem 1996;42:402-409.
- [3] Columbus RL, Palmer HJ. The integrated blood collection system as a vehicle into complete clinical laboratory automation. Clin Chem 1991;37:1548-1556.
- [4] Burtis CA, Johnson WF, Walker AW. Development of a simple device for processing whole blood samples into measured aliquots of plasma. Clin Chem 1986;32:1642-1647.
- [5] Schembri CT, Burd TL, Kopf-Sill AR, Shea LR, Braynin B. Centrifugation and capillarity integrated into a multiple analyte whole blood analyser. J Automatic Chem 1995;17:99-104.
- [6] Velazquez A, Kelly CJ. Evaluation of the Abbott Vision for stat chemistry profiles [Abstract]. Clin Chem 1991;37:979.
- [7] Bleeding Disorders: *Medically reviewed by **Elaine K. Luo, MD** on February 26, 2018 — Written by April Kahn on July 20, 2012*
- [8] Immune Deficiency Foundation: Other Antibody Deficiency