University of Mosul
Lecture No.: 1
College of Veterinary Medicine
Date:
Unit of Scientific Affairs
Website:

Lecture title: Hematology

Lecturer Affiliation: Assistant. Prof., Dr: Iman Daham Hadi/ Department of Internal and Preventive Medicine College of Veterinary Medicine, University of Mosul, Mosul, Iraq

Summary:

Serum and Plasma are both liquid components of blood , but they are obtained through different processes . Serum is the fluid remaining after blood clots, while plasma is the fluid portion of blood collected with ban anticoagulant to prevent clotting. serum lacks fibrinogen (a clotting protein) due to the clotting process, whereas plasma retains it.

1- Plasma and Serum, Anticoagulants, Blood Smear

Table .Site for Blood Collection by Species.

Species	Site of Collection
Mouse/Rat	Tail vein, Saphenous vein, Retro-orbital sinus, Cardiac(terminal only).
Rabbit	Marginal vein , Cardiac vein(terminal only)
Dog/Cat	Saphenous vein
Ruminants	Jugular vein
Chicken	Brachial wing vein, Jugular vein.

Serum

The clear liquid that can be separated from clotted blood.

Blood serum is about 90%water with dissolved Protein , Mineral, Hormones and Carbon dioxide and is an important source of electrolytes.

In blood, the serum is the component that is neither a blood cell(serum does not contain or red blood cells) nor a clotting factor, it is the blood plasma with the fibrinogens removed i.e.

Serum = Plasma – Clotting factors

Plasma

Plasma is a clear, straw – colored liquid portion of the blood in which the other cells are suspended.

Or **Plasma = Water+ Proteins + Dissolved substances**

1-It is 90-92 percent water.

2-Plasma is a transporting medium for cells and a variety of vital to the Human /Animals body.
3-Importantly , plasma contains proteins for blood clotting and defending the body against infection.

Component	Percent
Water	92
Proteins	6-8
Salts	0.8
Lipids	0.6
Glucose(blood sugar)	0.1

Plasma proteins

Albumins = 60%

Globulins = 35%

Fibrinogen = 4%

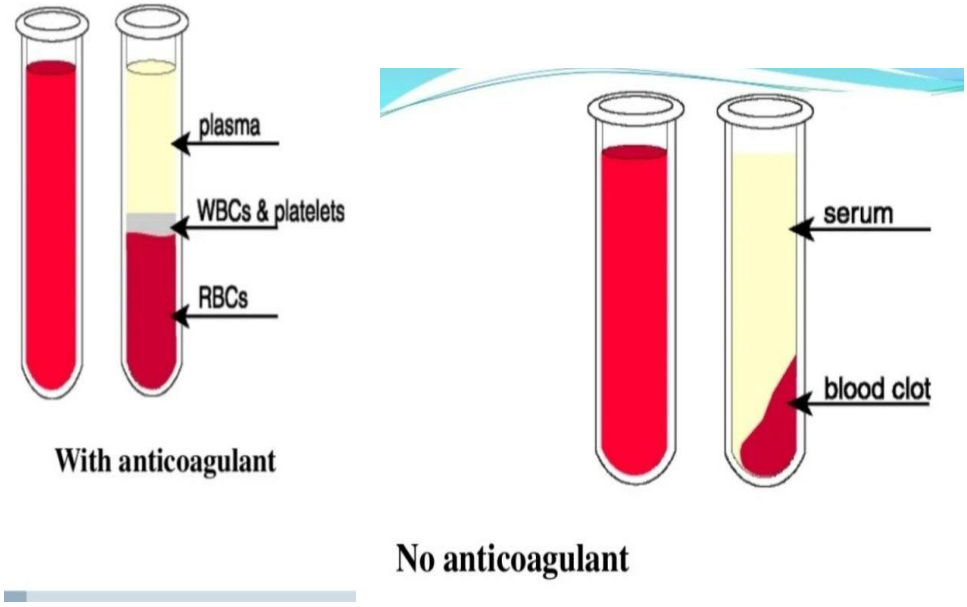
The other 1% of blood protein content = regulatory proteins , lipoproteins, iron – binding proteins.

Summary

Plasma	Serum
1-Fluid obtained when anti-coagulated blood has been centrifuged	1- Fluid obtained when coagulated has blood been centrifuged
2-Anti- coagulants are needed for separation	2- Anti –coagulants are not needed
3-Fibrinogen is present in plasma	3- Fibrinogen is absent
4-Does not need standing it could be Centrifuged as soon as it has been mixed thoroughly	4-Serum takes a longer time to prepare
5-Plasma are delivered to the patients who lack	5-Serum is the most preferred part of

Blood cells

blood used in checking blood groups and diagnosis of disease.



2- Classification of Anticoagulants.

Commonly used Anticoagulants:

1- EDTA
2- Oxalate
3- Sodium Heparin
4- Sodium Fluoride and Potassium Oxalate.

EDTA (Ethylene Di amine Tetra Acetic Acid)

Advantages:

1-Making a blood smear for cell morphology studies.

2-Used for tests for CBC ,Microfilaria, coombs test.

3-EDTApreserves the staining and morphology of leukocytes.

Disadvantages:

1-Excessive con % of EDTA will cause shrinkage of RBCs and erroneous PCV, MCV, and MCHC.

2-EDTAinterferes with blood chemistry tests as follows falsely decreases alkaline phosphates by binding Mg++.

3-Decreases CO2 combining power of blood.

4-Interferes with jaffe s reaction for creatinine test .

5-Decreases or alters Na+, K+, and Ca++ con % in plasma.

Heparin:

1-It is a natural anticoagulant in the body, found in the liver ,and may also be with in Basophils and Mast cells, heparin also called anti thromboplastic or ant thrombin.

2-It is available in a liquid or dry from as Sodium, Calcium, Ammonium and Lithium salt, each of these will interfere with determination of their respective ions in the plasma.

Advantages:

Heparin is the choice of Anticoagulant for blood pH, and blood gas analysis . Acid base Balance.

2-It may be used for special trace elements studies and some cytology.

3-Excessive heparin does not alter the RBC volume.

Disadvantage:

1-It causes clumping of leukocytes.

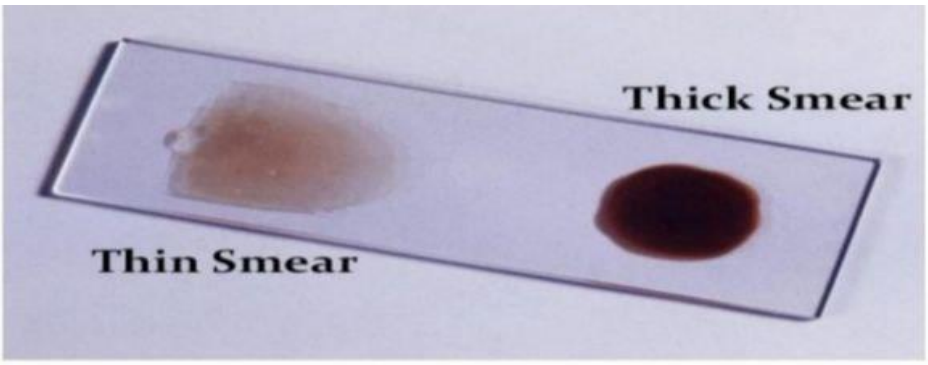
2-It interferes with staining of leukocytes.

3-It is the most expensive of the anticoagulant.

4-Blood clot in 8-12 hrs. because clotting is only delayed and not prevented.

5-It is not suitable for agglutination tests , and coagulation studies.

6-It may interfere with some automated biochemical analysis of plasma.



Differences Between Thick Blood Smear and Thin Blood Smear

Thick Blood Smear	Thin Blood Smear
1-Thick smear are most useful for detecting the presence of parasites.	1-thin smear helps to discover which species of parasite is causing the infection.
2-blood smear is a drop of blood on a glass slide.	2-blood smear is a drop of blood that is spread across a large area of the slide.
3-the blood films must be lacked before or during staining to rupture all the RBC so that only WBC, platelets and parasites are visualized.	3-the purpose is to allow malarial parasites to be seen within the RBC and to assess the size of the infected RBCs compared to uninfected RBCs.
4-thick smear allow a more efficient detection of parasites (increased sensitivity 11 times than thin smear).	4-less sensitive than a thick film especially where there is a low parasitemia.
5-It is not fixed in methanol.	5-It is fixed in methanol.
6-thick smears are mainly used to detect infection and to estimate parasitemia.	6-thin smears allow the examiner to identify malaria species, quantify parasitemia , and recognize parasite forms like schizonts and gametocytes.

References:

Nahom ,E & Selamawit , D.(2013) . The differences between Serum and Plasma.