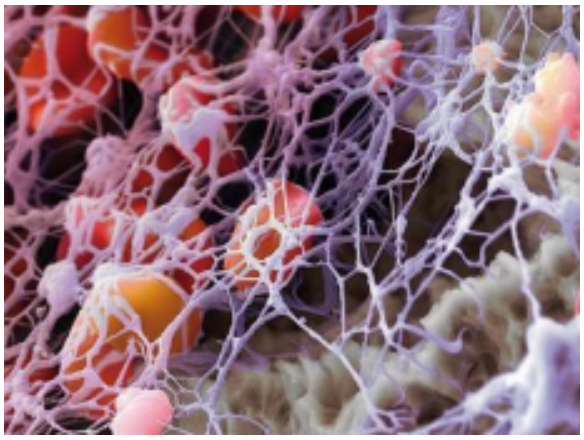
Ascension Sacred Heart

Clotted Samples in the Clinical Laboratory



Red cells, white cells, platelets and fibrin strands forming a clot.

Coagulation is a complex process by which blood forms clots. Coagulation begins almost instantly after an injury to the blood vessel has damaged the endothelium lining of the vessel. Exposure of the blood to proteins such as tissue factor initiates changes to blood platelets and the plasma protein fibrinogen, a clotting factor. Platelets immediately form a plug at the site of injury; this is called *primary hemostasis*. *Secondary hemostasis* occurs simultaneously: Proteins in the blood plasma, called *coagulation factors* or *clotting factors*, respond in a complex cascade to form fibrin strands, which strengthen the platelet plug.

Anticoagulated samples are required for many of the laboratory tests that are performed on a daily basis to assess and monitor patients. When these samples clot, they must be rejected and have to be recollected. Results are delayed, in turn, delaying timely treatment of patients.

What causes clotted specimens?

The top 3 causes of clotted samples are:

1. **Leaving blood in a syringe too long before placing in the tubes**

   Syringes have no anticoagulant in them. When blood is drawn from a vein or a line, coagulation begins almost immediately.

2. **Delay of placing blood in tubes**

   Such as with a slow draw using a syringe. Hemostasis begins during the draw and will continue after the blood is transferred to a tube. Removing the clot is prohibited; it will not stop hemostasis and will affect results.

3. **Improper mixing of anticoagulated tubes** (*primarily lavender and blue top tubes*)

   The anticoagulant in the lavender tube is sprayed onto the inside of the tube while the blue top tube has a liquid anticoagulant. The tubes need to be **inverted** at least 10 times to make sure that the anticoagulant is properly mixed with the blood components to stop the entire clotting mechanism. A **slow draw into a vacutainer tube -** tube should be mixed intermittently until filled to prevent hemostasis.

   Invert - Definition: To turn inside out or upside down; ex. **invert** an hourglass.

Phlebotomy Order of Draw

Coagulation Sodium Citrate / CTAD
Coagulation and CTAD tubes are used for examination of coagulation parameters. Coagulation tubes contain a buffered sodium citrate solution. The mixing ratio is: 1 part citrate solution to 9 parts blood.

Serum
The inner wall of the serum tube **is specially coated** with microscopic silica particles, which activate the coagulation process. Serum separator tubes contain a separation gel in the base of the tube; during centrifugation, this gel forms a stable barrier between the serum and the blood cells.

Heparin
The inner wall of the tube **is coated** with spray-dried lithium, sodium, or ammonium heparin. These additives are anticoagulants, which activate anti-thrombin, thus blocking the coagulation cascade of the blood specimen. LH Lithium Heparin Tubes are also available with a separator gel.

EDTA
EDTA tubes are for the examination of whole blood in hematology. EDTA binds the calcium ions and therefore blocks the coagulation cascade. Erythrocytes, leukocytes and thrombocytes in an EDTA anticoagulated blood sample are stable for up to 24 hours.

Sodium Fluoride
The tubes are ideal for glucose determinations. Sodium Fluoride Tubes contain an anticoagulant and a stabilizer.

K3E Cross-match K3EDTA Tube
Cross-match Tubes are available in two versions. The K3E Cross-match K3EDTA Tube is suitable when the testing material required is blood cells.