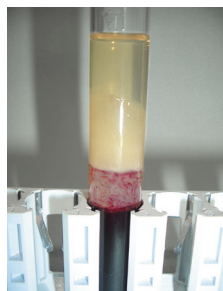


## PREANALYTIC PULSE

### Troubleshooting Fibrin



Under normal circumstances, when an injury to a blood vessel occurs, several clotting proteins circulating in the blood are activated through a series of events known as the coagulation cascade with the final reaction resulting in the conversion of fibrinogen to fibrin. Fibrin forms a mesh-like network that is the basis of a stable clot, which stems the loss of blood.

Though fibrin is part of the normal clotting process, it can create problems if the clot is not fully formed and results in fibrin strands in the sample tube. Often times, fibrin is visible in the tube following centrifugation as depicted in the image provided. However, fibrin strands may still be present and cause problems during analysis even if not readily apparent upon visual inspection.

There are several preanalytic variables and sample handling errors that can result in fibrin formation in both serum and plasma tubes. A review of these causative factors will illustrate how the formation of fibrin strands and the resulting instrument problems can be avoided.

CAUSE	EFFECT	PREVENTION
Centrifugation prior to clot retraction in serum samples	Fibrin strands can clog instrument probes, affect photometric reads in the cuvettes or clog wash stations potentially causing erroneous test results, test delays and/or instrument downtime.	Allow serum tubes to sit for 30 minutes allowing the sample to completely clot. If fibrin strands form, it may be necessary to redraw the sample since rimming of tubes to remove fibrin is not recommended. If this is not possible, available serum should be transferred to a secondary tube for testing.
Incomplete clotting due to anticoagulant therapy or clotting disorder	Because the clotting process is prolonged or prevented from occurring normally, fibrin strands may form but a complete clot may never form. This can cause instrument malfunction and erroneous test results.	A plasma sample should be drawn to bypass the extended clotting process. If serum is required, sample clotting must be closely monitored for fibrin formation or sample may be transferred to a secondary container for testing.
Improper mixing with additives	Insufficient or failure to mix tubes immediately following collection will allow the clotting process to begin in the case of plasma tubes or be initiated unevenly through the tube in the case of serum tubes.	Mix tubes with additives in a timely manner with the proper number of complete inversions as stipulated in the Instructions for Use.
Overfilling of tubes	Tubes containing anticoagulant are designed and manufactured to achieve an optimal blood to anticoagulant ratio within $\pm 10\%$ when appropriately filled. Overfilling tubes results in too little anticoagulant for the blood volume present and ultimately incomplete anticoagulation and fibrin strand formation.	Fill plasma tubes to level indicated by fill mark or range on the label or tube itself.

## Important tips to remember in avoiding the presence of fibrin in blood collection tubes:

Tubes should be filled to the indicated level.

Sample tubes should be mixed with the appropriate number of complete inversions immediately following collection.

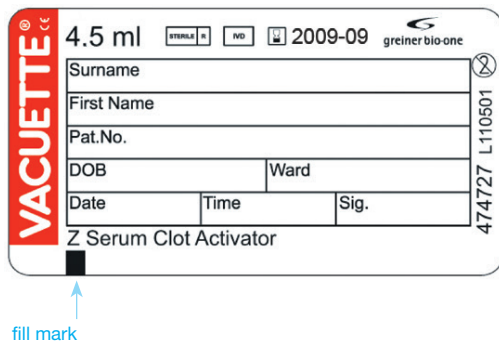
Serum tubes should be allowed to sit for 30 minutes prior to centrifugation.

Sample tubes should be centrifuged according to manufacturer's recommendations. If time or relative centrifugal force is adjusted, the site must verify or validate that there is no adverse effect to the sample or test results.

Re-centrifugation of sample tubes is not recommended.

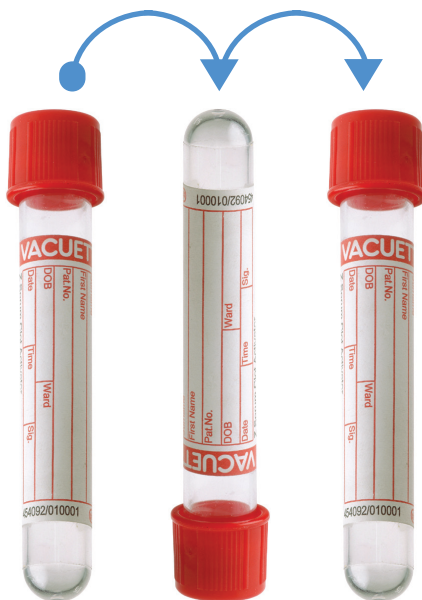
Rimming of specimen tubes with wooden applicator sticks is not recommended as it could cause hemolysis.

## Ensure Tubes are Properly Filled



VACUETTE® Blood Collection Tubes have an optimal fill mark on every tube label. The fill mark indicates the proper volume of blood-to-additive ratio for the best sample. The fill mark assists in a visual control of the specimen volume. Fill tolerance of the VACUETTE® tube is within +/- 10% of the stated nominal volume in accordance with ISO and CLSI.

## Ensure Proper Inversion



One Complete Inversion

## Importance of Mixing

Insufficient or delayed mixing of serum tubes may result in delayed clotting.

Inadequate mixing of anticoagulant tubes may result in platelet clumping, clotting or incorrect test results.