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Simulated Blood Products: 10% Glycerol in water may NOT be “One Size Fits All”

Posted on **September 4, 2012** by **janice**

In your validation procedure, are you using the right mixture to simulate Plasma, RBCs and Whole Blood?

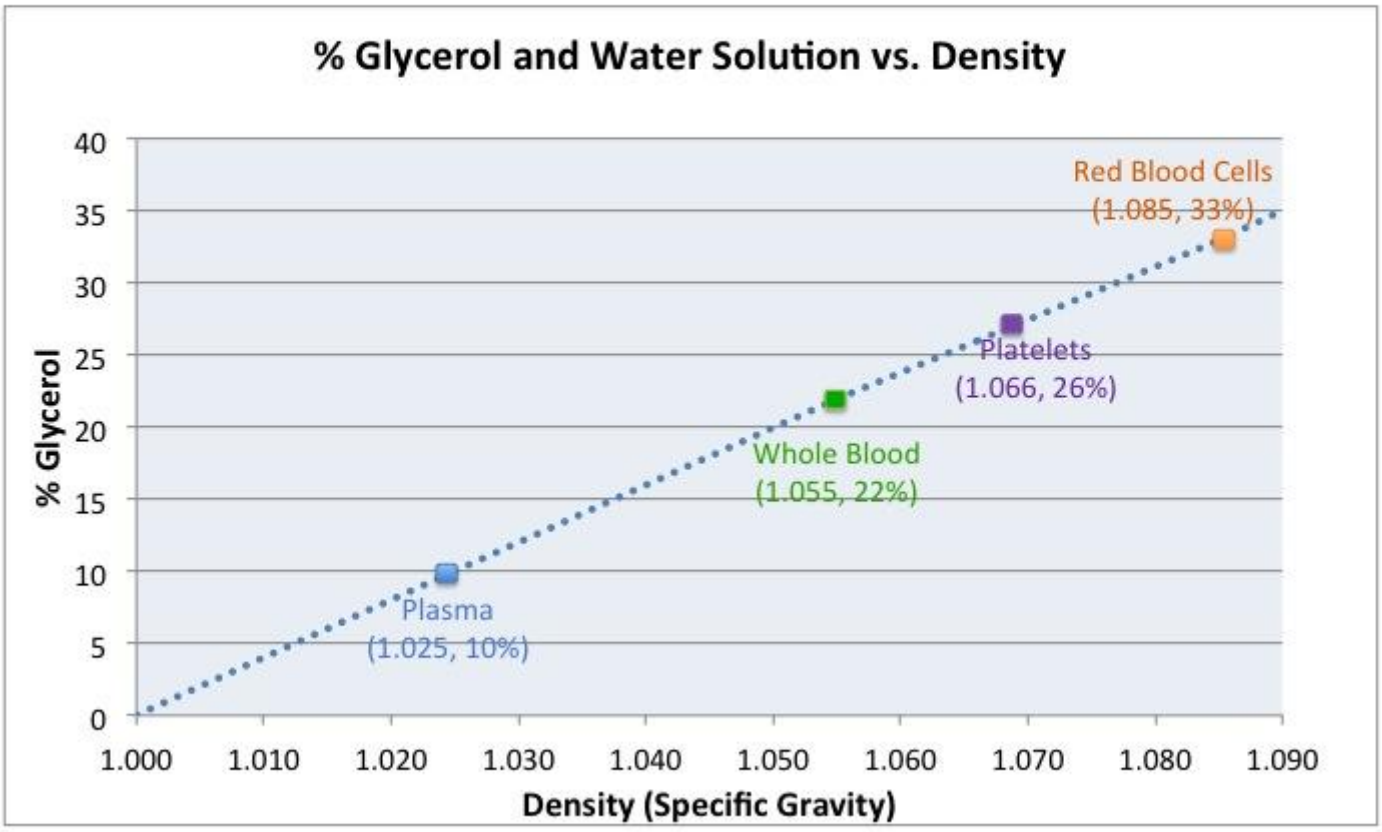
It would be reasonable to say that the common practice has historically been to use a 10% glycerol in water (by weight) mixture as a substitute for blood for various reasons, including transport cooler validation. In this VUEPOINT, we’d like to share with you our exploration of how accurate that “recipe” is for different blood products – namely Red Blood Cells, Whole Blood and Plasma.

Our work in the area of transport cooler validation with our new Val-A-Sure cooler validation kit product development was a major contributor to this lab exploration. At the same time, we were also performing a periodic review of several of the instructional procedures that we use for validating our blood temperature indicators, Safe-T-Vue.

With these two projects in front of me, I decided to research the commonly used 10% glycerol in water mixture. I finally found a chart in an old CRC Chemistry and Physics Handbook* that gave the source. I was surprised to find that the 10% glycerol solution (by weight, not volume) referred to plasma and that the densities for other blood products required increasing amounts of glycerol. The difference between plasma and RBCs is about 6% in density, meaning that simulating RBCs requires three times the amount of glycerol in water to achieve the equivalent density to actual RBCs. All along we’ve been operating with “10% glycerol in water” as the “one size fits all” substitute, when it actually only accurately simulates plasma.

Why may this be important in validation procedures?

Density can typically be related to the rate of heat transfer in a medium, where higher density usually indicates a faster rate of heat transfer. Making an assumption that the rate of warming of RBCs versus plasma is 6% faster, we estimate that over 30 minutes, a bag of RBCs would reach 10°C approximately 2 minutes faster than an equivalent bag of plasma. So, to accurately simulate RBCs, a mixture of 33% glycerol in water (by weight) should be used.



This graphic plots the % Glycerol (y-axis) to Density / Specific Gravity (x-axis), which reflects density, for Plasma, Whole Blood and RBCs.

You may find this information interesting as you evaluate your own validation procedures and if you are using simulated blood products, take this into consideration as you prepare your simulated units to decide if you would like to achieve a density more closely representative of the actual blood product.

This finding also leads me to the importance of having the lowest possible starting temperature for refrigerated blood, and careful packing of a transport cooler to maintain required blood product temperature during storage and transport.

Recommended "Recipe" for simulated blood products

Based on the data presented in this VUEPOINT, we recommend that you consider using the following mixtures for blood product simulation.

Blood Product	% Glycerol (by weight in water)	Water	Glycerol
Plasma	10%	900 ml	80 ml
Whole Blood	22%	780 ml	176 ml
Platelets	26%	782 ml	218 ml
RBCs	33%	670 ml	264 ml

Notes: *Stir for a few minutes to assure a homogeneous solution. Be sure to follow any precautions supplied by the glycerol manufacturer for handling pure glycerol.*

Reference: Bosart and Snoddy, Journal of Industrial Engineering Chemistry 19, 506 (1927)

Stop by our booth #1211 at AABB for a handout on this and other cooler validation tips.

This entry was posted in AABB Topics & Guidelines, Blood Banks, Storage & Transport of Blood Components, Transfusion Centers by janice. Bookmark the permalink.

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