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COST COMPARISON OF SHIPPING FROZEN PLASMA VERSUS AMBIENT TEMPERATURE USING VIVEST™

AM McClernon[1], AB Freeman[1], RD Cheeley[2], and DR McClernon[1]

[1] bioMONTR, Research Triangle Park, NC, [2]ViveBio, LLC, Lawrenceville, GA .

Introduction

Infectious disease monitoring including HIV/HCV viral load and genotyping often requires collection sites to ship patient samples to reference laboratories for analysis. The current established standard of transporting samples is shipment of frozen plasma requiring dry ice and specialized packaging, which increases the size and weight of a shipment, and thereby significantly increases the cost of each shipment. Alternatively, employing a novel dried ambient transportation matrix, here within called ViveST, would allow a more simple packaging structure and a significant cost savings to be realized. The purpose of this study was to assess the cost savings of sample transport and storage in order to mediate the costs of healthcare. This study compared the cost of shipping frozen plasma to the cost of shipping plasma at ambient temperature using ViveST. It should be noted that ViveST can be shipped standard ground since dry ice is not needed to keep product frozen. However, for this comparison, only the priority overnight shipping option will be utilized since there is no real alternative for frozen samples.

Methods

- Two sets of samples were prepared for shipment; one consisting of frozen plasma (1 mL each), shipped on dry ice, and another set of plasma dried on ViveST (1 mL each, see Figure 1). ViveST devices are dried overnight in a biosafety cabinet and sealed in matrix container with desiccant.
- Shipments with a variable number of samples were prepared at the bioMONTR facility in North Carolina, and the ViveBio facility in Georgia, including appropriate packaging and labeling to ensure shipment integrity, security, and reasonable expectation for delivery.
- Packages containing plasma included a sufficient quantity of dry ice to ensure shipment remained frozen during standard priority shipment. (specific packaging for frozen)
- Each shipment was individually assessed for required package dimensions and material in order to estimate cost per volume shipped. (specific for ViveST)
- All costs were based on FedEx Priority Overnight delivery (domestic shipments) or International Priority delivery. The cost of packing and shipping the frozen plasma and ViveST samples was evaluated and compared for cost savings realized.

Table 1. Comparative Analysis of Domestic Shipping Cost for Frozen Plasma versus ViveST

Specimen Type	Shipment	Number of Specimens	FedEx Shipment Type	FedEx Shipment Charge	Total Shipping Cost	Cost per Sample	% Change	% cost reduced w/VST
ViveST	NC to CA	20	Priority Overnight	$58.16	$58.71	$2.94	-283.22	73.9%
Plasma	NC to CA	20	Priority Overnight	$167.23	$224.99	$11.25		
ViveST	GA to CA	5	Priority Overnight	$65.04	$65.59	$13.12	-295.04	74.7%
Plasma	GA to CA	5	Priority Overnight	$201.35	$259.11	$51.82		
ViveST	GA to MA	2	Priority Overnight	$54.08	$54.63	$27.32	-328.28	76.7%
Plasma	GA to MA	2	Priority Overnight	$176.21	$233.97	$116.99		
ViveST	GA to DC	5	Priority Overnight	$49.60	$50.15	$10.03	-340.52	77.3%
Plasma	GA to DC	5	Priority Overnight	$163.16	$220.92	$44.18		
ViveST	GA to IL	20	Priority Overnight	$49.60	$50.15	$2.51	-340.52	77.3%
Plasma	GA to IL	20	Priority Overnight	$163.16	$220.92	$11.05		
ViveST	GA to CO	20	Priority Overnight	$59.98	$60.53	$3.03	-308.00	75.5%
Plasma	GA to CO	20	Priority Overnight	$189.20	$246.96	$12.35		

Table 2. Comparative Analysis of International Shipping Cost for Frozen Plasma versus ViveST

Specimen Type	Shipment	Number of Specimens	FedEx Shipment Type	FedEx Shipment Charge	Total Shipping Cost	Cost/ Sample	% Change	% cost reduced w/VST
ViveST	GA to Brazil	2	Int'l Priority	$137.75	$138.30	$69.15		82.2%
Plasma	GA to Brazil	2	Int'l Priority	$719.08	$776.84	$388.42	461.71	
ViveST	GA to Brazil	20	Int'l Priority	$137.75	$138.30	$6.92		82.2%
Plasma	GA to Brazil	20	Int'l Priority	$719.08	$776.84	$38.84	461.71	
ViveST	GA to India	5	Int'l Priority	$107.78	$108.33	$21.67		78.4%
Plasma	GA to India	5	Int'l Priority	$443.77	$501.53	$100.31	362.97	
ViveST	GA to India	20	Int'l Priority	$107.78	$108.33	$5.42		78.4%
Plasma	GA to India	20	Int'l Priority	$443.77	$501.53	$25.08	362.97	
ViveST	GA to China	5	Int'l Priority	$106.90	$107.45	$21.49		77.5%
Plasma	GA to China	5	Int'l Priority	$420.53	$478.29	$95.66	345.13	
ViveST	GA to China	20	Int'l Priority	$106.90	$107.45	$5.37		77.5%
Plasma	GA to China	20	Int'l Priority	$420.53	$478.29	$23.91	345.13	
ViveST	GA to UK	2	Int'l Priority	$98.72	$99.27	$49.64		75.5%
Plasma	GA to UK	2	Int'l Priority	$346.64	$404.40	$202.20	307.37	
ViveST	GA to UK	5	Int'l Priority	$98.72	$99.27	$19.85		75.5%
Plasma	GA to UK	5	Int'l Priority	$346.64	$404.40	$80.88	307.37	

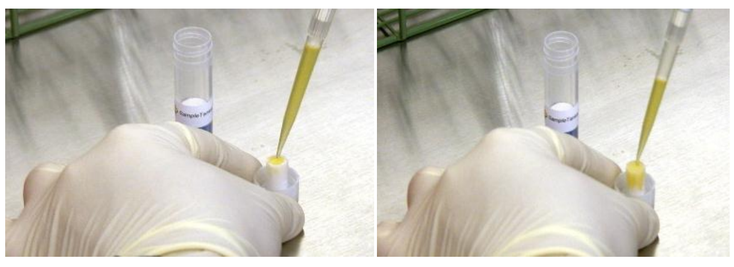
Results

- An average per sample cost savings of 77% was realized for shipments of ViveST samples compared to frozen plasma (Tables 1 & 2).
- ViveST shipment costs, on average, were approximately 26% the cost of frozen shipments within the US (~74% cost savings) and approximately 24% internationally (~78% cost savings).
- Shipping fewer samples per package resulted in an increased price per sample, however the percentage of cost savings realized remained comparable across the varied package sizes (Tables 1 & 2).
- On average, there was a 346% cost increase in shipping frozen samples versus samples stored on the ViveST device.
- Priority overnight and International priority are very expensive methods of shipping but are required for frozen plasma.

Conclusion

- This study confirms that ambient temperature shipments utilizing the ViveST sample transportation and storage device provides significant cost savings as compared to shipping frozen samples on dry ice.
- Although not analyzed in this study, additional cost savings may be realized by shipping ViveST samples standard mail or FedEx delivery (2-3 day) as opposed to priority delivery.
- The use of ViveST has the potential to enhance access to healthcare globally, and significantly reduce the burden associated with shipping costs and logistics of specimen transport to testing facilities.

Figure 1. Loading of Plasma onto ViveST Matrix



Send correspondence to:
Daniel McClernon
dmcclernon@biomontr.com

bioMONTR