

TxMD™

Choosing Plasma for Massively Bleeding Patients

Thawed Plasma vs. Liquid Plasma

A Plasma vs. AB Plasma



Introduction

In the United States one of the major causes of preventable death is massive bleeding.¹ To reduce mortality, prompt and early resuscitation with blood components is becoming increasingly widespread. Access and transfusion of blood components in a fixed ratio of red blood cells, plasma, and platelets (1:1:1 or 2:1:1) is optimal for patient survival.² Plasma given early and in a balanced manner with red blood cells has proven to be beneficial.² As a result, many hospitals have implemented massive transfusion protocols (MTPs) to address the rapid release of blood components for patients with life-threatening bleeding.

The unpredictable nature of bleeding patients requires ready-to-issue blood components. While most components are in liquid form, plasma is commonly frozen requiring it to be thawed before use, taking up to 30 minutes for preparation. Maintaining ready-to-issue plasma for the institution's MTP, while avoiding wastage, can be logistically challenging for the transfusion service.

Types	Collection	Preparation	Storage and Expiration
FFP, FP24 (frozen)	Whole blood or apheresis technology	Frozen within 8 hr (FFP) or 24 hr (FP24) of collection. Requires thawing for use.	-18°C or colder for up to 1 year
FFP, FP24 (thawed)		Frozen product thawed at 30-37°C	1-6°C up to 24 hours from thaw time
Thawed Plasma	FFP, FP24		1-6°C up to 5 days from thaw time
Liquid Plasma (never frozen)	Whole blood (CPD)	Separated from whole blood	1-6°C up to 26 days from collection
	Whole blood (CPDA-1)	Separated from whole blood	1-6°C up to 40 days from collection

Thawed Plasma

What is Thawed Plasma?

Plasma collected from whole blood or apheresis and frozen within 8 hours or 24 hours of collection is labeled as FFP or FP24, respectively. Once thawed, these products have a shelf life of 24 hours when stored at 1-6°C. If these products are held longer than 24 hours after thawing, they must be relabeled as Thawed Plasma and can then be stored for an additional four days at 1-6°C. In 2013, more than half of the plasma issued at AABB accredited hospitals in the United States was thawed plasma, and it is increasingly becoming the standard plasma component for transfusion.³

What are the current indications for Thawed Plasma?

Thawed plasma and FFP can be used interchangeably when supporting a massively bleeding patient. Currently thawed plasma is the most common plasma option for MTPs,⁴ since it can be rapidly released when an urgent need arises. Other indications for both products include the presence of active bleeding, emergent reversal of warfarin, and replacement for multiple coagulation factor deficiencies.

Liquid Plasma (Never Frozen)

What is Liquid Plasma?

Liquid plasma (never-frozen) is a FDA-approved product that has a longer shelf life than thawed plasma. Once collected, liquid plasma is kept refrigerated and has at least the expiration date of the whole blood from which the plasma was made.⁵

What are the current indications for Liquid Plasma?

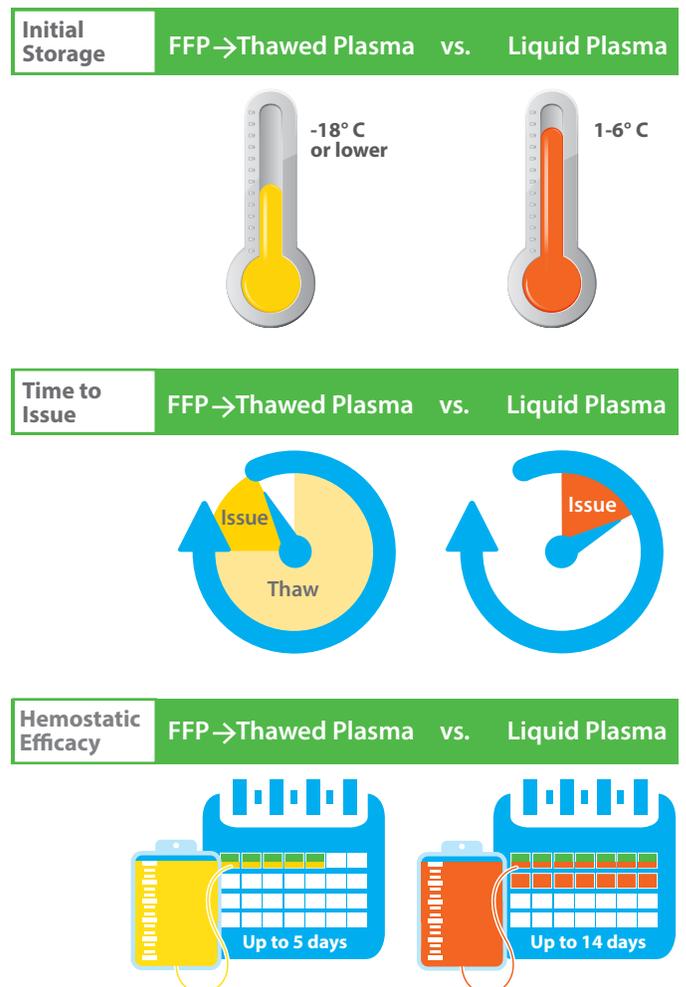
Liquid plasma is NOT approved for use in the general patient population where thawed plasma is clinically indicated.⁵ It is specifically approved for patients undergoing massive transfusion because of life-threatening trauma or hemorrhage and who have clinically significant coagulation deficiencies.

Is Liquid Plasma safe?

Liquid plasma contains all of the coagulation factors found in other currently used plasma products. Limited in vitro studies demonstrate liquid plasma to be more efficient than 5-day thawed plasma at forming clots.⁶⁻⁸ In addition, thromboelastography (TEG) or rotational thromboelastometry (ROTEM) and in vitro bleeding models show appropriate clotting and endothelial repair with use of liquid plasma comparable to thawed plasma.⁸

Clinical efficacy of liquid plasma beyond 14 days is limited and current practice recommends a shortened shelf life instead of using the product up to its approved expiration date.⁹ At approximately 2 weeks, some of the coagulation factors decline to 50% of their original content, which is similar to thawed plasma at day 5 of shelf-life.^{7,8} Trauma centers can now maximize the availability of plasma with little waste and keep the integrity of the product similar to the more widely-used thawed plasma. Moreover, a Swedish 12-year retrospective review of nearly 85,000 patients demonstrated that regardless of storage duration, the utilization of liquid plasma had no adverse outcomes when compared to FFP.¹⁰

Unlike plasma products that are frozen, liquid plasma can contain viable white blood cells. Irradiation may be considered to prevent potential adverse effects related to transfusion. As a precautionary measure, some sites irradiate liquid plasma to inactivate viable white blood cells, preventing potential transfusion-associated graft versus host disease.



Who currently uses Liquid Plasma?

The use of liquid plasma for traumatic bleeding is expanding in hospitals, medical centers, and health care systems across the United States. Its practical advantages – rapid availability and longer shelf-life – make liquid plasma an attractive option for MTPs. Some institutions have begun to include units of liquid plasma along with the RBC units in the transport coolers maintained by emergency medical personnel. If needed, liquid plasma can then be given in the pre-hospital setting at the site of injury.

What blood type is safe to use for plasma?

ABO type specific plasma is ideal in massively bleeding patients. However, when the blood type is unknown, other ABO type plasma may need to be issued.

Group AB Plasma

AB plasma is the “universal plasma” that can be given to any patient since it lacks A and B antibodies. Historically, hospitals have chosen AB plasma for massively bleeding patients when the patient’s blood type is unknown. As only 4% of the population is group AB, a limited supply exists.¹¹ Coupled with the need to keep multiple thawed plasma units continuously available for unexpected MTPs and a 5-day shelf life, inventory management of group AB plasma can be difficult. In an effort to prevent wastage, many of these “soon to expire” units are transfused to non-AB patients. This need can constrain the supply of AB plasma for both hospital transfusion services and blood suppliers.

Group A Plasma

While only 4% of the population is group AB, 40% is group A. This disparity in product availability has caused many trauma centers to transition to using group A thawed plasma for their massively bleeding patients when the blood type is unknown. This practice has proven to be safe for a number of reasons:

- 1) Group A plasma is compatible with both group O and A patients, and these individuals comprise approximately 85% of the population.
- 2) Most donor plasma has low anti-B titer and as a result, very low likelihood of hemolysis if the plasma is given to a group B or AB patient.¹²
- 3) Dilutional effect of concurrent rapid transfusion of group O RBCs further minimizes the risk of hemolysis in B and AB type patients.
- 4) The dynamic process of massive bleeding is thought to mitigate the risk of hemolysis.

Group A Plasma Compatibility

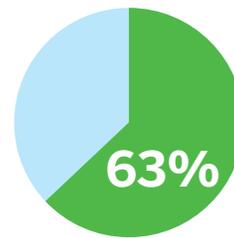
8.5 out of 10 patients with unknown blood type



While some blood centers may titer the amount of anti-B in group A plasma, there is no consensus on the appropriate titer level to label the plasma product as “low titer.” It is rare for a group A donor to have a high titer anti-B and many facilities do not offer titer levels. In fact, 79% (27 of 34) of Level I trauma centers who use group A thawed plasma provide non-titered, group A plasma for initial resuscitation of hemorrhaging trauma patients.⁴

Use of Group A Plasma as an Alternative for Group AB for MTP

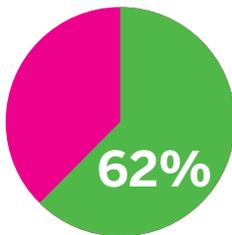
A recent survey of Level 1 trauma centers in the United States⁴ showed 63% (34 of 54) provided group A plasma for patients without a known ABO type.



Level 1 Trauma Centers that use group A plasma

Among these institutions, 62% (21 of 34) did not limit the volume of group A plasma for these patients.

In addition, the practice was shown to be safe in a follow-up retrospective study of 17 trauma centers¹³ that issue group A plasma for initial resuscitation when the blood type was unknown. No increased mortality or longer length of stay was demonstrated in group B and AB trauma patients receiving incompatible group A plasma when compared to group A patients receiving identical group A plasma.



Level 1 Trauma Centers do not limit group A plasma volume

Summary

Group A liquid plasma (never frozen) or group A thawed plasma are viable options for an institution to consider as part of its MTP to meet the needs of massively bleeding trauma patients when the ABO type is unavailable. Use of either product appears safe in this clinical setting and supported by studies to date. Once the patient's blood type is known, switching to ABO-specific or ABO-compatible plasma is recommended. Notably, liquid plasma should never be used for routine plasma transfusions. Each hospital should carefully weigh several factors, such as patient volume and complexity at their institution, product availability from their blood supplier, and overall plasma usage to decide on the type of plasma product for their MTP.

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