



Division of Traumatology, Surgical Critical Care & Emergency Surgery

Current Status of Dried Plasma, Frozen Platelets, and Dried Platelets

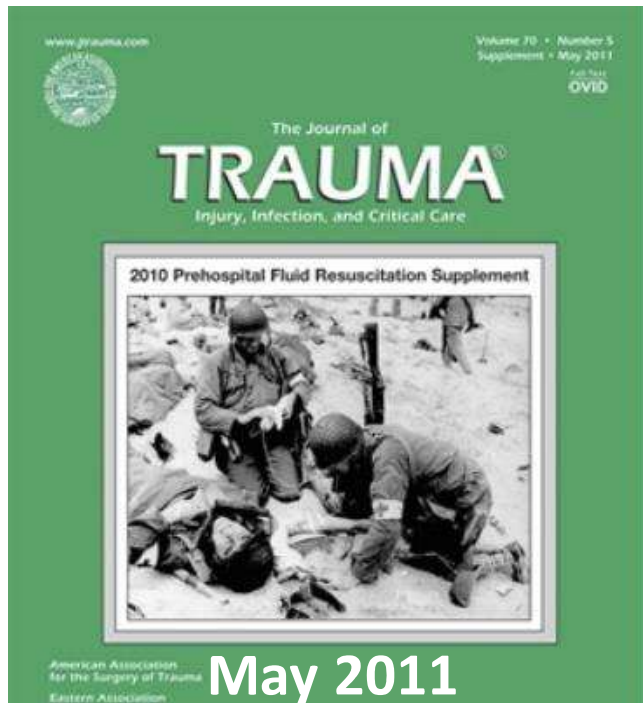
Jeremy W. Cannon, MD, SM, FACS
Professor of Surgery
Trauma Program Medical Director & Section Chief of Trauma

HERETIC Conference
12 October 2022



Disclosures

- ▶ UpToDate: REBOA
- ▶ DOD Research Funding: DCR Decision Support
- ▶ CLS Behring: Consultant on Trial Design
- ▶ Off Label Use
- ▶ DOD Disclaimer
- ▶ UPenn Disclaimer



PRESENTED PAPER

Freeze-Dried Plasma

Kenji Inaba, MD, FACS

PRESENTED PAPER

Lyophilized Platelets: Challenges and Opportunities

Andrew P. Cap, MD, PhD, and Jeremy G. Perkins, MD

Contemporary Update on Freeze Dried Plasma

The Future of Pre-hospital Resuscitation for Military and Civilian Trauma

AAST Grand Rounds
September 2013

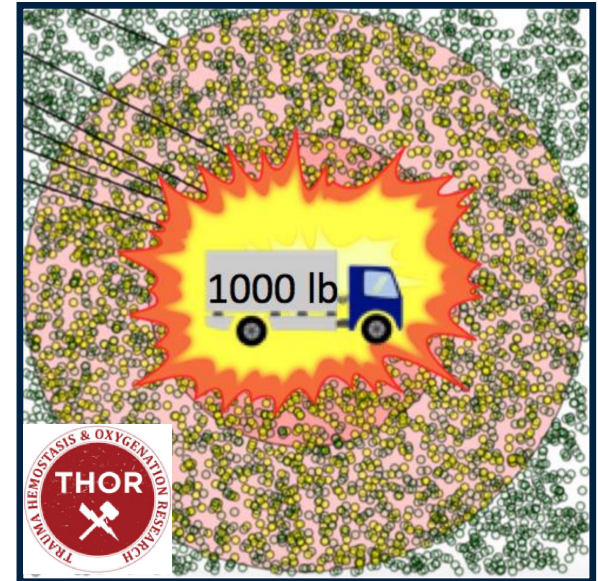
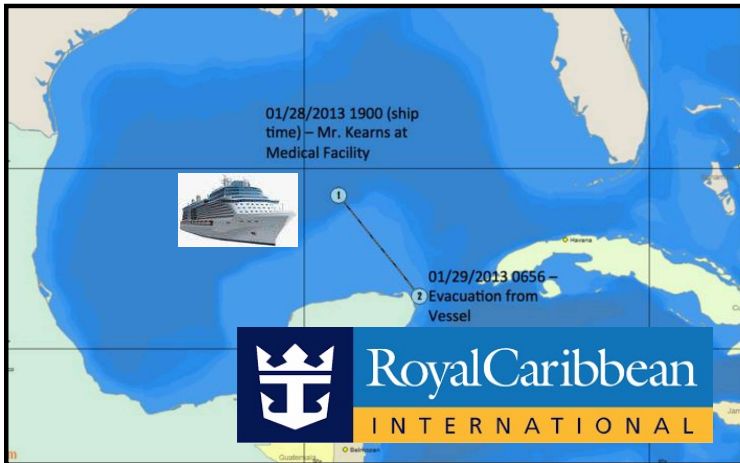
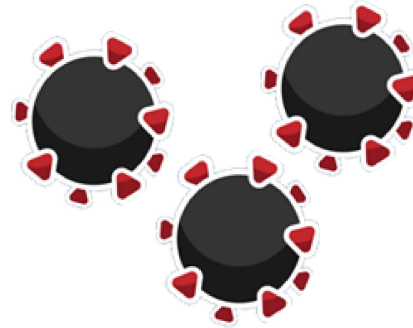
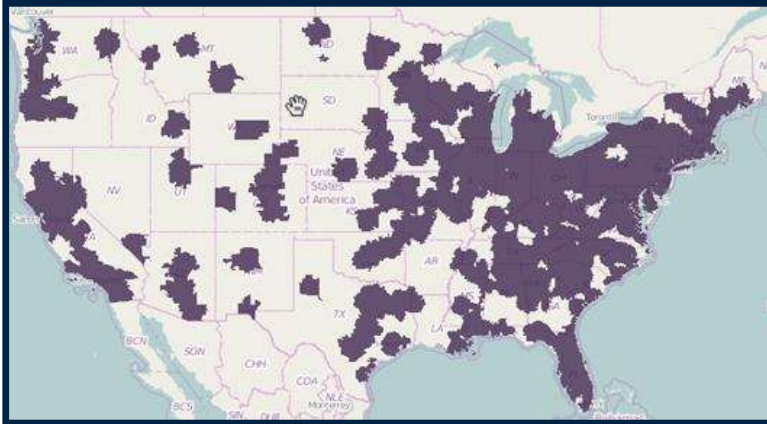
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What is the Need?



What is the Need?



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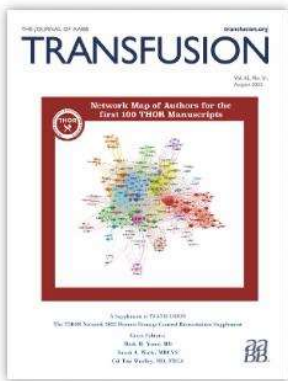
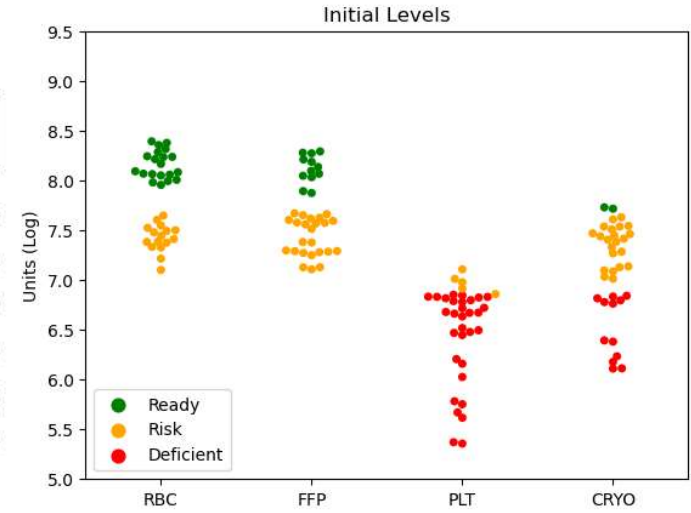
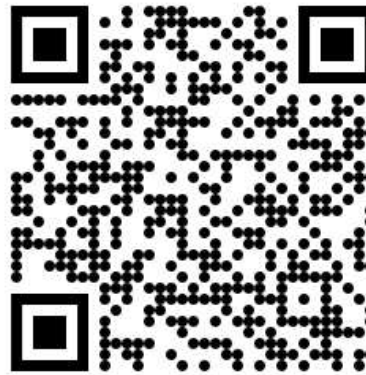
THE JOURNAL OF AABB transfusion.org

TRANSFUSION

DISASTER PREPAREDNESS | [Free Access](#)

U.S. cities will not meet blood product resuscitation standards during major mass casualty incidents: Results of a THOR-AABB working party prospective analysis

Jeremy W. Cannon ✉, Noah M. Igra, P. Dayand Borge, Andrew P. Cap, Dana Devine, Heidi Doughty, Zhi Geng, Jessica F. Guzman, Paul M. Ness, Donald H. Jenkins, Srijana Rajbhandary ... See all authors >



	Initial (N = 36)			
	RBC	FFP	PLT	CRYO
Ready	20	12	0	2
Risk	16	24	6 (4-7)	22 (22-26)
Deficient	0	0	30 (29-32)	12 (8-12)

* Value (95% Confidence Interval)

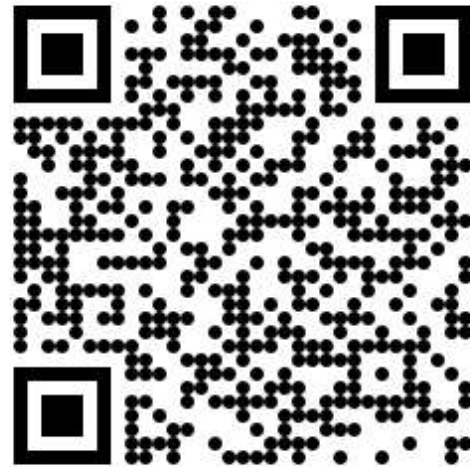
Can these cities manage n=95 critical casualties?

Which Patients?



Which patients?

- ▶ Hemorrhagic shock
 - Altered mental status in the absence of brain injury
 - Weak or absent radial pulse
- ▶ One or more major amputations
- ▶ Penetrating torso trauma
- ▶ Evidence of severe bleeding



<https://jts.health.mil/index.cfm/committees/cotccc/guidelines>

Current Recommendations



What Products?

- ▶ TXA
 - 2 g IV or IO
 - Within 3 hours of injury
- ▶ NO crystalloid or starch recs
- ▶ Blood Product Options
 - Cold Stored WB (O, low titer)
 - Warm Fresh WB (O, low titer)
 - (1:1:1 Components)
 - Reconstituted Dried Plasma



Current Status



Blood Product Innovation

- ▶ French FDP History
 - 2011, 2018
- ▶ F-FDP Outcomes
 - ?






Received: 11 February 2022 | Revised: 20 April 2022 | Accepted: 21 April 2022

DOI: 10.1111/trf.16951

ORIGINAL RESEARCH

TRANSFUSION

The U.S. Armed Services Blood Program support to U.S. Central Command 2014–2021: Transformation of combat trauma resuscitation through blood product innovation and expansion of blood availability far forward

Audra L. Taylor¹ | Jason B. Corley² | Andrew P. Cap³ | Matthew T. Swingholm² |
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Karen Royster¹ | George A. Hestilow⁸ | Colleen L. Cordrick⁹ |
Jonathan Hoiles¹⁰ | Kathleen Whitlock⁵ | Robin Whitacre¹ | Becky Pederson⁸

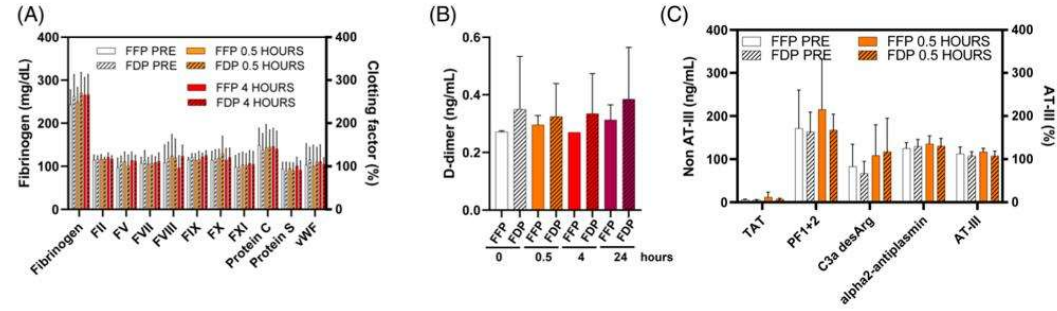
Freeze Dried Plasma

BLOOD COMPONENTS **TRANSFUSION**

Characterization and first-in-human clinical dose-escalation safety evaluation of a next-gen human freeze-dried plasma

Jose A. Cancelas¹ | Shawnagay Nestheide¹ | Neeta Rugg¹ |
 Anna Eckerman² | Victor W. Macdonald³ | Matthew L. Charles² |
 Luke Markstrom² | Andrew J. Atkinson³ | Melissa R. King⁴ |
 Michele Snyder⁴ | David Burgess⁴ | James Murto² | Manoj K. Valiyaveetil³ |
 Joan C. Pehta⁵ | Stephen A. Penegor²

Transfusion. 2022;62(2):406-417



n=24 healthy volunteers
1,2, or 3 units of autologous FFP, FDP
No SAEs



Teleflex Announces Submission of Biologics License Application for Its Investigational Freeze Dried Plasma

02/24/2021

Submission is eligible for priority review and accelerated approval

Of note, EZPlaz™ is not yet approved for use in the U.S. and therefore this is considered an “off-label” discussion.

This information is disseminated for medical and scientific/educational purposes only and contains information that may not have been approved by the US Food and Drug Administration (FDA) or CE or global regulatory authorities relating to a product manufactured/marketed/distributed by Teleflex. This information should not be construed to suggest that the Teleflex product is safe or effective for the intended use subject to the pending Biologics License Application.

Freeze Dried Plasma

FrontlineODP™ System For Spray Drying Plasma Process & Product



Pretreatment Station

Plasma is automatically spray dried in Velico's Frontline dryer following a simple pre-treatment process which stabilizes plasma proteins.

4 Store



Sterile water rehydration, in minutes, at the point of injury eliminates waste

Pouch & Store

Final packaging is completed by placing the separated ODP unit in a moisture vapor barrier bag containing a desiccant.

Spray Drying

Spray Drying converts never frozen or thawed plasma into a dry powder in an aseptic process where liquid plasma is atomized within a stream of clean dry air.

All spray drying is completed within a proprietary Plasma Drying Chamber (PDC) which includes an integrated bag for transfusion.

- Designed to be deployed in routine, blood component laboratory space without the need for clean rooms or glove boxes.
- The Frontline system features walk-away operation and push button convenience with intuitive process design.

Seal and Separate Primary Container

Upon completion of spray drying, plasma powder is consolidated in the bag for transfusion and then separated from the PDC using Velico's Seal and Separate device.

FrontlineODP™ On Demand Plasma

Attributes & Status

FrontlineODP (On Demand Plasma)

- High recovery of plasma proteins, functionally equivalent to traditional plasma products
- Expected long shelf life; targeting 2 years refrigerated, at least 1 year at room temp
- Rehydrates in minutes, with 200 ml sterile water for injection, at the point of care
- Complimentary to pre-hospital whole blood; ODP provides logistical benefits expected to be beneficial for civilian and military deployment
- Addresses BARDA's mission of ensuring strategic preparedness for mass casualty events

Business Model

- Decentralized, blood center-based manufacturing and storage ensures broad regional availability optimizing access for hospital and prehospital use

US Regulatory

- PMA pathway for Velico; targeting FDA clearance 2024; BLA for blood centers following Velico PMA

US Clinical Study

- Phase I dose escalation study targeted to commence October 2022
(*Hoxworth/Spaulding, Dr. José Cancelas*)

Funding

- Biomedical Advanced Research and Development Authority; Contract No. 75A50121C00059

Challenges

- Pre-hospital reimbursement for blood transfusion



Slides courtesy of Bill Skillman
Vice President, Commercial Development and Business Operations

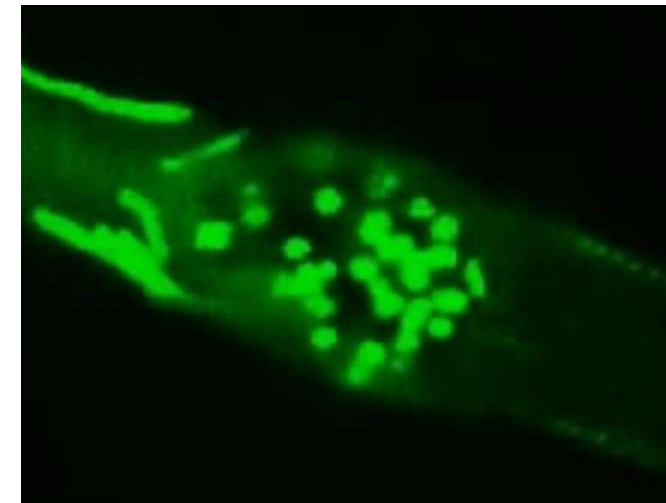
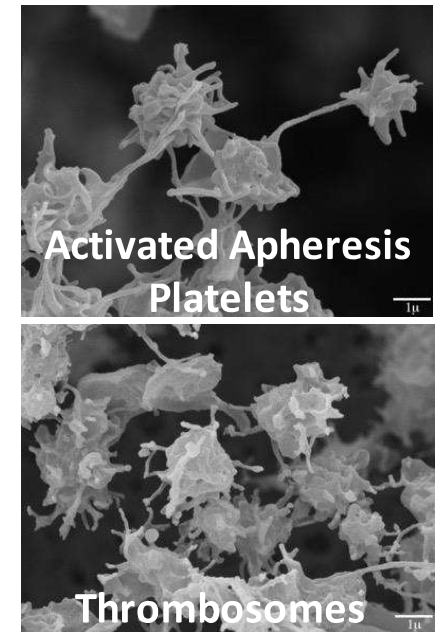
Freeze Dried Platelets



• Phase 2 trial

- Bleeding from chemotherapy, radiation, cancer, or all the above
- Administrative clinical hold has been lifted
- Enrollment will resume first of November

Information courtesy of W. Allan Alexander, MD
Chief Medical Officer



Cryoperserved Platelets

Advantages of CPP to Standard Platelets

- Provides better storage time (up to 5 years frozen)
 - Provides an activated product that is potentially more efficacious in actively bleeding patients
 - No serious adverse events to date in several thousand patients (Dutch military experience)
 - No recorded thromboembolic events
 - Improved availability (military operations, rural medical facilities, bridging inventory during shortages or times of high demand)
 - Reduced risk for bacterial growth
- **Phase 2/3 trial**
 - Cardiac Surgery after heparin reversal or after chest closure
 - High risk for post-operative bleeding
 - 75 patients in each arm (CPP vs Liquid Stored Platelets)



Summary/Conclusions

- ▶ Whole Blood/Components may not be available
 - Austere environment
 - Mass casualty/disasters, Pandemic
- ▶ Numerous products now in various stages in the development pathway
 - Freeze Dried Plasma
 - Spray Dried Plasma
 - Freeze Dried Platelets
 - Cryopreserved Platelets
- ▶ Outcomes need to be understood == Opportunity!
- ▶ *Trauma indications likely to be off-label...at least initially*

Thanks to commercial partners who have made these exciting developments possible!





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