

LETTER

Freeze dried plasma: a French army specialty

Jean Louis Daban¹, Patrick Clapson¹, Sylvain Ausset*¹, Anne V Deshayes² and Anne Sailliol²

See related review by Nascimento *et al.*, <http://ccforum.com/14/1/202>

We read with interest the article by Nascimento and colleagues [1] on fresh frozen plasma (FFP) in massive bleedings. We fully agree with their conclusion when they say that we need immediately available universal donor AB plasma.

Hemorrhagic shock is the primary cause of avoidable mortality in combatants. Data from the recent US army war experience show clearly that in cases of massive transfusion the transfusion policy strongly impacts mortality. Namely, for massive bleeding the ratio between red blood cells and clotting factors should be close to the composition of whole blood [2].

Plasma is thus essential for massive transfusions. But FFP use is impractical in uncertain environments such as a battlefield. During military operations, refrigerated transportation and storage are logistical problems. Thawing of FFP takes a long time, with an important loss of plasma in austere environments. For example, Mabry and colleagues [3] report that, during the Mogadishu urban battle, the available FFP was stored in bags that fractured one-third of the time upon thawing.

For these reasons, the French army has used freeze-dried and secured plasma (FDSP) since 1994. Plasma separated from fresh blood of at least ten donors is lyophilized to produce FDSP. Blood type selection allows the dilution and neutralization of natural anti-A and anti-B hemagglutinins. This FDSP is thus compatible with any blood type. In addition, FDSP is shelf-stable in ambient temperatures for 2 years and easily rehydrated with 200 ml of water for injections in less than 3 minutes, allowing immediate provision with the first packed red blood cells [4].

FDSP contains all clotting factors and proteins. After more than 2 years storage at ambient temperature, the fibrinogen and clotting factor levels of FDSP are equivalent to FFP [4].

The securization process is quarantine (i.e. the plasma is held until the donor returns and is retested after a period that is longer than the window period of known viruses). Plasma as FDSP is thus a logistically superior product, without compromising hemostatic properties, quickly available in cases of emergency for any blood type.

Authors' response

Bartolomeu Nascimento Jr, Jeannie Callum and Sandro B Rizoli

We thank Daban and colleagues for their insightful observations and agree with the comments on the challenges to using AB FFP in trauma. Products such as freeze-dried plasma or lyophilized plasma are appealing for trauma resuscitation since they have many of the characteristics of an ideal resuscitation fluid for bleeding/coagulopathic patients. Such an ideal fluid would be easy to prepare and rapid to administer, contain all clotting factors, not require blood typing and matching, be free of infectious and immunological risks and have a long shelf life. Concerning volume, it is unclear whether the benefit of early and aggressive FFP transfusion in massive

traumatic bleeding is related to either clotting factor or volume replacement with reduced crystalloid exposure. Since most trauma patients are hypovolemic, large volumes are often advantageous, but in circumstances where circulatory overload is a concern, the use of small volume clotting factor concentrates, including freeze-dried plasma, would be superior.

We lack experience with lyophilized plasma, which to our knowledge is available only to military personnel of some countries. Historically it was implicated in hepatitis epidemics during the Korean War, but safer preparations are now available and the interest in this product is growing, particularly over the past few years. Recent experience with this product comes from the battlefield, but mostly from animal models [4-6], in which lyophilized plasma was found to be equivalent to FFP in correcting coagulopathy [5,6]. We agree that further clinical studies with this product are needed.

*Correspondence: sylvain.ausset@gmail.com

¹Service d'Anesthésie-Réanimation, Hôpital d'Instruction des Armées Percy, 101 avenue Henri Barbusse, BP 406, 92141 Clamart cedex, France
Full list of author information is available at the end of the article

Abbreviations

FDSP = freeze-dried and secured plasma; FFP = fresh frozen plasma.

Competing interests

SBR has received speaker's fee and honorarium (as member of the Scientific Advisory Board) from NovoNordisk A/S, manufacturer of NovoSeven (recombinant factor VIIa). The other authors declare that they have no competing interests

Author details

¹Service d'Anesthésie-Réanimation, Hôpital d'Instruction des Armées Percy, 101 avenue Henri Barbusse, BP 406, 92141 Clamart cedex, France. ²Centre de Transfusion Sanguine des Armées Jean Julliard, 1 rue Lieutenant Raoul-Batany, BP 410, 92141 Clamart cedex, France.

Published: 14 April 2010

References

1. Nascimento B, Callum J, Rubenfeld G, Neto J, Lin Y, Rizoli S: **Clinical review: Fresh frozen plasma in massive bleedings - more questions than answers.** *Crit Care* 2010, **14**:202.
2. Spinella PC, Holcomb JB: **Resuscitation and transfusion principles for traumatic hemorrhagic shock.** *Blood Rev* 2009, **23**:231-240.
3. Mabry RL, Holcomb JB, Baker AM, Cloonan CC, Uhorchak JM, Perkins DE, Canfield AJ, Hagmann JH: **United States Army Rangers in Somalia: an analysis of combat casualties on an urban battlefield.** *J Trauma* 2000, **49**:515-528.
4. Daban JL, Deshayes AV, Clapson P, Batjom E, Schall JV, Clavier B, Ausset S, Sailliol A: **Le plasma cryodesséché : un produit stable et rapidement disponible pour les opérations militaires. Société française d'anesthésie réanimation. Congress (51;2009;Paris).** *Ann Fr Anesth Reanim* 2009, **28**:S141-S144.
4. Daban JL, Deshayes AV, Clapson P, Batjom E, Schall JV, Clavier B, Ausset S, Sailliol A: **Le plasma cryodesséché : un produit stable et rapidement disponible pour les opérations militaires. Société française d'anesthésie réanimation. Congress (51;2009;Paris).** *Ann Fr Anesth Reanim* 2009, **28**:S141-S144.
5. Shuja F, Shults C, Duggan M, Tabbara M, Butt MU, Fischer TH, Schreiber MA, Tieu B, Holcomb JB, Sondeen JL, Demoya M, Velmahos GC, Alam HB: **Development and testing of freeze-dried plasma for the treatment of trauma-associated coagulopathy.** *J Trauma* 2008, **65**:975-985.
6. Spoerke N, Zink K, Cho SD, Differding J, Muller P, Karahan A, Sondeen J, Holcomb JB, Schreiber M: **Lyophilized plasma for resuscitation in a swine model of severe injury.** *Arch Surg* 2009, **144**:829-834.

doi:10.1186/cc8937

Cite this article as: Daban JL, et al.: Freeze dried plasma: a French army specialty. *Critical Care* 2010, **14**:412.