

# Suggestion for an easy storage and fast opening freeze dried (lyophilised) Plasma pack

## Abstract

Hemorrhagic shock is an emergency situation. As plasma is highly indicated in hemorrhagic shock in addition to red cell concentrates and platelets concentrates, lyophilised plasma has been developed in order to skip time of thawing Fresh frozen plasma, and to be transported easily in prehospital. The aim of our suggestion is not to compare of lyophilised plasma vs fresh frozen plasma. Lyophilised plasma is stored in glass bottle. Plastics bags may be much easier to transport than glass bottle particularly in emergency ambulance. We suggest fast opening pack for plasma as multi-chambers bag. Fast opening pack may save precious time in emergency.

**Keywords** freeze dried or lyophilised plasma, emergency, glass bottle, multi chambers bag

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## Freeze dried (lyophilised) plasma

Transfusion of plasma is highly recommended in addition to transfusion of red blood cells concentrates (RBC), and platelets concentrates (PC) as treatment of hemorrhagic shock to prevent coagulating troubles.<sup>1-6</sup> Fresh plasma is not available. It is only in the form of Fresh Frozen Plasma (FFP). So FFP has to be thawed before transfusion. There was only one lyophilised plasma (PLyo) made by CTSA (Centre de transfusion des Armées) (Army transfusion centre) in France so lyophilised plasma can be known as French Lyophilised Plasma FLP.<sup>7,8</sup> In France, it has the status of product of blood in France and may stay in a blood bank. Recently Octapharma has developed a new lyophilised plasma OctaplasLg<sup>9</sup> this one is considered as a blood derived medication and can be stored in any pharmacy or ambulance. We only mention these two freeze dried plasma as there are the only ones known in France, but it does exist other freeze dried plasma Lyoplas in Germany and another one in South Africa.<sup>4-8</sup> In USA a freeze dried Plasma (Teleflex) and a dried (Entegriion) are to be prepared for the army and two other ones for civilian (Velico medical) and a freeze dried plasma (TerumoBCT).<sup>4-9</sup> Freeze dried plasma can be used instead of fresh frozen plasma as well.

## Are freeze dried lyophilised plasma worse than Fresh frozen plasma?

But both lyophilized plasmas are stored in bottles made of glass.<sup>8,9</sup> This makes their use more difficult, as a bottle is heavier than a plastic bag. A bottle may be shattered. When broken, the plasma is no more available, and the broken glass may make injuries. Particularly when in a hurry in emergency ward or in an ambulance. The problem is that the powder can't be mixed with water during storage, and the mixing has to be done immediately before use. This needs some time, some skill, and may induce septic risk. The dried plasma powder is in a bottle with vacuum. The water is in another bottle or a bag. A double ended needle allows transfer of water into powder. First you have to perforate the tap of the bottle or bag containing water. Then you put this bottle upside down. With the second end of the needle you have to perforate the tap of the bottle containing powder. The vacuum inside will suck water, and powder and water mix together and powder is re-hydrated, ready to use. As we can see it is a rather long time particularly in emergency.

The order of actions is very important, if you do wrong it becomes quite impossible to mix powder and water. So, it needs a certain skill, and as this procedure is scarcely performed, the risk in doing wrong is real. As you perforate taps with a needle, you may transfer some bacteria. As we have seen above freeze dried plasma is easier to transport and to use, in pre-hospital resuscitation, and it is indicated in emergency massive bleeding, we try to think about an easier pack to store and to make a shorter procedure to mix powder and water.

## Is there another way to store 2 products separately and mix together quickly at the good time?

We can see the same problem, with IV nutrition. Proteins, lipids and glucoside may stay separated. They are mixed just before use. For that purpose, these are stored in a multi chamber bag. Each compartment is separated from the other two by a peelable seal or peelable weld. What is a peelable seal or peelable weld? If the rims of the bag are strong, however, the seals between the compartments does not resist to pressure. In order to peel the seals and make the chambers open to each other, the nurse has to press, squeeze and roll the bag. The seal between the 3 chambers cracks and thus the compartments are communicating. The 3 liquids are mixing together.<sup>6-8</sup>

## Regarding this two ways of packing, what may we suggest?

We may suggest that both laboratories CTSA and Octapharma (and other ones) prepare their dried frozen plasma in such multi chambers bags .EG Technoflex<sup>9</sup> Zelas<sup>10</sup>. Plastic or PVC bag: lighter than glass, no risk of shattering

Easier to store (less volume). No bacteriological risk during transfer of water into the powder, as there is no need to use needle for transfer. No skill requested to do the mixture of liquid and powder. Less waste of time for transfer. Easy to hang on the drip stand. Less risk of air embolism as there is no need to have an air intake. Easier way to discard waste.

## Multi-chambers bag

Multi-chambers bag would be much easier to store, and use those plasma. However, we have had a discussion about such packing with a person involved in lyophilised plasma technology and it appears that

wet of air may perspire through the plastic and alter the powder. So, we can suggest for a better preservation of the dried powder a double plastic wall. And so, in the same bag, there would be a first chamber containing the liquid, the second one separated with a peel able sealing. In this second chamber there would be vacuum and a third chamber inserted inside. (Like Matryoshka stacking dolls). This third chamber with a peel able weld and containing the dried plasma powder, could be in contact with water when cracking the second peel able seal. on that way, the powder would be protected by two plastic walls and so, probably protected from perspiration of moisture of the air.<sup>11-14</sup> Perhaps research to create double walls plastic bag (like Matryoshka stacking dolls) is not interesting as it concerns only a few amount of products. But this way of storing plasma in multi chambers bags should be extended to all the freeze dried medications extracted from plasma as CCP Clotafact® fibrinogen, Kanokad ®...Le Laboratoire Français du fractionnement ET des Biotechnologies (LFB). Octamate® or Octaplex® \_ Octapharma... And other medications made of powder which need immediate rehydration.

## Conclusion

**Two freeze dried (lyophilized) plasma are nowadays available.**

Freeze dried plasma are stored in two separate glass bottles, one for powder the other one for sterile water, as these two parts should not be mixed. These two parts are to be mixed immediately before use. The procedure to do the mixing of these two parts is a little bit difficult. Multi chambers bags seem have many advantages vs glass bottle and be more efficient in emergency situation. This way of storage may be useful for freeze dried plasma. It has been demonstrated that plastic storage is not suitable for dried powder as the wet in the air perspires through the plastic and alters the powder. We think that a double plastic wall should be sufficient to protect powder from moisture. So, we suggest to laboratories preparing freeze dried plasma to test storage in double walls multi chambers plastic bags (Matryoshka stacking doll chamber bags) and other medications extracted from plasma. These double wall could prevent alteration of dry powder from wet.

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## Conflict of interest

The author reports no conflict of interest in this work.

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