

CRYO-SAVE INFORMS

Freezing umbilical cord blood – Why we separate the cells.

The expert Prof. Colin McGuckin comments on Cord Blood processing.

There have been two main options for storing the umbilical cord blood of newborns over the years: The blood can be deep-frozen with all its components (whole blood) and then stored in umbilical cord blood banks. Or, only those components of the umbilical cord blood that may be required for possible medical treatment are obtained and preserved: the stem cells.

I am not generally in favour of storing whole blood unless there is no other way forward and only in special circumstances. Some umbilical cord blood banks only store whole blood as a cost-cutting measure, but this limits the later use of the stem cell components of the blood unfortunately. Obtaining and preserving stem cells from whole umbilical cord blood requires more labour and, therefore, is more cost-intensive than freezing whole blood.

Reasons for not storing whole blood:

- **Danger due to the bursting of red blood cells**

When red blood cells (erythrocytes) contained in whole blood are deep frozen, there is the risk that they may burst (lyse) during thawing. The risk of bursting (lysis) even exists when the thawing procedures are considered “gentle”. If large quantities of ruptured red blood cells are infused into the patient, the resulting break-down products can cause problems in the body. Damage to the inner-most layer of the blood vessel (endothelium) is possible. However, small amounts of damaged erythrocytes are usually tolerated by a healthy system.

- **Hazard from DMSO-mediated cell damage**

The substance DMSO (dimethyl sulphoxide) is used in the preparation for long-term storage of frozen blood products. Because of the greatly increased cell number, preserving whole blood generally requires more DMSO than freezing separated stem cells. Since DMSO is toxic in larger doses and the various blood cell types can change irreversibly during long contact periods, care should be taken to use as little DMSO as possible. Red cells also change the absorbency of DMSO compared to nucleated cells. Cryo-Save is involved in research including European Commission funded cryopreservation research to find the best way forward to store cord blood and so far, our research shows that storing whole cord blood is not the best way forward.

- **Hazard from damaged blood platelets**

When thawing deep frozen whole blood, not only the red blood cells suffer. Blood platelets (thrombocytes), which are important in blood coagulation, can also be damaged in the required

preparation procedures. A study published a few years ago has demonstrated: If blood platelets are irritated – in a manner of speaking – during temperatures changes, they release a large quantity of stimulating cytokines. These cytokines act, for example, on the stem cells contained in the blood and may impair their functional ability.

- **What happens after thawing the blood?**

The number of stem cells that can be separated out of thawed whole blood is smaller and the quality of the cells is inferior. A recent study in our laboratories showed that the regenerative medicine potential for whole blood or even plasma-depleted blood is much less than that of cord blood that has been specifically separated. Therefore, when considering a stem cell bank, it is recommended to work with a bank that carries out system which complies with good practice and using the latest technology available.

About Prof. Colin McGuckin:

With more than 20 years of experience in stem cell research, Professor McGuckin is considered an opinion leader, whose judgement is invoked by governments and clinics around the world – among them the US Senate, the United Nations in Geneva and the parliaments of France, the United Kingdom, Austria and Germany. Colin McGuckin is the president of the research consortium Novus Sanguis, www.novussanguis.org which was founded in 2008 under the leadership of the president of the European Parliament. Novus Sanguis promotes the cooperation of global leaders in stem cell research and clinicians for the purpose of advancing the development of therapies, e.g., of heart diseases, stroke, diabetes and research in organ regeneration.

During his long years of work in research, he developed the first mini-liver from human umbilical cord blood. In the meantime, his team has moved on to develop various human tissues such as nerve tissue and blood vessels from umbilical cord blood cells. They have also succeeded in creating pancreas tissue, which is responsible for insulin production – the function of which is impaired in diabetics.

About Cryo-Save:

Cryo-Save is the leading European stem cell bank. For nearly 10 years, Cryo-Save has operated a policy of responsible stem cell banking. We support the leading research in storing umbilical cord and cord blood, not least through a number of European Parliament funded European Commission Framework research projects.