Umbilical cord blood-derived cells with embryonic phenotype: a population of cells with great potential for future clinical applications

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Introduction:

Hematopoietic stem cells (HSCs) from umbilical cord blood (UCB) can easily be collected without harming the patient. Former studies showed that these cells can be turned into cells which share characteristics with embryonic stem cells. We are aiming at optimizing this method using a population of naive cells from UCB for further expansion, differentiation and transplantation in the field of cell based therapies.

Materials and Methods:

Isolated HSCs from UCB were cultured in-vitro by using a mixture of the cytokines LIF, FGF and TGF. By comparing different culture strategies such as using different media, different amount of additives (Glutamine, FCS) and different mixtures of the mentioned cytokines we study efficient ways to propagate and expand cells with embryonic phenotype. Up to now, cells were analyzed by flow cytometry, immunohistochemistry and RT-PCR using hematopoietic markers and embryonic stem cells markers.

Results:

Critical factors in this method are the basic media and the cell concentration. IMDM supplemented with 2 mM Glutamine, 10-20% FCS, and a cell concentration of 5x105/ml showed optimal results. For cell expansion the isolated HSCs were treated with LIF for several days. To promote the expression of embryonic cell markers additional cytokines were introduced. To generate suitable cells for transplantation we also work on strategies to avoid any animal substances in our culture system.

Discussion and Conclusions:

It is desirable to set up an easy method to generate a homogeneous population of embryonic-like cells derived from HSCs of UCB in order to use them in future clinical cell based therapies. It seems that our cells express stem cells markers such as SSEA-4 and are expandable. However, a lot more work needs to be done to assure that these cells (and/or their differentiated offspring's) will not cause more harm than good after clinical use (e.g. transplantation).