

## **Low Oxygen Conditions Accelerate Umbilical Cord Blood Derived Mesenchymal Stem Cell Growth With No Effect On Their Immunophenotype And Potency**

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### Abstract:

The umbilical cord blood (UCB)-derived mesenchymal stem cells (MSCs) have great potential to self-renew and differentiate to multiple cell lineages.

Compared to bone marrow (BM), UCB is an easily accessible source of stem cells; collection is painless and riskless to the donor. UCB-derived MSCs are proposed to be immunologically more naïve and morphologically different than BM-derived MSCs. However, one cord blood unit contains a limited number of MSC cells and this is limiting their use in therapeutic applications. To gain a therapeutically adequate amount of MSCs, *ex vivo* cell cultivation methods are used to increase the cell population. Standard cell culture methods expose cells to much higher oxygen tension than what exists in tissues that these cells are originating. This exposes cells to oxidative stress that is assumed to lead to harmful effects and finally premature senescence of the cells.

In this work we have addressed the question of how oxygen level influences the cell proliferation and survival.

Two UCB-MSC cell lines, 391P and 454T(7) were grown in parallel at low (3 %) and high oxygen (21 %) in standard culture medium. During several consecutive subculturing steps cells were analyzed for their immunophenotype properties, proliferation capacity, osteogenic, adipogenic and chondrogenic differentiation potency and karyotype. Both cell lines showed 1,3 -1,5 fold increase in expansion capacity in each culturing step at low oxygen level compared to normoxia conditions. The low oxygen cells retained their immunophenotypic characteristics as well as less expanded normoxia cells. These results show that low oxygen pressure is beneficial for fast expansion of the cells and may help the cells to retain their stem cell characteristics.