

Umbilical Cord-Derived Cells in Corneal Epithelial Regeneration

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Abstract : Extensive studies of the human umbilical cord, both basic and translational, over the last three decades have unveiled a plethora of information. The cord lining harbors at least two phenotypically different multipotent stem cells: mesenchymal stem cells (MSCs) and cord lining epithelial stem cells (CLECs). These cells exhibit a mixed genetic profiling of both embryonic and adult stem cells, hence display a broader stem features than cells from other sources. We have observed that umbilical cord-derived cells are immunologically privileged and non-tumorigenic by animal study. These cells are ethically acceptable, thus provides a significant advantage over other stem cells. The high proliferative capacity, viability, differentiation potential, and superior harvest of these cells have made them better candidates in comparison to contemporary adult stem cells. Following 30 replication cycles, these cells have been observed to retain their stemness, with their phenotype and karyotype intact. Transplantation of bioengineered CLEC sheets in limbal stem cell-deficient rabbit eyes resulted in regeneration of clear cornea with phenotypic expression of the normal cornea-specific epithelial cytokeratin markers. The striking features of low immunogenicity protecting self along with co-transplanted allografts from rejection largely define the transplantation potential of umbilical cord-derived stem cells.

Keywords : cord lining epithelial stem cells, mesenchymal stem cell, regenerative medicine, umbilical cord

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