Proceedings of German Society for Stem Cell Research (PGSSCR)

Human pancreatic islet-derived precursor cells display mesenchymal stem cell features and differentiation capacity

Limbert C1,2, Jakob F2, Ebert R2, Path G1, Niu X1, Bretzel G3, Seufert J1

1University Hospital of Freiburg, Division of Endocrinology and Diabetology, Department of Internal Medicine II, Freiburg, Germany
2University of Wurzburg, Orthopedic Center for Musculoskeletal Research, Stem Cell Biology, Wurzburg, Germany
3University Hospital of Giessen and Marburg, Department of Internal Medicine III, Giessen, Germany

Published on 16 May 2007

Introduction:

Strategies for cell based-therapy of type 1 diabetes mellitus are based on pancreatic islet replacement and islet regeneration. Human islet-derived precursor cells (hIPC) expressing nestin and c-met have been investigated as an additional source of beta-cells. These cells have been demonstrated to differentiate in vitro into insulin producing cells and are assumed to be of endodermal origin. In continuation of previous work we provide further evidence that hIPCs share a common phenotype with human bone marrow derived mesenchymal stem cells (hMSC) and, in addition, bear the potential to differentiate along mesenchymal maturation pathways.

Materials and methods:

hIPC and hMSC phenotyping was performed by FACS and immunocytochemistry. Gene expression was examined by cDNA array analysis (Affymetrix U133 Plus Chip). hIPCs were expanded and subjected to osteogenic, chondrogenic and adipogenic differentiation media. Differentiation markers were analysed by RT-PCR and immunocytochemistry.

Results:

Both cell types express nestin and c-met. hIPCs display a mesenchymal immunophenotype (SH3+, SH2+, CD29+, CD44+, CD54+, CD90+) and a gene expression pattern similar to hMSC. Moreover, hIPCs could be induced to differentiate in vitro towards the osteogenic (osteocalcin, alkaline phosphatase, day 28), adipogenic (LPL, PPARgamma, day 14) and chondrogenic (collagen IX, X, day 21) lineages.

Conclusion:

Our results demonstrate that hIPCs and hMSCs share common phenotypes and similar mesenchymal differentiation capacities supporting the occurrence of endodermal to mesodermal transition in epithelial precursor cells. Understanding the molecular mechanisms that enable these cells to cross the
traditional germ layer boundaries will help to develop effective strategies for in vitro generation and differentiation of specific phenotypes for the use in cell therapeutic approaches. Moreover, if hIPCs represent a population of pancreatic cells with stem cell/regeneration potential, these cells could be induced \textit{in vivo} to differentiate into insulin secreting cells or to provide regeneration of beta-cells in the injured diabetic pancreatic islet.