Mesenchymal stem cells – precursors of insulin-producing cells?

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Background. Mesenchymal stem cells (MSCs) have recently come to the forefront of regenerative medicine, in a bid to sidestep the ethical, technical, and safety concerns which embryonic stem cells (ES) and induced pluripotent stem cells respectively pose (iPSCs). A substantial population of CD117-positive was found among dental pulp stem cells (DPSCs), with potential for use to generate insulin-producing pancreatic β-like cells.

Aim. The objectives of the current study are to assess the presence and amount of CD117-positive stem cells in MSCs derived from several sources (adipose tissue, placenta, osteoarticular, muscular), to isolate, characterize and maintain CD117-positive MSCs, comparing their transcriptional profile with that of iPSCs, and to employ them for the differentiation of insulin-producing pancreatic β-like cells.

Materials and methods. MSCs from infrapatellar Hoffa fat, lipoaspirates, placenta and osteoarticular sources are surveyed for the presence of CD117-positive stem cells, which are

isolated using magnetic sorting. CD117-positive stem cells are induced to differentiate in serum free, animal product-free media, and are subsequently treated with 5.5 mM or 25.0 mM glucose in media simulating normoglycaemic or glucotoxic conditions respectively.

Results. Morphological changes reminiscent of pancreatic islet formation were detected, and markers of mature functional pancreatic β-cells insulin, C-peptide, GLUT2 were found to be strongly expressed in the differentiated CD117+ stem cells. Endogenous insulin and C-peptide production was significantly increased in differentiated CD117+ stem cells, also but to a lesser extent for cells kept under glucotoxic conditions.

Conclusion. These findings suggest that CD117-positive MSC populations have potential to be used as precursors of insulin-producing pancreatic β-like cells. The variation in density and phenotype among CD117-positive stem cells derived from the various sources of MSCs surveyed suggest further characterization of CD117-expressing subpopulations is required.

Key words: mesenchymal stem cells, CD117-positive, insulin-producing cells, pancreatic β-like cells.