Improving the therapeutic properties of mesenchymal stromal cells for ischemic heart disease

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Cardiovascular diseases represent the major cause of morbidity and morbility worldwide. In particular, heart failure represents one of the most severe clinical manifestations. Loss of cardiac tissue, deposition of fibrotic tissue and ventricular remodeling result in decreased cardiac output and insufficient blood supply to all organs. The use of stem cell therapy to regenerate cardiac tissue has been proposed as possible strategy to treat heart failure. Although encouraging results have been obtained, the efficiency of the cardiac regeneration is very poor, with paracrine effects playing the major role in mediating the positive effects observed. In particular, the low engraftment of the transplanted cells remains a serious issue and the capacity of adult stem cells to differentiate into mature CMC remains substandard at best. In order to achieve true myocardial regeneration we will need new tools to increase both cell retention and differentiation. We propose that the use of biomaterials and the manipulation of adult stem cells with miRNA or other pro-cardiogenic molecules may represent a possible solution to these relevant issues and bring the field of cell therapy closer to clinical application.