

Research Project

Generation of a mesenchymal niche - Importance of CD34

Third-party funded project

Project title Generation of a mesenchymal niche - Importance of CD34 Principal Investigator(s) Scherberich, Arnaud ; Co-Investigator(s) Martin, Ivan ; Organisation / Research unit Departement Biomedizin / Tissue Engineering (Martin) Bereich Operative Fächer (Klinik) / Tissue Engineering (Martin) Department Project start 01.11.2011 Probable end 31.12.2014

Status Completed

Due to its abundance and easy access, subcutaneous adipose tissue has emerged as a potential source of adult stromal/stem cells for tissue engineering and regenerative medicine applications. The stromal vascular fraction (SVF) of adipose tissue indeed

includes progenitor cells, referred to as human adipose stromal/stem cells (hASC) with

extensive plasticity and the capacity to differentiate into various musculoskeletal lineages. SVF cells express a membrane protein, CD34, in vivo but CD34 expression by hASC spontaneously decreases over time in culture. Culture-expanded hASC are therefore described as CD34 negative cells. CD34 expression in SVF cells has recently been associated with increased biological potential. Preliminary results from our group show that long-term cultures of SVF cells in Petri dishes without passaging into new dishes at cell confluence, in order to favor cell-extracellular matrix and cell-cell interactions, stably maintained and expanded CD34 expression in roughly 20 % of hASC for up to 8 weeks of culture, and that those hASC positive for CD34 expressed higher levels of markers known to be expressed by stem cells. These data suggest the generation of a highly specific hASC culture system in vitro.

The ultimate goal of the present project aims at defining the role of CD34 in the biology, function and in vivo potential of hASC. We therefore hypothesize that the expression of CD34 characterizes a subset of hASC with increased self renewal and differentiation capacities. We plan to study the following different aspects: 1. To study the functional role of CD34 in hASC biology. 2. To investigate the exploitability of the hASC obtained without passaging, by testing their in vivo performance in terms of tissue formation, with an emphasis on bone tissue. 3. To analyze the mechanisms involved in the maintenance of CD34-positive cells, i.e. the possible contribution by soluble factors, extracellular matrix and cell-cell interactions.

The study proposed here, based on the promising preliminary results already provided by the new protocol to expand hASC, will result in a more in-depth knowledge about the biology and possible self-renewal capacity of hASC, the maintenance of their in vitro environment, and about some molecular players, of which CD34, which could be pivotal in the control of hASC phenotype, differentiation potential and in vivo capability. Thereby, this fundamental study will greatly impact on the applicability of ASC in regenerative medicine in general, and in bone tissue engineering in particular.

Keywords mesenchymal stromal cells, adipose tissue, in vitro culture systems, CD34, bone tissue engineering

Financed by

Swiss National Science Foundation (SNSF)

Add publication

Add documents

Specify cooperation partners