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Adhesion to extracellular matrix-derived peptides can differentiate between human bone marrow derived mesenchymal stem cells and MSC-like pericytes

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Mesenchymal stem cells (MSC) contribute in vivo to wound repair and can be used for tissue regeneration. MSC are sometimes attached to a scaffold to maintain the cells in the area of interest. We therefore screened for proteins and peptides that allow a specific attachment of MSC and at the same time avoid attachment of scar tissue promoting fibroblasts. MSC were isolated from placenta (pMSC) and bone marrow (bmMSC) and routinely characterized. Dermal fibroblasts served as controls. 70 peptides with potential cell-binding sites were synthesized, coupled to bovine serum albumin (BSA) and spotted on cell culture dishes. The remaining dish surfaces were sealed by BSA. Cells were allowed to attach for 15 min, loose cells were rinsed away, and attached MSC were recorded by dark-field microscopy. We report that two of the screened peptides (P#15, P#17) were highly specific for pMSC, whereas bmMSC did not bind to these peptides. In contrast, P#7 preferably bound bmMSC, but bound weakly to pMSC. In other experiments we showed that P#7, P#15, and P#17 failed to bind fibroblasts. Other tested peptides failed to bind any MSC or bound MSC and fibroblasts alike. We conclude that MSC attach to distinct peptides with a given avidity, possibly associated with distinct affinities between the peptide and the responsible receptor. P#15 and P#17 seem to be suitable to label, enrich or select pMSC over bmMSC and fibroblasts. They therefore may be interesting components for improving biomaterials for tissue engineering or in situ regeneration purposes.

Biography

Wilhelm Aicher completed his Ph.D. at University of Alabama (UAB) and at the University of Tübingen, Germany (UKT). He was research fellow at UAB (1987-1992), followed by Research Project Manager at the University of Freiburg, Germany (1992-1996). In 1996 he was appointed Research Head in the Department of Orthopedic Surgery (UKT), in 2006-2011 he served as Deputy Director in the Center for Regenerative Medicine (UKT). He is now Head of the Clinical Research Group in the Department of Urology (UKT). This project was supported in part by grants to WKA (Landesstiftung BW, BMBF, DFG), to MLH (Fortüne), and institutional funding.

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