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Mesangiogenic progenitor cells (MPCs) in orthopedics, a new tool for cell-based medicinal products?

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Mesangiogenic progenitor cells (MPCs) have been firstly described in 2008 in human bone marrow (hBM) mononuclear cell cultures, intended to isolate mesenchymal stromal cells (MSCs) in animal-free conditions. Later, we developed a clinical-grade and selective culture method to isolate MPCs with high grade of purity with yields around 1% of plated cells. MPC are characterized by lack of MSC markers, specific integrin profile and phenotype that include CD31 and surprisingly CD45. From the first report on MPCs, these cells showed both mesengenic and angiogenic potential in vitro. Interestingly, pluripotency-associated gene, as OCT-4, NANOG and nestin expression were also detected. Mesengenic differentiation protocol has been set up in chemical defined conditions and more recently, the angiogenic potential was clearly demonstrated also in vivo, applying MPC constructs on chicken chorioallantoic membrane. Surprisingly, the ex vivo precursor of MPCs in hBM has been identified in CD45dimCD64brightCD31brightCD14neg population with a morphology resembling the monoblast. For their peculiar differentiation properties and clinical-grade isolating methods, MPCs could represent a new tool for the implementation of cell-based medicinal products (CBMPs) applicable for skeletal tissue regeneration, as these cells could also support the neo-vascularization. In fact, future studies on tissue reconstruction should take in consideration that the newly formed tissue growth and integration should be supported by concomitant neo-vessels formation. The co-existence of mesengenic and angiogenic potential in MPCs could significantly improve the regeneration potential of new therapeutic approaches that involve these interesting cells.

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