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CD271+CD51+PALLADIN- human mesenchymal stromal cells possess enhanced ossicle-forming potential

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Abstract

Human mesenchymal stem/stromal cells (hMSCs), when engrafted into immunodeficient mice can form ectopic bone organs with hematopoietic stem cell supportive functions. However, the ability to do so, through a cartilage intermediate appears limited to 30% of donor bone marrow samples. Here, we characterize the heterogeneous nature of hMSCs and their ability to efficiently form humanized ossicles observed in "good donors" to correlate with the frequency and functionality of chondrocyte progenitors. Flow cytometry of putative hMSC markers were enriched in the CD271+CD51+ stromal cell subset, which also possessed enhanced hMSC activity as assessed by single-cell CFU-F and undifferentiated mesosphere formation. Transcriptome analysis of CD271+ cells presented upregulation of chondro/osteogenesis-related genes and those related to HSC/niche maintenance factors such as CXCL12 and ANGIOPOIETIN 1. Among the candidate genes selected to enrich for subsets with greater chondrogenic ability, cells negative for the actin cross-linker, PALLADIN displayed the greatest CFU-F potential. Our study contributes to a better characterization of ossicle-forming hMSCs and their efficient isolation for the optimized engineering of human bone organs.

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The treatment of articular cartilage injuries with mesenchymal stem cells in different animal species

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Abstract

One of the major problems observed in veterinary practice is articular cartilage injuries in animals. In terms of agriculture, it leads to their culling from the herd, even if they are highly productive animals. With companion animals, owners usually have to decide between euthanasia or long-term sometimes lifelong treatment of the injury by a veterinarian. The use of mesenchymal stem cells (MSCs) for the treatment of cartilage injury in veterinary medicine is based on the good results observed in preclinical studies, where large animals have been used as experimental models to study the regenerative activity of MSCs. According to the literature, MSCs in veterinary medicine have been used to treat cartilage injury of dogs and horses, whereas sheep and goats are generally models for reproducing the disease in preclinical experimental studies.