The Recruitment of Host Progenitor Cells After Mesenchymal Stem Cells (MSC) Implantation Plays a Key Role in the Development of the Tissue-Engineered Bone

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Introduction
Following implantation of porous ceramic cubes seeded with mouse MSC into immunocompetent syngenic mice, we demonstrated bone tissue formation by cells of host origin within the implanted scaffold after 6-8 weeks. Seeded MSC appeared pivotal at the early stages of the tissue development. No bone formation was observed when the porous ceramic cubes were implanted without the addition of MSC (1).

Materials and Methods
GFP+ MSC/scaffold constructs were implanted in syngenic, GFP- recipients. Implants were harvested after 3, 7, and 11 days, and collagenase-digested to generate single-cell suspensions. Recovered cells were sorted, based on GFP expression, in order to distinguish GFP+ implanted MSC and GFP- recruited cells.

Results
We identified two subgroups of cells, distinct for the expression of CD14 and CD45. CD14+CD45+ double-positive cells (DP) presented characteristics similar to the cells that are not specifically recruited into implanted empty scaffolds. On the contrary, the number of CD14-CD45- double-negative cells (DN) progressively increased from 3 to 11 day implantation time. Day 7-DN cells were enriched in CD31+ endothelial cells, while day 11-DN cells were enriched in CD146+ cells and possessed osteogenic properties. This phenomenon indicated that the nature of the seeded and implanted cells influences not only the implant vascularization, but also the mobilization of host cells with an osteogenic potential, thus confirming that a tight link between host endothelial cells and host osteoprogenitor cells recruitment exists.

Discussion and Conclusions
A deeper knowledge of the nature of stem/progenitor cells locally present or recruited in the bone regenerative niche and a better comprehension of their cross talk and interactions are mandatory to elucidate cellular and molecular control mechanisms behind the bone formation/regeneration process and the possible translation of this knowledge to the clinical application.

References

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