Bioengineered 3D-microfibrous-matrix modulates osteopontin release from MSCs and facilitates the expansion of hematopoietic stem cells

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Abstract

The osteopontin released from mesenchymal stem cells (MSC) undergoing lineage differentiation can negatively influence the expansion of hematopoietic stem cells (HSCs) in co-culture systems developed for expanding HSCs. Therefore, minimising the amount of osteopontin in the co-culture system is important for the successful ex vivo expansion of HSCs. Towards this goal, a bioengineered 3D-microfibrous matrix that can maintain MSCs in less osteopontin releasing condition has been developed and its influence on the expansion of HSCs has been studied. The newly developed 3D-matrix significantly decreased the release of osteopontin, depending on the MSC culture conditions used during the priming period before HSC seeding. The culture system with the lowest amount of osteopontin facilitated more than 40-fold increase in HSC number in 1 weeks' time period. Interestingly, the viability of expanded cells and the CD34+ pure population of HSCs found to be the highest in the low osteopontin containing system. Therefore, bioengineered microfibrous 3D-matrices seeded with MSCs, primed under suitable culture conditions can be an improved ex vivo expansion system for HSC culture.

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