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Role of microRNA in mesenchymal stem cell fate decisions

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Mesenchymal stem cells (MSCs) are adult stem cells with the capacity for self-renewal and differentiation into osteoblast, adipocyte and chondrocyte lineages. MicroRNAs (miRs) are a class of small non-coding RNAs of 20-22 nucleotides molecules which suppress protein synthesis and regulate many aspects of cell function. Therefore the aim of this study was to investigate the hypothesis that miRNAs may regulate cell fate of MSCs. MSCs were tested for differentiation into osteoblast, chondrocyte and adipocyte lineages by qRT-PCR for lineage specific genes. To identify miRNAs involved in MSC differentiation we used a miRNA PCR-array. 5 miRNA were selected based on their significant up/down-regulation in array, as unknown miRNAs in MSC differentiation, according to previous studies, for further investigation. Next, their expression was validated by qRT-PCR. Finally, to determine the role of the miR-302 family during MSC differentiation, their functional activity was tested by knockdown using miRNA inhibitors. MSCs showed osteoblast, chondrocyte and adipocyte differentiation on induction with specific culture media. In the PCR array members of the miR-302 family were down regulated and this was confirmed during MSC differentiation, by qRT-PCR. Knockdown of miR-302 resulted in an 80% and 50% decrease in miR-302 band an expression respectively. Transfection of MSCs with miRNA inhibitor resulted in increase in osteocalcin (*BGP*) and *ALP* expression during osteogenesis and in *FAB, PPARγ* and CEBP during adipogenesis. The results suggest that miR-302 may be an inhibitor of osteogenic and adipogenic differentiation of MSCs and may maintain stem cell properties. Further investigations are in progress on the effect of miR-302 overexpression.

Biography

Bahareh Ghasemi has completed her study in Medicine from Medical School of Arak Medical Science University in Iran in 2004 and she is currently a PhD student.

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