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Regulation of mesenchymal stem cell differentiation towards osteoblast by MicroRNAs

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Mesenchymal stem cells (MSCs) are multipotent cells which can differentiate into various types of mature cells including osteoblasts. This process is tightly controlled by several regulators including microRNAs (miRNAs). During skeletal development, several miRNAs have been identified and they are considered to be a closely related regulator of osteogenesis. In this study, the functional role of miR-15b in osteoblast proliferation and differentiation was determined. Osteoblastic cells transiently transfected with miR-15b inhibitor increased their proliferation suggesting a role for miR-15b in inhibition of cell proliferation. Cyclin E1 was found to be one of the target genes of miR-15b. Runx2, a bone specific transcription factor is required for expression of osteoblast differentiation marker genes and in response to miR-15b inhibitor; Runx2 mRNA expression was not changed; whereas its protein expression was decreased. Even though Smurf1 (SMAD specific E3 ubiquitin protein ligase 1), HDAC4 (histone deacetylase 4), Smad7 and Crim1 were found to be few of miR-15b's putative target genes, Smurf1 was seen to be directly targeted by miR-15b using the luciferase reporter gene system. This is well documented that Smurf1 interacts with Runx2 and degrades it by proteasomal pathway. Thus, miR-15b promotes osteoblast differentiation by indirectly protecting Runx2 protein from Smurf1 mediated degradation. Overall, this study provides new insights in understanding the role of miR-15b as negative regulator of osteoblast proliferation and positive regulator of osteoblast differentiation. This information would help for developing new strategies to treat bone and bone related diseases.

Biography

N Selvamurugan completed his PhD from Madurai Kamaraj University, India and Postdoctoral studies from Saint Louis University, USA. He worked as an Assistant Professor at Robert Wood Johnson Medical School, USA. He is currently a Professor at the Department of Biotechnology, School of Bioengineering, SRM University, India. His areas of specialization are bone biology, stem cell biology and cancer biology. He has published more than 62 papers in peer-reviewed journals and has been serving as an Editorial Board Member of reputed journals. He has received grant support from various funding agencies in USA and India.

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