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Regulation of osteoblastogenesis: Concerted action of transcription factors (TFs), microRNAs and histone deacetylases (HDACs)

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Historically, osteoblastogenesis, as assessed by the expression of osteoblast specific genes, or by *in vitro* assays like ALP positive and mineralization surfaces are often attempted explained by the concerted action of developmental phase related appearance of transcription factors (TFs) like Msx2, Satb2, Runx2 and Osterix. The impact of other small protein subsets regulating β-catenin, being a key mediator of the canonical effect of Wnt signaling in osteoblasts, has also been emphasized. Over the past 6-7 years, differentiation of stem cells towards osteoblasts has been scrutinized in view of intrinsic levels of several microRNA species, like miR-133 and -135, miR-204 and -211, as well as miR-149, -328 and -339. Many excellent reviews describe a network of TF vs. microRNA interactions; however, few attempts to emulate such interactions for osteoblasts through bioinformatics have been made. In parallel, accumulating data on the impact of important epigenetic phenomena on osteoblastogenesis, via the concerted activity of various classes of histone deacetylases (HDACs), have been described.

This paper gives an overview of the current understanding of osteoblastogenesis and demonstrates the use of the mirantan algorithm in an attempt to divulge a minimal size, epigenetically-based regulatory system, which to a certain precision may predict how stem cells or pre-osteoblasts develop into mature, mineralizing osteoblasts. It also sketches some experimental approaches being useful in assessing the biological importance of predicted regulatory loops involving microRNAs, TFs and/or HDACs.

Biography

Jan O Gordeladze, PhD holds a triple Professor competence (Medical Biochemistry, Physiology, and Pharmacology), and is presently working as a Professor at the Department of Biochemistry, Institute of Basic Medical Science, University of Oslo, Norway. He has previously been employed as the Medical Director of MSD, Norway, serving two years as a Fulbright Scholar at the NIH, Bethesda, Maryland, USA, and from 2006-2009 also being employed as Associate Professor at the University of Montpellier, France. He is a member of the Norwegian Stem Cell Center, and his research has over the past 5-6 years been devoted to differentiation of osteochondral cells from stem cells focusing on the impact of transcription factors and microRNA species constituting regulatory loop interactions with functional target genes. He has published more than 120 scientific articles, reviews/book chapters and presented more than 250 abstracts/posters/talks at conferences world-wide.

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