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Collagen XXIV (Col24?1) Promotes Osteoblastic Differentiation and Mineralization through TGF-?/Smads Signaling Pathway

Weizhuo Wang1,3, Douglas Olson1, Gang Liang1, Renny T Franceschi4, Chunyi Li1, Bingyan Wang5, Shuen Shiuan Wang1, Shuying Yang1,2?

1. Department of Oral Biology, School of Dental Medicine, University of Buffalo, State University of New York, Buffalo, NY, 14214, USA. 2. Developmental Genomics Group, New York State Center of Excellence in Bioinformatics and Life Sciences, University of Buffalo, The State University of New York, Buffalo, NY, 14203, USA. 3. Department of Orthopedics Surgery, The Second Affiliated Hospital, College of Medicine, Xi'an Jiaotong University, Xi'an, 710004, People's Republic of China. 4. Department of Periodontics and Oral Medicine, University of Michigan School of Dentistry, Ann Arbor, MI 48109-1078. 5. Department of Periodontics, University of Texas, Health Science Center at Houston, School of Dentistry, Houston, TX 77030, USA.

Abstarc :

Collagen XXIV (Col24?1) is a recently discovered fibrillar collagen. It is known that mouse Col24?1 is predominantly expressed in the forming skeleton of the mouse embryo, as well as in the trabecular bone and periosteum of the newborn mouse. However, the role and mechanism of Col24?1 in osteoblast differentiation and mineralization remains unclear. By analyzing the expression pattern of Col24?1, we confirmed that it is primarily expressed in bone tissues, and this expression gradually increased concomitant with the progression of osteoblast differentiation. Through the use of a lentivirus vector-mediated interference system, silencing Col24?1 expression in MC3T3-E1 murine preosteoblastic cells resulted in significant inhibition of alkaline phosphatase (ALP) activity, cell mineralization, and the expression of osteoblast marker genes such as runt-related transcription factor 2 (Runx2), osteocalcin (OCN), ALP, and type I collagen (Col I). Subsequent overexpression not only rescued the deficiency in osteoblast differentiation from Col24?1 silenced cells, but also enhanced osteoblastic differentiation in control cells. We further revealed that Col24?1 interacts with integrin ?3, and silencing Col24?1 up-regulated the expression of Smad7 during osteoblast differentiation while at the same time inhibiting the phosphorylation of the Smad2/3 complex. These results suggest that Col24?1 imparts some of its regulatory control on osteoblast differentiation and mineralization at least partially through interaction with integrin ?3 and the transforming growth factor beta (TGF-?) /Smads signaling pathway.

Key Word :
COLLAGEN XXIV, Osteoblast differentiation, Bone mineralization, SMAD, Integrin.

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