Bone morphogenetic protein-2 (BMP-2) and transforming growth factor-β1 (TGF-β1) alter connexin 43 phosphorylation in MC3T3-E1 Cells

ABSTRACT

BMP-2 and TGF-β1 do not alter expression of Cx43 at the mRNA or protein level. BMP-2 and TGF-β1 may inhibit GJIC by decreasing the phosphorylated form of Cx43 in MC3T3-E1 cells.

INTRODUCTION

Introduction Bone morphogenetic protein-2 (BMP-2) and transforming growth factor-β1 (TGF-β1), members of the TGF-β superfamily, play important roles in bone repair and regeneration. BMPs, defined as osteoinductive by their ability to induce osteogenesis when implanted in extraskeletal sites, are thought to mediate the transformation of undifferentiated mesenchymal cells into bone-producing osteoblasts. BMP-2 and TGF-β1 promote osteogenesis in vivo and have been applied exogenously to accelerate healing of bony defects in various animal models. Gap junctional intercellular communication (GJIC) represents one mechanism of cell-cell communication and has been implicated in the maintenance of intercellular homeostasis and regulation of signals during embryogenesis, differentiation, growth, and regeneration. Gap junctions have been shown by electron microscopy to exist between osteoblasts and osteocytes in homologous and heterologous cell populations. Gap junctions are thought to be essential for maintaining skeletal integrity and coordinating repair of osseous tissue by propagating intracellular signals generated in response to soluble factors, such as epidermal growth factor (EGF) and basic fibroblast growth factor (bFGF), or mechanical stimuli, such as cyclic stretch. Connexins are the structural subunits of gap junctions and connexin 43 (Cx43) has been shown to mediate intercellular communication in osteoblasts. In a previous study, we reported that BMP-2 or TGF-β1 markedly inhibited GJIC in the murine-derived MC3T3-E1 cell. Cx43 is the predominant gap junctional protein expressed in this cell line and we hypothesized that Cx43 mediated intercellular communication in these osteoblast-like cells. In this study, we describe the effects of BMP-2 and TGF-β1 on the expression, phosphorylation, and subcellular localization of Cx43 in MC3T3-E1 cells.

CONCLUSION

Conclusions BMP-2 and TGF-β1 do not alter expression of Cx43 at the mRNA or protein level. BMP-2 and TGF-β1 may inhibit GJIC by decreasing the phosphorylated form of Cx43 in MC3T3-E1 cells.