Inhibition of adipogenic differentiation of bone marrow mesenchymal stem cells by erythropoietin via activating ERK and P38 MAPK


Hematology Institute of Ji’nan University, Guangzhou City, Guangdong Province, China

*These authors contributed equally to this study.
Corresponding author: S.T. Chen
E-mail: liugexiu_lgx@163.com

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ABSTRACT. We examined whether erythropoietin (EPO) can inhibit adipogenic differentiation of mesenchymal stem cells (MSCs) in the mouse bone marrow and its underlying mechanism. We separated and extracted mouse bone marrow MSCs and induced adipogenic differentiation using 3-isobutyl-1-methylxanthine, insulin, and dexamethasone. Different concentrations of EPO were added to the cells and observed by Oil Red O staining on the 20th day to quantitatively analyze the degree of cell differentiation. mRNA expression levels of peroxysome proliferator-activated receptor γ (PPARγ), CCAAT enhancer binding protein α, and adiponectin were analyzed by real-time quantitative polymerase chain reaction, and the activity of PPARγ, extracellular signal-regulated kinase (ERK), and p38 mitogen-activated protein kinase (p38 MAPK) were determined by western blotting. EPO significantly inhibited adipogenic differentiation of MSCs after 20 days and reduced absorbance values by Oil Red O staining without affecting proliferation.
activity. EPO downregulated the mRNA expression of PPARγ, CCAAT enhancer binding protein α, fatty acid binding protein 4, and adiponectin during adipogenesis and increased protein phosphorylation of ERK, p38 MAPK, and PPARγ during differentiation. EPO downregulated the mRNA expression of PPARγ, CCAAT enhancer binding protein α, fatty acid binding protein 4, and adiponectin by increasing protein phosphorylation of ERK, p38 MAPK, and PPARγ during differentiation, which inhibited adipogenic differentiation of MSCs.

**Key words:** Differentiation; Erythropoietin; Mesenchymal stem cell; Proliferation; Signaling pathways