2,6-Diisopropylphenol protects osteoblasts from oxidative stress-induced apoptosis through suppression of caspase-3 activation.

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Abstract

2,6-Diisopropylphenol is an intravenous anesthetic agent used for induction and maintenance of anesthesia. Since it is similar to -tocopherol, 2,6-diisopropylphenol may have antioxidant effects. Osteoblasts play important roles in bone remodeling. In this study, we attempted to evaluate the protective effects of 2,6-diisopropylphenol on oxidative stress-induced osteoblast insults and their possible mechanisms, using neonatal rat calvarial osteoblasts as the experimental model. Clinically relevant concentrations of 2,6- diisopropylphenol (3 and 30 ┐M) had no effect on osteoblast viability. However, 2,6-diisopropylphenol at 300 ┐M time-dependently caused osteoblast death. Exposure to sodium nitroprusside (SNP), a nitric oxide donor, increased amounts of nitrite in osteoblasts. 2,6-Diisopropylphenol did not scavenge basal or SNP-releasing nitric oxide. Hydrogen peroxide (HP) enhanced levels of intracellular reactive oxygen species in osteoblasts. 2,6-Diisopropylphenol significantly reduced HP-induced oxidative stress. Exposure of osteoblasts to SNP and HP decreased cell viability time-dependently. 2,6- Diisopropylphenol protected osteoblasts from SNP- and HP-induced cell damage. Analysis by a flow cytometric method revealed that SNP and HP induced osteoblast apoptosis. 2,6-Diisopropylphenol significantly blocked SNPand HP-induced osteoblast apoptosis. Administration of SNP and HP increased caspase-3 activities. However, 2,6-diisopropylphenol significantly decreased SNP- and HP-enhanced caspase-3 activities. This study shows that a therapeutic concentration of 2,6-diisopropylphenol can protect osteoblasts from SNP- and HP-induced cell insults, possibly via suppression of caspase-3 activities.