Antioxidative activity of dexmedetomidine as a direct free radical scavenger

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Purpose

Dexmedetomidine (DXM) is clinically used for sedation in perioperative patients. Previous studies reported that DXM is preventive against oxidative stress. Thus we hypothesized that DXM directly scavenges free radicals thereby acting as antioxidant.

Methods

Direct scavenging activity of DXM was evaluated against nine species of free radicals by electron spin resonance spectroscopy with the spin-trapping method. Fluorescence-based assays of cellular viability and intracellular free radical production were conducted using Alamar Blue and MitoROS 580.

Results

DXM significantly scavenged the following free radicals in dose-dependent manners; hydroxyl radical, superoxide anion, *t*-butoxyl radical, singlet oxygen and ascorbyl free radical. However, no scavenging activity was observed against *t*-butyl peroxyl radical, nitric oxide, DPPH and tyrosyl radical. Cellular viability of MRC-5 cells exposed to hydrogen peroxide was significantly improved in the presence of 0.1 μM DXM. 10 μM DXM significantly inhibited mitochondrial superoxide anion by Antimycin A. DXM showed no cytotoxicity up to 100 μM.

Conclusions

Although no effect was observed on nitrogen-centered radicals including nitric oxide, it was confirmed that DXM directly scavenges multiple oxygen-centered free radicals including hydroxyl radical (one of the strongest free radicals in living body) and superoxide anion (the most upstream of ischemia-reperfusion injury), which probably contributes to its antioxidative activity.