Down-regulation of superoxide dismutase gene expression in cultured rat aortic smooth muscle cells (A7r5) after long-term incubation with vitamin C

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摘要

Abstract

Reactive oxygen species have been linked with neuropathological changes in the central nervous system. Epidemiological studies supported the beneficial effect of supplementation of antioxidants. Superoxide dismutase (SOD) is an endogenous enzyme which can scavenge reactive oxygen species. This study investigated the effect of supplementation with ascorbic acid (vitamin C) on the changes of SOD in cultured neurological cells. Rat brain astrocytes (RBA-1 cells) were incubated with vitamin C and divided into four groups: a control group (without vitamin C) and three treatment groups with vitamin C at 40, 80, and 160 μmol/l. After short-term (2 days) and long-term (7 days) incubation, SOD activity, SOD mRNA level by Northern blotting, and SOD protein amounts by Western blotting were measured. After 2 days of incubation, vitamin C resulted in a decrease in the activity of SOD in a concentration-dependent manner (Mn-SOD from 14.8 ± 1.2 to 13.2 ± 0.5 U/mg protein and Cu/Zn-SOD from 64.8 ± 1.2 to 51.7 ± 0.9 U/mg protein; $p < 0.05$), and vitamin C also attenuated the Cu/Zn-SOD mRNA level from 100 to 86.3 ± 6.7%; $p < 0.01$), whereas the protein amounts of these two SODs remained unchanged. After 7 days of incubation with vitamin C, the SOD activity of RBA-1 cells decreased significantly (Mn-SOD from 14.9 ± 0.3 to 11.8 ± 0.3 U/mg protein and Cu/Zn SOD from 61.8 ± 1.8 to 54.6 ± 0.9 U/mg protein; $p < 0.01$), and the mRNA level was also attenuated (Mn-SOD from 100 to 86.8 ± 8.7% and Cu/Zn-SOD from 100 to 84.7 ± 4.8%; $p < 0.01$). These results suggest that 2 and 7 days of incubation with relatively high concentrations of vitamin C may downregulate activity and gene expression of SOD in cultured RBA-1 cells.