Folic acid-mediated mitochondrial activation for protection against oxidative stress in human dental pulp stem cells derived from deciduous teeth

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Folic acid-mediated mitochondrial activation for protection against oxidative stress in human dental pulp stem cells derived from deciduous teeth
(葉酸によるミトコンドリアの活性化はヒト乳歯由来の歯髄幹細胞酸化ストレスを低減する)

区　　分　：甲

論 文 内 容 の 要 旨

Enzymatic antioxidant systems, mainly involving mitochondria, are critical for minimizing the harmful effects of reactive oxygen species, and these systems are enhanced by interactions with nonenzymatic antioxidant nutrients. Because fetal growth requires extensive mitochondrial respiration, pregnant women and fetuses are at high risk of exposure to excessive reactive oxygen species. The enhancement of the antioxidant system, e.g., by nutritional management, is therefore critical for both the mother and fetus. Folic acid supplementation prevents homocysteine accumulation and epigenetic dysregulation associated with one-carbon metabolism. However, few studies have examined the antioxidant effects of folic acid for healthy pregnancy outcomes. The purpose of this study was to elucidate the association between the antioxidant effect of folic acid and mitochondria in undifferentiated cells during fetal growth. Neural crest-derived dental pulp stem cells of human exfoliated deciduous teeth were used as a model of undifferentiated cells in the fetus. Pyocyanin induced excessive reactive oxygen species, resulting in a decrease in cell growth and migration accompanied by mitochondrial fragmentation and inactivation in dental pulp stem cells. This damage was significantly improved by folic acid, along with decreased mitochondrial reactive oxygen species, PGC-1α upregulation, DRP1 downregulation, mitochondrial elongation, and increased ATP production. Folic acid may protect undifferentiated cells from oxidative damage by targeting mitochondrial activation. These results provide evidence for a new benefit of folic acid in pregnant women and fetuses.