

Epigenetic regulation of human buccal mucosa mitochondrial superoxide dismutase gene expression by diet

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The impact of nutrition on the epigenetic machinery has increasingly attracted interest. The aim of the present study was to demonstrate the effects of various diets on methylation and gene expression. The antioxidative enzyme mitochondrial superoxide dismutase (MnSOD) was chosen as the model system because epigenetic regulation has been previously shown in cell lines for this gene. Promoter methylation and gene expression of MnSOD in buccal swabs from three sample groups were analysed. The three groups included: (1) forty vegetarians (aged 20–30 years); (2) age-matched omnivores; (3) elderly omnivores (aged > 85 years). A 3-fold increase in the expression of the MnSOD gene was associated with decreased CpG methylation of the analysed promoter region in the vegetarian group compared with the age-matched omnivores group. Expression and promoter methylation of the MnSOD gene in elderly omnivores showed no significant differences compared with younger omnivores. In accordance with previous findings in various tissues, DNA global methylation was found to be significantly higher (30%) in buccal swabs of younger subjects (independent of the diet), than in those of elderly omnivores. In the control experiment which was designed to verify the findings of the human buccal swab studies, the Caco-2 cell line was treated with zebularine. Results of the control study showed a 6-fold increase of MnSOD expression, an approximately 40% decreased methylation of specified CpG in the MnSOD promoter and a 50% reduction of global DNA methylation. These results indicate that diet affects the epigenetic regulation of human MnSOD.

Mitochondrial superoxide dismutase: Epigenetic regulation: Buccal mucosa: Vegetarian diet