A COMPARISON OF GENETIC DAMAGE AND PLASMA MICRONUTRIENTS IN VEGETARIANS AND NON-VEGETARIANS

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Because genetic damage is considered to be an intiating event in cancer and a cause of premature ageing we are interested in determining which diets and lifestyles may prevent the accumulation of mutations. We therefore performed a biochemical and cytogenetic epidemiological study to establish if there are significant differences between vegetarians and non-vegetarians in their peripheral blood lymphocyte micronucleus index, which is a measure of chromosome damage rate (Fenech and Morley 1985; Fenech 1993). The level of plasma vitamin-C, vitamin-E, vitamin B_{12} and folic acid was also analysed to assess if differences in chromosome damage rates were associated with these potentially anti-mutagenic micronutrients. Volunteers were either classified as 'vegetarian' if they had abstained from eating any flesh foods for at least three years prior to the study or classified as 'non-vegetarian' if they consumed meat or meat products at least five days per week for at least three years before participation in the study.

The volunteers in the study consisted of 47 male and 79 female vegetarians and 66 male and 72 female non-vegetarians, all of whom were non-smokers for at least three years prior to the study. The age of the volunteers varied between the ages of 20 and 89 years. There was no significant difference in the slope of the age-related increase in micronucleus index of vegetarians and non-vegetarians of either sex. However, the micronucleus index was significantly lower in non-vegetarian males in the age group 20-40 y and significantly lower for vegetarian males in the 41-60 y age-group. No difference between the micronucleus index of older males was detectable and there also was no difference in the micronucleus index of vegetarian and non-vegetarian females across all age groups. Vegetarians were generally found to have significantly higher plasma levels of vitamin-C and folic acid, significantly lower levels of vitamin B_{12}, and similar levels of vitamin-E when compared to non-vegetarians. Vitamin-C correlated positively with micronucleus index in young males but the reverse was true for vitamin B_{12}. In young females folate and vitamin B_{12} appeared to correlate negatively with micronucleus index. Vitamin-E had no apparent impact on micronucleus index.

These data suggest that the level of folate and vitamin B_{12} may be more important than vitamin C or vitamin E in minimising chromosome damage rates in human lymphocytes. Overall the data from this study do not support the hypothesis that vegetarians have a lower genetic damage rate than non-vegetarians. The study does not exclude the possibility that vegetarian diets may be protective against cancer development via alternative mechanisms such as prevention of angiogenesis .

FENECH, M. and MORLEY, A.A. (1985). Mutation Res. 147:29
FENECH, M. (1993). Environmental Health Perspectives 101(3):101

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