INHIBITION OF FRIED MEAT-INDUCED DNA DAMAGE: USE OF CRUCIFEROUS VEGETABLES, YOGURT, AND CHLOROPHYLLIN IN A DIETARY INTERVENTION STUDY IN HUMANS

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Abstract: Dietary exposures have been implicated as risk factors in colorectal cancer. Such agents may act by causing DNA damage or may be protective against DNA damage. The effects of dietary exposures in either causing or preventing damage have not been assessed directly in colon tissue. In this pilot study, 16 healthy volunteers were enrolled in a 4-week controlled feeding study. In the first phase, in a crossover design, eight subjects were fed diets for 2-week periods that contained meat cooked at either low or high temperature; the diet also included non-cruciferous vegetables. In the second phase, the remaining eight subjects were fed either the high-temperature meat diet or a diet containing high-temperature meat along with three types of antimutagens: cruciferous vegetables, yogurt, and chlorophyllin tablets, also in a crossover design. The high-temperature meat was highly mutagenic and had high levels of heterocyclic amines (HCAs), whereas the low-temperature meat was weakly mutagenic and had undetectable HCA levels. In both phases of the study, urine and blood were collected, and rectal biopsies were obtained from subjects each week during study. The effects of the different diets on DNA damage in colonic epithelium and lymphocytes were assessed using the comet assay, and changes in urine mutagenicity were evaluated in the Salmonella plate-incorporation assay. Tail Moment values in the comet assay were higher in colon epithelium from patients consuming high-temperature meat diets compared to those consuming the low-temperature meat diet, although the overall difference between the low- and high-temperature meat diets was not statistically significant. Tail Moment values were significantly lower in subjects consuming diets with antimutagens plus high-temperature meat compared to diets containing fried meat alone ($p = 0.026$). Urine mutagenicity increased 1.9-fold in subjects consuming the high-temperature vs. the low-temperature meat diet. For subjects consuming the diet containing the antimutagens, the unconjugated urine mutagenicity decreased in 4/8 subjects, whereas the conjugated mutagenicity increased 2.5-fold in these subjects. This study provides the first evidence in humans that these dietary antimutagens (a) reduce DNA damage in the target organ (colon) and (b) reduce the systemic levels of genotoxicants associated with consumption of a mutagenic diet.

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