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CHEMOPREVENTION AGAINST DIETARY MUTAGENS IN HUMANS BY INGESTION OF CRUCIFEROUS VEGETABLES

Hans Steinkellner[1], Andrea Gsur[1], Michael Kundi[2], and Siegfried Knasmüller[1]

[1]Institute of Cancer Research, University of Vienna, Austria
[2]Institute of Environmental Hygiene, University of Vienna, Austria
E-mail: hans.steinkellner@univie.ac.at

Results from laboratory experiments indicate that induction of phase II enzymes by dietary constituents leads to inactivation of genotoxins. In animal studies glutathione *S*-transferase (GST) induction was paralleled by a reduction of chemically induced tumours. However data on induction of phase II enzymes in humans is scarce. Therefore we carried out intervention studies in which we investigated the effect of cruciferous vegetables on GST induction, and studied the effects of these vegetables on meat derived urinary mutagenicity. In the GST studies five different brassica varieties were investigated. Participants (n=10) received 300 g of different cruciferous vegetables for five days. GST activity in plasma was enhanced 1.8- fold with red cabbage (Roxy) and 1.7 fold with Brussels sprouts (Cyrus) whereas no induction of the GST isoenzyme (measured with ELISA) was seen in any of the studies. A pronounced increase in the GST isoenzyme (measured with ELISA) was seen again with red cabbage (Roxy), Brussels sprouts (Cyrus) and red cabbage (Reliant). The induction of GST was about 3-fold for red cabbage (Roxy), 1.8-fold and 2.5-fold for Brussels sprouts (Cyrus) and for red cabbage (Reliant) whereas broccoli (Montop) and white cabbage (Kilor) were negative. In a second study series the impact of different food processing methods was evaluated using red cabbage (Roxy). No correlations between GST induction and gender, GST and GST genotypes could be established. It is known from epidemiological studies that impaired GST is associated with increased rates of specific forms of cancer in humans (lung-, prostate-, breast-, testicular-, esophageal-, and colon cancer), therefore the induction of GST by vegetable diets could be protective against genotoxic carcinogens moreover since in epidemiological studies consistently decreased cancer risks are associated with

increased uptake of Brassicas. We also investigated the effect of red cabbage on the urinary excretion of meat induced urinary mutagenicity. Red cabbage was consumed for five days, then a hamburger meal was consumed. The urinary mutagenicity was measured in Ames tests with S. typhimurium 1024 and a pronounced decrease in urinary mutagenicity was seen after the vegetable diet. Results from chemical analyses (Prof. Mark Knize, Livermore, U.S.A.) with the heterocyclic aromatic amine PhIP suggest that the shift in mutagenicity might be due to enhancement of glucuronidation reactions. Overall the results from our studies suggest that cruciferous vegetables affect the metabolism of carcinogens in humans.