

Trace Levels of Animal Carcinogens in Coffee: An Evaluation of their Human Cancer Risk in Light of the Health Benefits from Maillard Reaction Products

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SUMMARY

In 2002, Swedish researchers found acrylamide in many fried and baked foods, especially potato chips and French fries, at levels from 30-2,300 parts per billion. Acrylamide production was attributed to the higher temperatures reached in Maillard non-enzymatic browning reactions required for desirable color, flavor, aroma and texture production. Both unbrewed and brewed coffees have since been shown to contain measurable levels of acrylamide. Acrylamide is a neurotoxicant and rodent carcinogen. Academic, government and industry research groups have initiated major acrylamide research programs to determine intakes in various countries' diets, means to mitigate its formation and whether or not it is a significant public health risk. The current consensus is that currently available information on acrylamide in foods is not sufficient to draw firm conclusions about its cancer risk to humans. International authorities have stated that there is no indication at this time that consumers need to change their eating or drinking habits.

In late 2003, the European Union initiated a major research program (HEATOX) to expand the acrylamide database in foods and seek ways to mitigate its formation. HEATOX is also focussing on other toxicants/carcinogens produced by heating and cooking foods. In addition, the U.S. FDA in May 2004 released preliminary data on the presence of furan (another rodent carcinogen) in a range of heated foods up to 160 ppb, with concentrations in brewed coffee up to about 80 ppb.

An important toxicological consideration that has received little attention to date is that many Maillard Reaction Products (MRPs) have been shown to be beneficial to health, including many antioxidants, anti-mutagens and anti-carcinogens. MRPs have also been identified that induce the formation of carcinogen-detoxifying enzymes, including glutathione transferase, the enzyme known to detoxify acrylamide. In addition, furan has been shown to be a good antioxidant, as have many other volatile heterocyclic flavor compounds as well as the melanoidins, the complex brown Maillard polymers.

The dietary human cancer risk of acrylamide and furan in coffee must be evaluated in light of their metabolic disposition in the human body, the extensive epidemiological database on coffee consumption and cancer and the beneficial health effects known to be produced by the Maillard reaction. The results of ongoing global research efforts on the health effects of heat processing and cooking of foods and beverages, including coffee, must be used to carefully evaluate both the risks and benefits of these heat-induced compounds.