MedicalXpress

Compounds in saliva and common body proteins may fend off DNA-damaging chemicals

May 30 2014

A compound in saliva, along with common proteins in blood and muscle, may protect human cells from powerful toxins in tea, coffee and liquid smoke flavoring, according to results of a new study led by investigators at the Johns Hopkins Kimmel Cancer Center.

The findings, reported online May 19 in *Food and Chemical Toxicology*, suggest that people naturally launch multiple defenses against plant chemicals called pyrogallol-like polyphenols or PLPs found in teas, coffees and liquid smoke flavoring. The presence of these defenses could help explain why PLPs are not crippling cells and causing illness as would be expected from their toxic punch and widespread use, the researchers say.

Last year, Johns Hopkins investigator Scott Kern, M.D., and his colleagues demonstrated that PLPs found in everyday foods and flavorings could do significant damage by breaking strands of DNA, the carrier of all genetic information. The impact of the toxins was so strong—in some cases producing 20 times the damage of chemotherapy drugs delivered to cancer patients—that the researchers immediately thought to find out why there wasn't more damage, and to look for ways that cells might be fighting back.

"If these chemicals are so widespread—they're in flavorings, tea, coffee—and they damage DNA to such a high degree," Kern said, "we

thought there must be defense mechanisms that protect us on a daily basis from plants we choose to eat."

Kern and colleagues found that an enzyme in saliva called alpha-amylase, the blood protein albumin, and the muscle protein myoglobin all protected cells from DNA breakage by tea, coffee and isolated PLPs. The researchers identified the amount of DNA damage in the cells by looking for high activity levels of a gene called p53. The gene helps repair DNA damage.

"It was quite easy to uncover a few of these protective substances against the tested cancer therapeutic drugs, which suggests there may be many more layers of defenses against toxins," said Kern, the Kovler Professor of Oncology and Pathology at the Johns Hopkins University School of Medicine.

Kern emphasized that the saliva enzyme and the proteins did not protect against chemotherapeutic drugs, which can also damage DNA, a fact suggesting that defenses against PLPs may have evolved over time, in response to natural plant compounds that have been part of human diets for a long time.

Surprisingly, he says, the cells did not seem to need these protein protectors after a period of exposure to the toxins. "After about two weeks we found it difficult to get the cells to be damaged by the same chemicals, even if they were damaged by the chemicals weeks earlier," Kern explained. "They seem to have some innate ability to respond to the damage or sense it and somehow protect themselves against it, even in the absence of albumin, muscle proteins or saliva components."

"It made us wonder, do people who eat the same PLP-containing diet day after day develop a natural cellular protection to the toxins," Kern asked, "so that, as has been said before, what doesn't kill us makes us

stronger?"

The researchers plan to explore further how albumin, myoglobin and salivary alpha-amylase protect against PLPs and learn more about other possible innate defenses against the chemicals. Kern also plans to study how these natural defenses might be circumvented in some people, causing cancers or other illnesses.

Kern says the findings also invite speculation as to whether a morning cup of coffee might be less harmful to our bodies if it is enjoyed with the protective myoglobins in a few strips of bacon. Or if eating smoked meats might be less toxic if they are tasty enough to make a diner salivate. But Kern cautions that these ideas are just that—speculation.

More information: Paper: dx.doi.org/10.1016/j.fct.2014.05.002

Provided by Johns Hopkins University School of Medicine