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Reheating Vegetable Oil Releases Toxin Study

Research implicates cooking oils used in homes and restaurants

By E.J. Mundell
HealthDay Reporter

FRIDAY, May 6 (HealthDay News) -- High amounts of a toxin with known connections to heart disease and neurological disorders accumulate in vegetable-based cooking oils that are heated or reheated for hours at a time, new research shows.



The fatty acid-derived toxin, called 4-hydroxy-trans-2-nonenal (HNE), forms in especially high amounts in polyunsaturated oils that have linoleic acid, which is found in canola, corn, soybean and sunflower, researchers say. The compound does not form in saturated oils sourced from animal fat.

"There's a tremendous literature in biochemistry on HNE, a library of studies goes back 20 years. It's a very toxic compound," said lead researcher A. Saari Csallany, professor of food chemistry and nutritional biochemistry at the University of Minnesota.

Based on the findings, American Dietetic Association spokeswoman Jeannie Moore said that "if a person is concerned about the health aspects of HNE, then my recommendations would be to never heat any oil to the point of smoking and, as cooking at home goes, just use the oil one time. And avoid eating fried food at restaurants."

Donna Garren, a regulatory affairs executive with the National Restaurant Association which represents more than 358,000 of the nation's eating establishments, said there are no industry-wide rules currently in place governing the choice and maintenance of cooking oils.

But, she added, "if there is a risk, we'd be concerned about that and want to work with the appropriate federal agency to look at a thorough risk assessment."

The findings were presented this week at the American Oil Chemists Society annual meeting, in Salt Lake City.

According to Csallany, who conducted the research with graduate student Chris

Seppanen, HNE has a long pedigree as a health threat to humans. Numerous studies have linked HNE consumption to increased risks for cardiovascular disease, stroke, Parkinson's, Alzheimer's, Huntington's disease, liver ailments and even cancer, she said.

Vegetable-based monounsaturated and polyunsaturated fats are inherently unstable, especially at high temperatures, Csallany said. And "HNE arises from linoleic acid [contained in these oils]. For example, soybean oil is about 54 percent linoleic, a bit lower, corn oil a little higher, maybe 60 percent, and sunflower oil is even higher than that," she added.

"HNE's toxicity is that it reacts very energetically with biomolecules" once it is absorbed into the body via food, Csallany said. "It reacts with the various kinds of amino groups -- proteins, DNA, RNA, affecting basic cellular processes," she added.

In their previous work, Csallany and Seppanen discovered that HNE tends to form in vegetable oils at high temperatures, accumulating steadily over a period of up to 24 hours, after which point it begins to decompose.

A study they published last year in the *Journal of the American Oil Chemists' Society* also found that the level of absorbed HNE in French fries was equal to HNE concentrations in the oil the fries were cooked in, she said.

"Our next question was, 'So, what happens if somebody at home is using oil for 24 hours, then lets it stand overnight for two or three days? Does it decompose by itself? Or if it's reheated does the accumulation start adding up again?'" Csallany said.

Their latest experiment found that "intermittent heating is just as bad as continuous heating," Csallany said.

Based on the findings, she recommends that people avoid foods fried in polyunsaturated vegetable oils.

"It's not so bad if you eat these foods once or twice in a while, but if you are continuously eating them, and the oils are neglected, kept aside, that's not so healthy," she said.

And what about fast-food restaurants, where deep fryers are kept hot and active all day?

"Smaller operations tend to use soybean oil or some other vegetable oil," Csallany said. "At the chains -- although we haven't tested there -- they generally use hydrogenated soybean oil. Hydrogenation doesn't get rid of the linoleic acid, but it could make it a little less. However, it's still there in high concentrations."

Moloo agreed that the real concern is restaurant fare. "I'm not so worried about home cooking using a vegetable oil -- using a corn or soybean oil to stir-fry vegetables, for example -- because most of the time it's a short, one-time use," she said. "I'm more concerned about fried foods in restaurants, where the oil may be used over and over."

Garren said, "It's the option of the [restaurant] operator as to what combination of oils they use -- they might want to use a combination of animal (protein-based) and vegetable oils, depending on palatability."

As to changing the oil, she added, "There is mention of maintenance of oils in the [U.S. Food and Drug Administration's] Food Code, and it leaves it to the discretion of the operator."

the operator, based on the cleanliness of the oils."

She noted, however, that too-frequent changing of cooking oils can bring its own problems.

"You have to make sure that you aren't wasting oils that are perfectly good to use because then you have disposal issues. We want to make sure we're not creating another problem by arbitrarily dumping oil," she said.

But Moloo says dumping vegetable-based cooking oil after use may be a good idea at least in residential kitchens.

"If you deep-fry foods at home, throw out the oil after cooking rather than saving it," she said. "And if HNE is a concern for you, then one of the ways to eliminate it from your diet is simply not to eat these fried foods."

She also noted that not all vegetable oils are created equal.

"Oils that are high in saturated fats and monounsaturated fats are the most stable when heated -- from a vegetable oil standpoint, those would include peanut and olive oil," the nutritionist said.

Other polyunsaturated oils such as soybean, corn, canola or sunflower "might be used at room temperature, such as in salad dressings," she added.

For her part, Csallany said she would abandon vegetable oils as a cooking staple altogether.

"If I was frying, I'd go back to beef tallow -- it's very high in oleic acid," which does not produce HNE, she said. "And there's new information that shows that not all [animal-based] saturated fats are the same. Stearic acid, for example, is found in animal saturated fat and it doesn't increase cholesterol and doesn't produce HNE."

But Moloo is more leery of any switch back to animal oils.

"Anytime we're looking at eating a lot of fat in the diet it's going to cause problems, whether it's toxic compounds that come out through the heating process, or other components of the fat, such as high cholesterol levels," she said.

For its part, the National Restaurant Association intends to wait for word from the FDA, which has the power to issue guidances on these types of issues.

At this point, Garren said, "it would be fairly arbitrary for us to make a decision. Obviously, we'd want to carefully monitor this and be of any help we can be to the FDA in moving forward with a thorough risk assessment."

More information

For much more on dietary fats and oils, visit the [American Dietetic Association](#)

SOURCES: A. Saari Csallany, D.Sc., professor, food chemistry and nutritional biochemistry, University of Minnesota, Minneapolis/St. Paul; Jeannie Moloo, registered dietitian, Sacramento, Calif., and spokeswoman, American Dietetic Association; Garren, Ph.D., vice president, health and safety, regulatory affairs, National

Restaurant Association; May 4, 2005, presentation, American Oil Chemists Soc annual meeting, Salt Lake City

Last Updated: May-06-2005

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