

How healthy is genetically modified soybean oil?

5 March 2015

Soybean oil accounts for more than 90 percent of all the seed oil production in the United States.

Genetically modified (GM) soybean oil, made from seeds of GM soybean plants, was recently introduced into the food supply on the premise that it is healthier than conventional soybean oil.

But is that premise true?

Just barely, say scientists at the University of California, Riverside and their colleagues at UC Davis. The researchers compared the effects of both oils in experiments performed in the lab on mice. They found that the GM soybean oil is just as unhealthy as regular soybean oil in that it also induces obesity, diabetes and fatty liver. GM soybean oil does, however, have one advantage: it does not cause insulin resistance - the inability to efficiently use the hormone insulin.

"While genetic modification of crops can introduce new beneficial traits into existing crops, the resulting products need to be tested for long-term health effects before making assumptions about their impact on human health," said senior investigator Frances Sladek, a professor of cell biology and neuroscience at UC Riverside.

Study results will be presented tomorrow, March 6, at the Endocrine Society's 97th annual meeting, currently taking place in San Diego, Calif., by Poonamjot Deol, an assistant project scientist in the Department of Cell Biology and Neuroscience who is driving the project in the Sladek lab.

Naturally high in unsaturated fats, vegetable oils were once thought to be healthy, and were hydrogenated to increase their shelf-life and temperature stability. The hydrogenation, however, generated *trans* fats - now widely recognized as being unhealthy.

Soybean oil, the most common vegetable oil used in the United States, contains about 55 percent

linoleic acid, a polyunsaturated fat.

"Our previous results on mice showed that replacing some of the fat in a [diet](#) high in saturated fats from [coconut oil](#) with soybean oil - to achieve a level common in the American diet - causes significantly more weight gain, adiposity, diabetes and insulin resistance than in mice fed just the high-fat coconut oil diet," Sladek said.

To determine whether linoleic acid was responsible for the metabolic effects of soybean oil, the researchers designed a parallel diet in which regular soybean oil was replaced, on a per gram basis, with GM soybean oil. The GM soybean oil has a fatty acid composition (low linoleic acid) similar to that of olive oil. The GM plants were developed by DuPont to reduce *trans* fat production, increase soybean oil shelf life and create a generally healthier cooking oil.

"The GM soybean oil has 0 grams *trans* fat and more of the monounsaturated fats that are considered heart healthy," Deol said. "But it had not been tested for long term metabolic effects until our current study."

Deol and the rest of the research team found to their surprise that the parallel diet containing GM soybean oil induced weight gain and fatty liver essentially identical to that of a diet with regular soybean oil, with the exception that the mice remained insulin sensitive and had somewhat less adipose (fat) tissue.

"These results indicate that linoleic acid may contribute to insulin resistance and adiposity but that another as yet unidentified component of the soybean oil affects the liver and overall weight gain," Deol said.

In their experiments, the researchers gave four groups of mice different diets for 24 weeks. Each group was comprised of 12 mice. The control group

received a low-fat diet (5 percent of daily calories from fat). The other groups received a diet with 40 percent of daily calories from fat, an amount common in the American diet. One diet was high in saturated fat from coconut oil, and one had 41 percent of the saturated fat replaced with regular soybean oil. The fourth group had 41 percent of the saturated fat replaced with the GM soybean oil. The body weights, food intake, glucose tolerance and insulin sensitivity of all the mice were tracked.

What the researchers found was that mice fed a diet with either of the soybean oils had worse fatty liver, glucose intolerance and obesity than the group that got all their fat from coconut oil. But the mice whose diet included the GM soybean oil had less fat tissue than the animals that ingested regular soybean oil. These mice weighed about 30 percent more than the controls that ate a low-fat diet, while the group on the diet containing regular soybean oil weighed 38 percent more than controls. The mice on the diet that was primarily coconut oil weighed only about 13 percent more than controls. Unlike the diet with regular soybean oil, the diet with the new GM soybean oil did not lead to insulin resistance.

"While the GM soybean oil may have fewer negative metabolic consequences than regular soybean oil, it may not necessarily be as healthy as olive oil, as has been assumed by its fatty acid composition, and it is certainly less healthy than coconut oil which is primarily saturated fat," Sladek said. "It is important to understand the metabolic effects and health impact of the GM soybean oil before it is widely adopted as a healthier alternative to regular soybean oil. It is equally important to understand the health effects of regular soybean oil, which is ubiquitous in the American diet and seems to be much more detrimental to metabolic health than saturated fat."

Sladek and Deol were joined in the research by Jane R. Evans, Antonia Rizo and Cynthia Perez at UCR; and Johannes Fahrman, Dimitry Grapov, Jun Yang and Oliver Fiehn at UC Davis who performed extensive analysis on the liver and blood samples from these mice.

"To our knowledge this is the first in-depth analysis

of the [metabolic effects](#) of GM soybean oil, and the first metabolomics analysis comparing [soybean oil](#) - regular and GM - to coconut oil," Deol said.

Provided by University of California - Riverside

APA citation: How healthy is genetically modified soybean oil? (2015, March 5) retrieved 22 October 2021 from <https://medicalxpress.com/news/2015-03-healthy-genetically-soybean-oil.html>

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