It's in McDonald's fries, Pizza Hut crust, and the "healthy" *9-grain bread used for your Subway sandwich.*

This has been spoken about for decades but commercial interests take little notice and simply change to a similar product

America's most widely consumed oil causes genetic changes in the brain

Soybean oil linked to metabolic and neurological changes in mice

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University of California – Riverside

New research shows soybean oil not only leads to obesity and diabetes, but could also affect neurological conditions like autism, Alzheimer's disease, anxiety, and depression.

FULL STORY

New UC Riverside research shows soybean oil not only leads to obesity and diabetes, but could also affect neurological conditions like autism, Alzheimer's disease, anxiety, and depression.

Used for fast food frying, added to packaged foods, and fed to livestock, soybean oil is by far the most widely produced and consumed edible oil in the U.S., according to the U.S. Department of Agriculture. In all likelihood, it is not healthy for humans.

It certainly is not good for mice. The new study, published this month in the journal *Endocrinology*, compared mice fed three different diets high in fat: soybean oil, soybean oil modified to be low in linoleic acid, and coconut oil.

The same UCR research team found in 2015 that soybean oil induces obesity, diabetes, insulin resistance, and fatty liver in mice. Then in a 2017 study, the same group learned that if soybean oil is engineered to be low in linoleic acid, it induces less obesity and insulin resistance.

However, in the study released this month, researchers did not find any difference between the modified and unmodified soybean oil's effects on the brain. Specifically, the scientists found pronounced effects of the oil on the hypothalamus, where a number of critical processes take place.

"The hypothalamus regulates body weight via your metabolism, maintains body temperature, is critical for reproduction and physical growth as well as your response to stress," said Margarita Curras-Collazo, a UCR associate professor of neuroscience and lead author on the study.

The team determined a number of genes in mice fed soybean oil were not functioning correctly. One such gene produces the "love" hormone, oxytocin. In soybean oil-fed mice, levels of oxytocin in the hypothalamus went down.

The research team discovered roughly 100 other genes also affected by the soybean oil diet. They believe this discovery could have ramifications not just for energy metabolism, but also for

proper brain function and diseases such as autism or Parkinson's disease. However, it is important to note there is no proof the oil causes these diseases.

Additionally, the team notes the findings only apply to soybean oil -- not to other soy products or to other vegetable oils.

"Do not throw out your tofu, soymilk, edamame, or soy sauce," said Frances Sladek, a UCR toxicologist and professor of cell biology. "Many soy products only contain small amounts of the oil, and large amounts of healthful compounds such as essential fatty acids and proteins."

A caveat for readers concerned about their most recent meal is that this study was conducted on mice, and mouse studies do not always translate to the same results in humans.

Also, this study utilized male mice. Because oxytocin is so important for maternal health and promotes mother-child bonding, similar studies need to be performed using female mice.

One additional note on this study -- the research team has not yet isolated which chemicals in the oil are responsible for the changes they found in the hypothalamus. But they have ruled out two candidates. It is not linoleic acid, since the modified oil also produced genetic disruptions; nor is it stigmasterol, a cholesterol-like chemical found naturally in soybean oil.

Identifying the compounds responsible for the negative effects is an important area for the team's future research.

"This could help design healthier dietary oils in the future," said Poonamjot Deol, an assistant project scientist in Sladek's laboratory and first author on the study.

"The dogma is that saturated fat is bad and unsaturated fat is good. Soybean oil is a polyunsaturated fat, but the idea that it's good for you is just not proven," Sladek said.

Indeed, coconut oil, which contains saturated fats, produced very few changes in the hypothalamic genes.

"If there's one message I want people to take away, it's this: reduce consumption of soybean oil," Deol said about the most recent study.

Story Source:

Materials provided by **University of California - Riverside**. Original written by Jules Bernstein. *Note: Content may be edited for style and length.*

Journal Reference:

1. Poonamjot Deol, Elena Kozlova, Matthew Valdez, Catherine Ho, Ei-Wen Yang, Holly Richardson, Gwendolyn Gonzalez, Edward Truong, Jack Reid, Joseph Valdez, Jonathan R Deans, Jose Martinez-Lomeli, Jane R Evans, Tao Jiang, Frances M Sladek, Margarita C Curras-Collazo. **Dysregulation of Hypothalamic Gene Expression and the Oxytocinergic System by Soybean Oil Diets in Male Mice**. *Endocrinology*, 2020; DOI: 10.1210/endocr/bqz044

Abstract

Soybean oil consumption has increased greatly in the past half-century and is linked to obesity and diabetes. To test the hypothesis that soybean oil diet alters hypothalamic gene expression in conjunction with metabolic phenotype, we

performed RNA sequencing analysis using male mice fed isocaloric, high-fat diets based on conventional soybean oil (high in linoleic acid, LA), a genetically modified, low-LA soybean oil (Plenish), and coconut oil (high in saturated fat, containing no LA). The 2 soybean oil diets had similar but nonidentical effects on the hypothalamic transcriptome, whereas the coconut oil diet had a negligible effect compared to a low-fat control diet. Dysregulated genes were associated with inflammation, neuroendocrine, neurochemical, and insulin signaling. Oxt was the only gene with metabolic, inflammation, and neurological relevance upregulated by both soybean oil diets compared to both control diets. Oxytocin immunoreactivity in the supraoptic and paraventricular nuclei of the hypothalamus was reduced, whereas plasma oxytocin and hypothalamic Oxt were increased. These central and peripheral effects of soybean oil diets were correlated with glucose intolerance but not body weight. Alterations in hypothalamic Oxt and plasma oxytocin were not observed in the coconut oil diet enriched in stigmasterol, a phytosterol found in soybean oil. We postulate that neither stigmasterol nor LA is responsible for effects of soybean oil diets on oxytocin and that Oxt messenger RNA levels could be associated with the diabetic state. Given the ubiquitous presence of soybean oil in the American diet, its observed effects on hypothalamic gene expression could have important public health ramifications.

Keywords: Plenish; coconut oil; diabetes; high-fat diet; linoleic acid; oxytocin; stigmasterol.

Would you like brain damage with that? America’s favorite cooking oil causes neurological changes, says animal study

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Peter Andrews *is an Irish science journalist and writer, based in London. He has a background in the life sciences, and graduated from the University of Glasgow with a degree in Genetics.*

New research has shown that despite being marketed as a healthy alternative, soybean oil, America's most popular oil, causes neurological changes in the brains of mice, and may contribute to autism and dementia in humans.

Extracted from the seeds of soybeans and used in everything from fast food to animal feed and even baby formula, soybean oil is easily the most widely consumed oil in the US, ubiquitous in the national cuisine.

It's in McDonald's fries, Pizza Hut crust, and the *"healthy"* 9-grain bread used for your Subway sandwich.

A research team from University of California, Riverside has been studying the impact of soybean oil for several years. They previously found that it induces diabetes and obesity in mice, hardly surprising given that vegetable oils are high in saturated and unsaturated fatty acids. By now, most people know that eating too much fried food is bad for your ticker.

But what is really shocking about their latest findings is the effect soybean oil seems to have on the brain.

From Alzheimer's to autism

The study is published in Endocrinology, a scientific journal, and it shows that when soybean oil is fed to mice it has major impact on their hypothalamus, an area of the brain crucial for regulating mood and behaviour.

More worryingly, it even affected over 100 of the mice's genes, including one for controlling oxytocin, the love and bonding hormone. Soybean-fed mice showed lower levels of oxytocin in the hypothalamus. Other genes affected had to do with metabolic and hormone pathways, including the insulin pathway, synonymous with diabetes. There was also upregulation of genes associated with anxiety, depression, and schizophrenia.

Considering the evidence, the authors believe that soybean oil could increase the risk of Parkinson's disease, Alzheimer's disease, and autism. However, there is no concrete proof yet that soybean oil causes these conditions, since this research was conducted on male mice only. But mice are used as a model organism for human health for a reason, as a mammal species they have similar tissues and genetics to us, and it is reasonable to provisionally project some of the authors' health warnings onto humans.

Lead author Poonamjot Deol said: *"If there's one message I want people to take away, it's this: reduce consumption of soybean oil."*

Is the GM version better?

There is a genetically engineered form of soybean oil that has a lower linoleic acid (LA) content, and this form is healthier for the heart. The authors also fed mice this form to see whether the results would be any better, but the low-LA form had a similarly detrimental effect on the mice's brains.

It is produced from what are called Roundup Ready soybeans, designed for use with the signature product of bought-out agrochemical firm Monsanto, which is embroiled in a controversy of its own.