

Trans fats hinder multiple steps in blood flow regulation pathways

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Partially hydrogenated vegetable oils in processed foods contain trans fatty acids that interfere with the regulation of blood flow. A new report reveals a new way in which these "trans fats" gum up the cellular machinery that keeps blood moving through arteries and veins.

In the August 2009 issue of the international journal *Atherosclerosis*, University of Illinois emeritus veterinary biosciences professor Fred Kummerow reports for the first time that [trans fats](#) interfere with more than one key enzyme in the regulation of blood flow.

Kummerow begins by describing the two main causes of heart disease - sudden blood clots in the coronary arteries, and atherosclerosis, the buildup of plaque in the arteries to the point where it interferes with blood flow.

"The arteries of someone who dies from atherosclerosis look like old scrub boards as a result of the formation of plaques," Kummerow said. "They look corrugated, and this plaque buildup continues to the point where it will stop blood flow."

Trans fats contribute to both of these causes of heart disease, Kummerow said.

Trans fats are made through hydrogenation, which involves bubbling hydrogen through hot vegetable oil, changing the arrangement of double bonds in the essential fatty acids in the oil and "saturating" the

"unsaturated" carbon chain with hydrogen. Because double bonds are rigid, altering them can straighten or twist fat molecules into new configurations that give the fats their special qualities, such as the lower melting point of margarine that makes it creamy at room temperature.

Kummerow, 94, has spent nearly six decades studying lipid biochemistry, and is a long-time advocate for a ban on trans fats in food.

While the body can use trans fats as a source of energy for maintenance and growth, Kummerow said, trans fats interfere with the body's ability to perform certain tasks critical to good health. Because these effects are less obvious, many researchers have missed the underlying pathologies that result from a diet that includes trans fats, he said.

Trans fats displace - and cannot replace - the essential fatty acids linoleic acid (omega-6) and linolenic acid (omega-3), which the body needs for a variety of functions, including blood flow regulation. Studies have shown that trans fats also increase low-density lipoproteins (LDLs) in the blood, a factor which some believe contributes to heart disease.

Trans fats are associated with increased inflammation in the arteries. And trans fats have been found to change the composition of cell membranes, making them more leaky to calcium. Inflammation, high LDL cholesterol and calcified arteries are the signature ingredients of atherosclerosis.

Trans fats also were shown to interfere with an enzyme that converts the essential fatty acid linoleic acid into arachidonic acid, which is needed for the production of prostacyclin (a blood-flow enhancer) and thromboxane (which regulates the formation of blood clots needed for wound healing). While some in the food oil industry believed this problem could be overcome simply by adding more linoleic acid to partially hydrogenated fats, in 2007 Kummerow's team reported that

extra linoleic acid did not overcome the problem.

"Trans fats inhibited the synthesis of arachidonic acid from linoleic acid, even when there was plenty of linoleic acid available," he said.

The new study reports that in addition to interfering with the production of arachidonic acid from linoleic [acid](#), trans fats also reduce the amount of prostacyclin needed to keep blood flowing. Thus blood clots may more easily develop, and sudden death is possible.

According to the American Heart Association, each year more than 330,000 people in the U.S. die from coronary heart disease before reaching a hospital or while in an emergency room. Most of those deaths are the result of sudden cardiac arrest, the Heart Association reports.

"This is the first time that trans [fatty acids](#) have been shown to interfere with yet another part of the [blood-flow](#) process," Kummerow said. This study adds another piece of evidence to a long list that points to trans fats as significant contributors to [heart disease](#), he said.

Kummerow believes the U.S. Food and Drug Administration's new requirement (begun in 2006) that trans fats be included on food labels is inadequate and misleading. Anything less than one-half gram of trans fats per serving can be listed as zero grams, Kummerow said, so people are often getting the mistaken impression that their food is trans fat-free.

"Go to the grocery store and compare the labels on the margarines," he said. "Some of them say zero trans fat. That's not true. Anything with partially hydrogenated oils in it contains trans fat."

"Partially hydrogenated fats can be made trans fat-free," Kummerow said. "The industry would be helped by an FDA ban on trans fat that would save labeling costs, medical costs and lives."

Source: University of Illinois at Urbana-Champaign ([news](#) : [web](#))

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