

Профессора Такуйа Ногучи и Ацуши Мацузава из Университета Тохуку, Япония, установили, что транс-жиры часто выступают непосредственной причиной смерти ряда клеток в организме без промежуточного механизма активации реактивного кислорода. Транс-жирами особенно богаты чипсы, кондитерские изделия, многие продукты масложировой промышленности.

Злоупотребление этими продуктами с точки зрения ученых приводит к ускоренному развитию атеросклероза, стенокардии (сердечной жабы), инфарктов и инсультов. С другой стороны целый ряд жиров, особенно растительных, наоборот имеют защитные свойства. Этикетки таких защитных жиров легко найти на полках магазинов по этикеточной надписи: «Рекомендовано Российской Диабетической Ассоциацией».
The action of trans-fatty acids may be more damaging to cells than previously thought, as a study reveals the mechanism by which cell death occurs faster, leading to atherosclerosis, heart attacks and strokes.
The research team, led by associate professor Takuya Noguchi and professor Atsushi Matsuzawa, from Tohuku University, Japan suggest that trans-fatty acids (TFAs) - by products from the food manufacture of baked goods, cakes and crackers - promote cell death without increasing reactive oxygen species (ROS), contradicting previous explanations.
The team believe this step is bypassed as TFAs appear to boost extracellular energy levels, which activate two enzymes that go on to promote cell death in a series of chain reactions.
In addition, the researchers found that the TFAs elaidic acid, linoelaidic acid and trans-vaccenic acid all played a significant role in promoting cell death.
"These results demonstrate that TFAs promote extracellular ATP-induced apoptosis by targeting ASK1 and indicate novel TFA-associated pathways leading to inflammatory signal transduction and cell death that underlie the pathogenesis and progression of TFA-induced atherosclerosis," the researchers explained.
"Our study thus provides insight into the pathogenic mechanisms of and proposes potential therapeutic targets for these TFA-related disorders".
With these findings, food manufacturers could gain deeper insights into how TFAs function, which could lead to the development of less damaging versions that could reduce their need in food.
TFA intake has been linked to the rising tide of cardiac complications and obesity, particularly in industrialised nations.
Previous studies have shown that a ban of TFAs in diets could reduce the risk of heart attacks

and strokes and could potentially prevent thousands of deaths.

ROS: the missing step

The role of ROS has been considered central in atherosclerotic formation. It was previously thought that ATP energy molecules generate further ROS.

This in turn, triggers the ASK1 kinase enzyme that further promotes the cell death process.

TFAs were thought to accelerate the cell death process by generating more ROS.

Although it is already known that TFAs are harmful, little research has been done on the specific mechanisms that make them so.

Study details

The study compared the effects of two of the most abundant TFAs in processed foods - elaidic acid and oleic acid - in a mouse cell line (RAW264.7) by pre-treating the cells with 200 μM EA or OA, which were then stimulated with ATP.

RAW264.7 cells were also stimulated with a nonlethal dose of ATP (0.5 mM) in the presence and absence of EA.

Several TFA types - elaidic acid, linoelaidic acid and trans-vaccenic acid - stimulate cell death but not their corresponding cis-fatty acids, which are naturally occurring unsaturated fatty acids with health benefits.

The harmful TFAs are made from these cis-fatty acids through a hydrogenation process commonly used by the food industry.

The research team concluded that future studies should investigate how TFAs lead to the development of atherosclerosis and cardiovascular diseases at a molecular level.

Industry implications

The World Health Organization (WHO) recommend that intake of trans-fat should be “as low as possible” and should be less than 1% of total energy intake.

This equates to no more than 2 grams (g) of trans-fat per day for a person requiring 2000 calories.

Industrially produced trans-fat can comprise up to 60% of a product's fat content, according to the organisation, and is commonly found in pies, hash browns, chicken nuggets and pastries.

Many European countries have introduced legislative limits on trans-fat, including Denmark, Switzerland and Iceland.

This normally caps trans-fat at 2 g per 100 g of fat or oil.

The United Kingdom has a public Health Responsibility Deal which contains a set of public health goals which food companies can voluntarily pledge to achieve. The 3rd goal is to remove artificial trans-fats from all foods.

The UK health service, NHS, has reported that trans-fat in diets are already at low levels compared to 10 or 20 years ago.

Source: Journal of Biological Chemistry
Published online: DOI: 10.1074/jbc.M116.771519
"Trans-fatty acids promote proinflammatory signaling and cell death by stimulating the apoptosis signal-regulating kinase 1 (ASK1)-p38 pathway".
Authors: Yusuke Hirata, Miki Takahashi, Yuki Kudoh, Kuniyuki Kano, Hiroki Kawana, Kumiko Makide, Yasuharu Shinoda, Yasushi Yabuki, Kohji Fukunaga, Junken Aoki, Takuya Noguchi, and Atsushi Matsuzawa