Are you really what you eat?

How ultra-processed food may reach your brain through your gut, and what scientists know so far about the route.

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Background. Ultra-processed foods are industrial products made mostly from refined ingredients and additives. They supply more than half of the calories eaten in the United States and the United Kingdom. Large studies have linked them to faster decline in memory and thinking, a higher risk of dementia, and early signs of damage on brain scans. People have long said "you are what you eat". Research on the gut and the brain now gives that saying a physical meaning.

Purpose. To explain, for a general audience, why the health of your gut matters to your brain, and how ultra-processed food can harm both.

What the evidence shows. Studies in people point the same way. In Brazil, adults who ate the most ultra-processed food declined faster on memory and thinking tests over eight years. In the United Kingdom, heavy consumers had a higher risk of dementia and of Parkinson's disease. A Canadian scan study found early damage to the brain's small blood vessels in middle age, before any symptoms. Swapping some ultra-processed food for minimally processed food went with a lower risk.

What this means for you. Whether the processing itself is to blame, or the sugar, salt, fat and missing fiber that come with it, is not yet settled. Either way the answer is the same. Eating mostly whole foods has never failed anyone, and the earlier the habit starts, the better.

What "ultra-processed" means

Almost nothing we eat is raw. Pasteurizing milk is processing, and it kills germs. Turning corn into a sweetened breakfast cereal is processing too, and it leaves little of the corn behind. Processing in itself is not the problem. The question is how far a food has traveled from the thing it started

as, and why.

Think of the difference between a tomato, a can of tomatoes and a tomato-flavored corn snack. The can is still tomatoes with a little salt. The snack contains no recognizable tomato at all. It is a mixture of starch, oil, sugar, salt, flavorings and colorings, shaped and baked in a factory to look,

smell and taste like something it is not.

Carlos Monteiro, a nutrition researcher in Brazil, introduced the NOVA scale in 2009 as a research tool for identifying how heavily a food has been processed. NOVA sorts every food into four groups by the nature, extent and purpose of its processing.

- Group 1: unprocessed or minimally processed. Fruit, vegetables, grains, beans, eggs, meat, fish, plain milk and plain yogurt. They may be dried, frozen, ground or pasteurized, but nothing is added.
- Group 2: culinary ingredients. Salt, sugar, butter and oils. These come from group 1 foods and are used for cooking, rarely eaten alone.
- Group 3: processed foods. Group 1 foods with salt, sugar or oil added, usually two or three ingredients. Canned vegetables, salted nuts, cheese, cured meat and freshly baked bread.
- Group 4: ultra-processed foods. Industrial formulations, often with five or more ingredients, built from refined parts of foods rather than the foods themselves, such as protein isolates, hydrogenated oils, emulsifiers (which keep oil and water from separating), flavorings, colorings and sweeteners. They are made to be convenient, long-lasting and hard to stop

eating.

There is a simple test you can use in the store. Turn the package over and read the ingredient list. If it names things you would not easily find in a home kitchen, most of the time the product belongs in group 4 and is ultra-processed. Soft drinks, packaged snacks, sweetened breakfast cereals,

flavored yogurts, mass-produced bread, sausages and nuggets, and ready-to-heat meals all belong there.

These foods now make up a large part of what people eat. Ultra-processed food, or UPF for short, supplies about 58% of calories in the United States, 57% in the United Kingdom, 48% in Canada and 30% in Brazil. Among adolescents, estimates run from 29% to 68% of daily calorie intake.

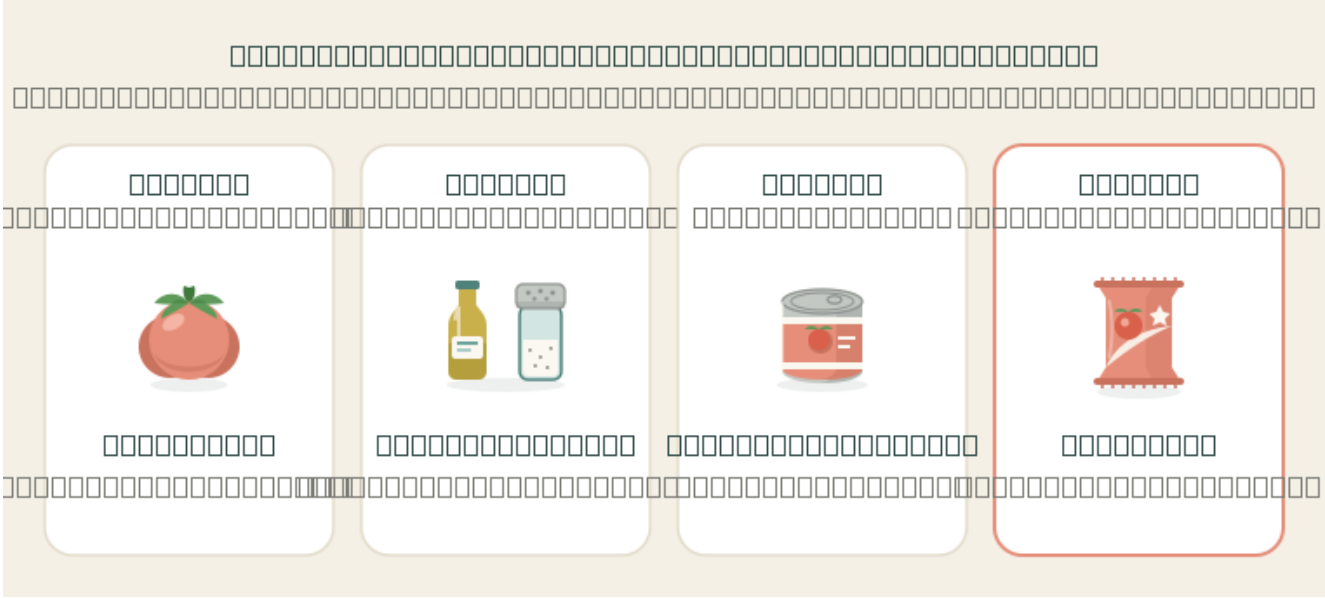


Figure 1. From tomato to tomato snack. The four NOVA groups shown as a row, with everyday examples in each: a tomato, a bottle of oil, a can of tomatoes, a tomato-flavored snack.

What it does to your body

One of the most familiar UPFs on an American breakfast table is sweetened cereal. It is high in refined sugar, unhealthy fats and salt, and low in fiber. It also carries additives such as emulsifiers, colorings and flavorings, and the high-heat processing it goes through creates compounds that can damage nerve cells. Each of these features acts on the body in its own way. Together they set off a chain reaction that can reach the brain.

The chain has four links. UPFs are easy to overeat, and the sugar and fat in them disturb blood sugar and blood fats, meaning the cholesterol and triglycerides that circulate in the bloodstream. The missing fiber and the additives change the microbes living in the gut. A weakened gut lining then lets fragments of those microbes leak into the blood, where the immune system treats them as intruders and stays switched on. That constant low-level inflammation reaches the brain, and the brain's own immune cells react to it.

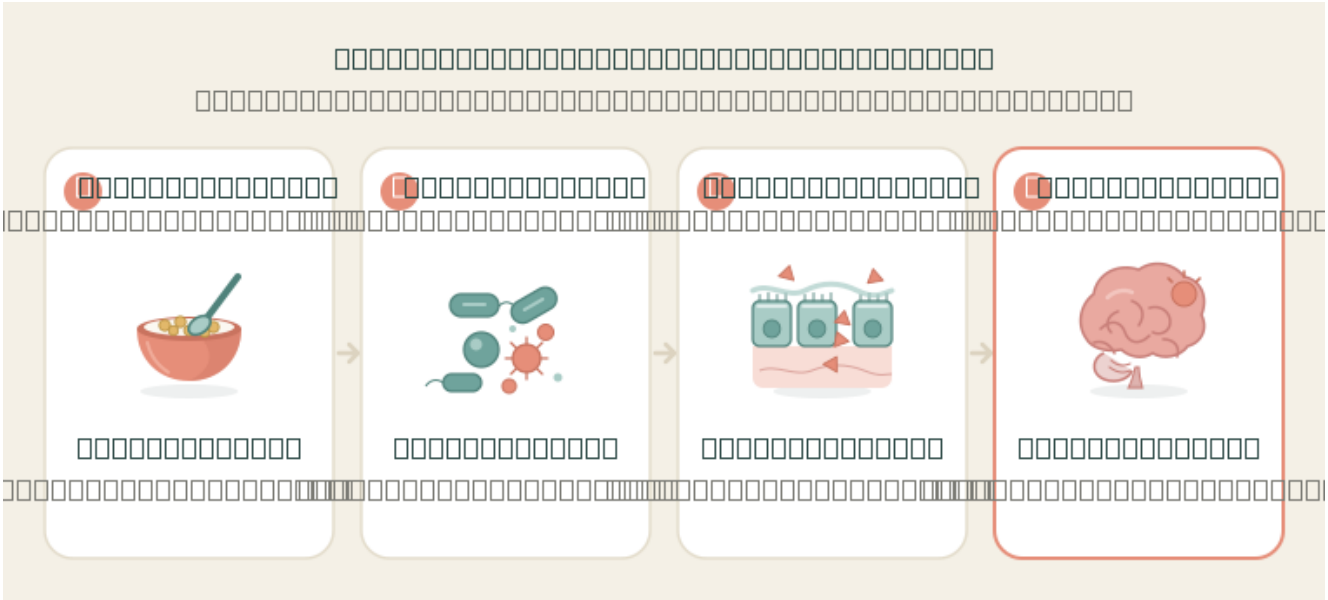


Figure 2. The chain in four links. Overeating, a shift in gut microbes, a leaking gut lining and the brain's response, drawn left to right with what happens at each step.

Step 1: sugar, fat and the overeating problem

Most people know the feeling of finishing a bag of chips without deciding to. UPFs are usually soft, so they go down fast, often before the brain's "full" signal arrives. Their mix of fat and sugar also gives the brain's reward system an unusually strong nudge to keep going. This is the one

link that has been tested in a controlled experiment. Kevin Hall and colleagues at the US National Institutes of Health gave volunteers a UPF diet and a minimally processed diet, one after the other. On the UPF diet they ate faster, ate more calories and gained weight.

Refined sugar does a second thing. Because UPFs are easy to digest, their sugar reaches the blood quickly. Laurel Cherian, a stroke specialist at Rush University Medical Center in Chicago, describes what follows. Blood sugar spikes and then crashes, and the crash triggers hunger "even when sufficient calories have already been consumed". Over

years, repeated spikes push the body toward insulin resistance, the first step on the road to type 2 diabetes. Saturated and hydrogenated fats raise LDL cholesterol, the kind that builds up in artery walls.

In a study of 33,654 adults from the UK Biobank, a long-running British health study, people who ate more UPF had higher blood sugar, higher triglycerides, lower "good" HDL cholesterol, more fat around the waist, and higher C-reactive protein, the standard blood marker of inflammation. Body fat is not just stored energy. It sends out signals that keep the immune system switched on. So the fat a person gains from overeating causes inflammation on its own. Over years it slowly wears down blood vessels and nerve cells, which is why it matters for the brain.

Step 2: the gut's garden goes out of balance

Your gut is home to trillions of microbes, mostly bacteria, together called the gut microbiome. Think of it as a garden. The plants in it depend on what you water them with, and what grows there shapes the soil for everything else. Many of these microbes live on dietary fiber, which your own

digestion cannot break down but the bacteria can. As they ferment it, they release short-chain fatty acids (small molecules that feed the cells lining the gut and calm inflammation). These are the gut's good bacteria.

UPFs are low in fiber, so those bacteria go hungry, and the garden shifts toward species that thrive on sugar and fat instead. The result is an imbalance in the gut's community (dysbiosis). A review from the Catholic University of the Sacred Heart in Rome describes a Spanish study of 186 adults. The

90 who ate more than five servings of UPF a day had fewer of the bacteria that make short-chain fatty acids.

Some additives act on the garden directly. Emulsifiers are the most studied. Two common ones are carboxymethylcellulose, a thickener made from plant fiber, and polysorbate 80, a detergent-like additive that stops oil and water separating. Benoit Chassaing and Andrew Gewirtz at Georgia State University found that, in mice, both thinned the gut's protective

mucus layer and shifted the bacteria toward types linked with inflammation. The same group later ran a small randomized trial in people: 16 healthy adults ate a controlled diet for 11 days, with or without carboxymethylcellulose. Those who ate the emulsifier lost some helpful bacteria and made fewer short-chain fatty acids.

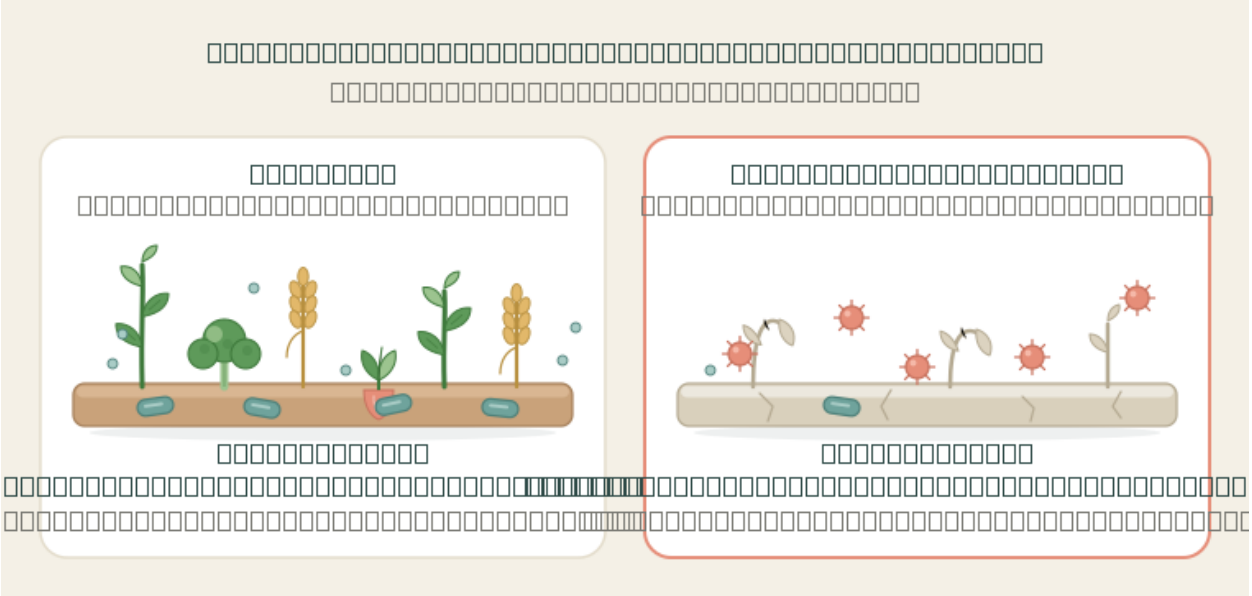


Figure 3. Your gut's garden. Two gardens side by side. One is fed fiber and grows a varied crop that produces short-chain fatty acids. The other is fed UPF and grows fewer, less varied plants.

Step 3: the gut lining, a barrier, starts to leak

The lining of your gut acts as a barrier, and it has a job on both sides. It lets nutrients through into the blood and keeps bacteria out. It does this with a single layer of cells, joined tightly to each other, covered by mucus and patrolled by immune cells underneath. Short-chain fatty acids from the gut's microbes maintain that barrier. They feed the lining cells, encourage mucus and keep the joins tight. When the microbes that make them are starved of fiber, and when additives thin the mucus, the barrier weakens. The medical term is increased intestinal permeability. Most people know it as "leaky gut".

What leaks through is not whole bacteria but fragments of them. The most studied is lipopolysaccharide, a piece of the outer coat of certain bacteria.

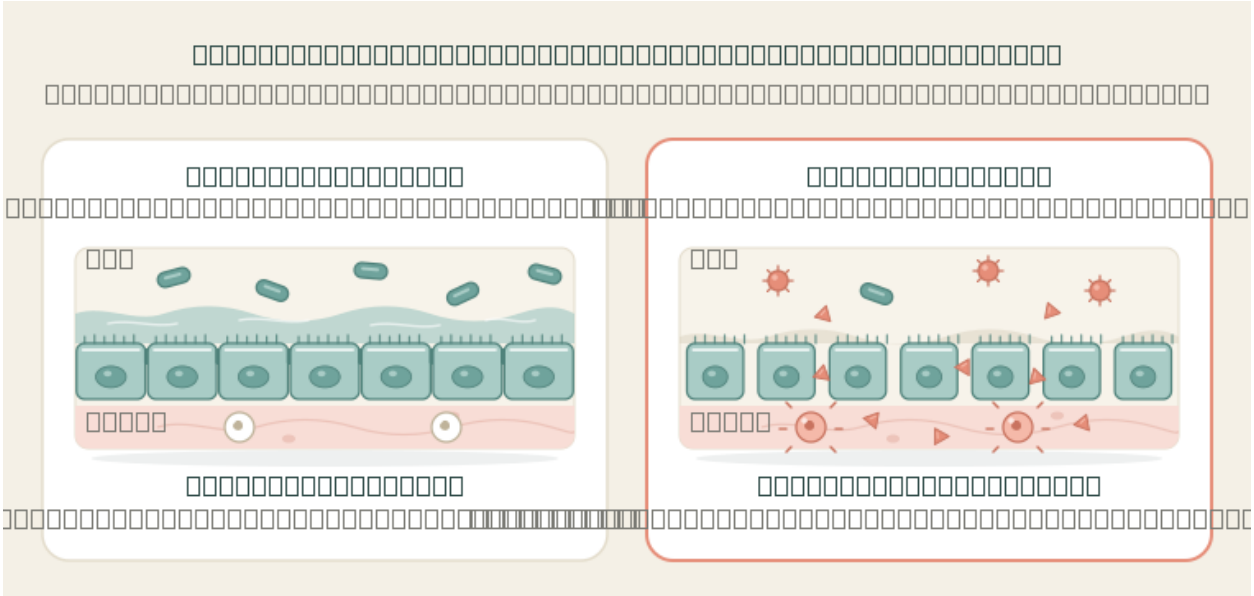


Figure 4. When the barrier leaks. The gut wall in cross-section, with the gut above and the blood below. On the left, a healthy barrier with thick mucus, cells joined tightly and bacteria kept out. On the right, a leaky barrier with thin mucus, loose joins and fragments of bacteria slipping through into the blood, where immune cells react.

Step 4: the immune system stays on alert

Your immune system treats a bacterial fragment in the blood as a sign of invasion and responds with inflammation. Normally that response does its job and switches off. When fragments keep arriving in small amounts, meal after meal, it never fully does. The result is a mild, constant inflammation throughout the body (systemic

low-grade inflammation). This is the same state that underlies heart disease and type 2 diabetes, which is one reason those conditions so often travel together with cognitive decline.

Step 5: the brain joins in

The gut and the brain talk to each other all the time. They do it through nerves, through molecules carried in the blood, and through the immune system. Scientists call this the gut–brain axis.

The brain has its own immune cells, called microglia. In a healthy brain they clear away waste, remove dead or damaged cells and keep the brain clean. When inflammatory signals arrive from the blood, they switch into a defensive mode and release their own inflammatory molecules, a state called neuroinflammation. Cells whose job

is to protect nerve cells start to harm them instead, releasing reactive oxygen and nitrogen species (unstable, highly reactive molecules made to destroy microbes) that damage the nerve cells nearby. If this persists, the damage builds up over time, and it is a feature of Alzheimer's disease and other dementias. The brain's own barrier, the blood–brain barrier, can also become more permeable under persistent inflammation.

Glycotoxins, also known as advanced glycation end-products, are compounds that form when food is cooked at high temperatures, as in industrial frying and the browning that gives many UPFs their color and flavor. The body also makes more of them when blood sugar is high. They are hard to break down and they

accumulate. They promote oxidative stress (chemical damage from reactive molecules) and inflammation in the brain, and they damage the small blood vessels that feed it. A related compound, acrolein, forms in fried food and has been found at raised levels in the brains of people with Alzheimer's disease. In one study, adults with higher blood levels of these compounds scored lower on tests of memory and attention.

How this connects to memory, thinking and brain disease

Scientists have now looked at this question in large groups of people, following tens of thousands of adults for years and testing their memory and thinking, or scanning their brains. The pattern is consistent. People who eat the most UPF decline faster on thinking tests and have a higher risk of dementia, about

44% higher than the lowest consumers when ten studies are pooled. In middle age, before any difference in thinking scores, their brain scans already show more damage to small blood vessels. Replacing some UPF with minimally processed food goes with a lower risk. All of these are observational studies. They show a link, not proof that UPF is the cause. The link is weaker in people whose diet is otherwise healthy.

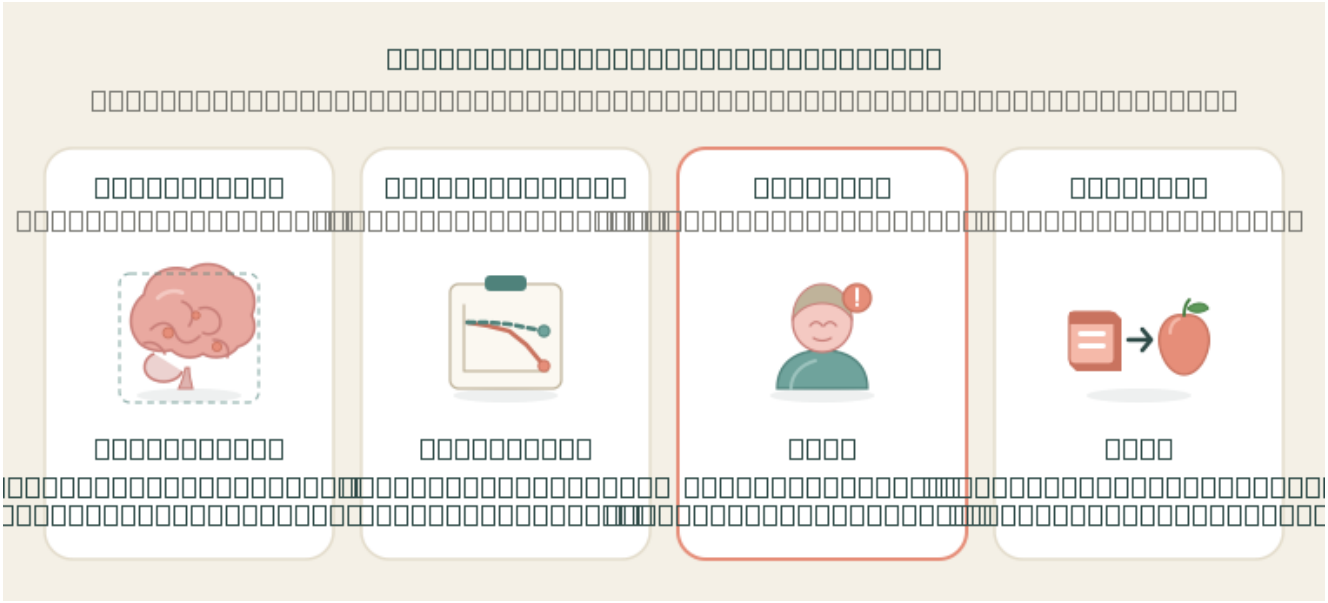


Figure 5. What the studies in people found. Four cards, one per kind of study: brain scans, thinking tests, dementia risk, and what swapping UPF for minimally processed food goes with.

What you can do

None of the scientists quoted in this article tells people to cut UPF out entirely. Laurel Cherian of Rush University Medical Center puts it this way. "It may not be realistic to completely eliminate ultra-processed foods, but the goal should be a diet focused on whole foods that are prepared fresh," along the lines of the Mediterranean diet, which is built on vegetables, fruit, beans, whole grains, olive oil and fish. Russell de Souza of McMaster University in Canada, who led the brain-scan study, suggests one question to ask at the store. "Am I choosing foods that look more like what comes from nature, or foods that have been heavily manufactured and reformulated?" Dietary fiber from beans, lentils, oats, nuts, fruit and vegetables feeds the bacteria that keep the gut barrier intact. Not every UPF is equally suspect, so the label for added sugar, salt and saturated fat matters as much as the ingredient list. And the earlier the habit starts, the more years of protection it gives. The Brazilian study found its link in people under 60, and the brain is most open to influence early in life.

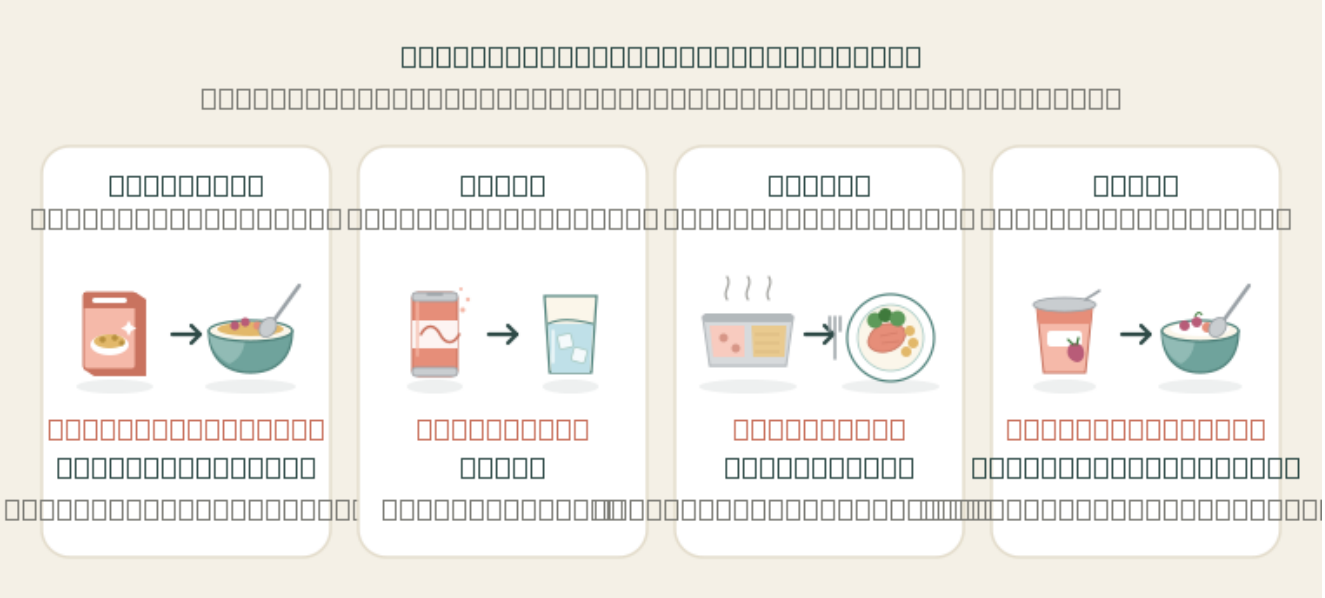


Figure 6. The swaps the studies point to. Common UPFs beside a minimally processed alternative: sweetened cereal and oats, a soft drink and water, a ready meal and a home-cooked one, flavored yogurt and plain yogurt with fruit.

So, are you really what you eat?

Yes, and more literally than the saying intends. The microbes in your gut live on what you feed them. Fed fiber, they keep the gut barrier intact and the immune system quiet. Fed mostly UPF, they are starved, the barrier leaks, and inflammation reaches the brain. According to large studies in Brazil (https://doi.org/10.1001/jamaneurol.2022.4397), the United States (https://doi.org/10.2105/AJPH.2026.308505) and the United Kingdom (https://doi.org/10.1016/j.jnha.2025.100644), the more UPF someone eats, the faster their thinking declines and the higher their risk of dementia.

None of this yet proves that UPF is the cause. The human studies show a link, and the experiment that would settle it has not been done. But every study so far points the same way, and the scientists who ran them give the same advice. Eat more of what looks like it came from a farm, and less of what came from a factory.

This article is for information only and is not medical advice.

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