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How the Western Diet Has Derailed Our Evolution

Burgers and fries have nearly killed our ancestral microbiome.

BY MOISES VELASQUEZ-MANOFF
ILLUSTRATION BY KATHERINE DIEMERT
NOVEMBER 12, 2015



For the microbiologist Justin Sonnenburg, that career-defining moment—the discovery that changed the trajectory of his research, inspiring him to study how diet and native microbes shape our risk for disease—came from a village in the African hinterlands.

A group of Italian microbiologists had compared the intestinal microbes of young villagers in Burkina Faso with those of children in Florence, Italy. The villagers, who subsisted on a diet of mostly millet and sorghum, harbored far more microbial diversity than the Florentines, who ate a variant of the refined, Western diet. Where the Florentine microbial community was adapted to protein, fats, and simple sugars, the Burkina Faso microbiome was oriented toward degrading the complex plant carbohydrates we call fiber.

Scientists suspect our intestinal community of microbes, the human microbiota, calibrates our immune and metabolic function, and that its corruption or depletion can increase the risk of chronic diseases, ranging from asthma to obesity. One might think that if we coevolved with our microbes, they'd be more or less the same in healthy humans everywhere. But that's not what the scientists observed.



AN INSIDE VIEW : Microbiologist Justin Sonnenburg (left) is revealing how our refined Western diet may be upsetting ancestral metabolic processes and raising the risk of chronic diseases, from asthma to obesity. Graduate student Will Van Treuren looks on.

Photography by Peter van Agtmael/Magnum Photos, from Stanford University's #nextgreatdiscovery Series

“It was the most different human microbiota composition we’d ever seen,” Sonnenburg told me. To his mind it carried a profound message: The Western microbiome, the community of microbes scientists thought of as “normal” and “healthy,” the one they used as a baseline against which to compare “diseased” microbiomes, might be considerably different than the community that prevailed during most of human evolution.

And so Sonnenburg wondered: If the Burkina Faso microbiome represented a kind of ancestral state for humans—the Neolithic in particular, or subsistence farming—and if the transition between that state and modern Florence represented a voyage from an agriculturalist’s existence to 21st-century urban living, then where along the way had the Florentines lost all those microbes?



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Earlier this year I visited Sonnenburg at Stanford University, where he has a lab. By then he thought he had part of the answer. He showed me, on his computer, the results of a multigenerational experiment dreamed up by his wife, Erica, also a microbiologist.

When the Burkina Faso study was published, in 2010, the question of what specific microbes improved human health remained maddeningly elusive, but evidence was beginning to suggest that diversity itself was important. So despite their relative material poverty, these villagers seemed wealthy in a way that science was just beginning to appreciate.

Where did that diversity come from? Humans can’t digest soluble fiber, so we enlist microbes to dismantle it for us, sopping up their metabolites. The Burkina Faso microbiota produced about twice as much of these fermentation by-products, called short-chain

fatty acids, as the Florentine. That gave a strong indication that fiber, the raw material solely fermented by microbes, was somehow boosting microbial diversity in the Africans.

How did the microbiome of our ancestors look before it was altered by sanitation, antibiotics, and junk food?

Indeed, when Sonnenburg fed mice plenty of fiber, microbes that specialized in breaking it down bloomed, and the ecosystem became more diverse overall. When he fed mice a fiber-poor, sugary, Western-like diet, diversity plummeted. (Fiber-starved mice were also meaner and more difficult to handle.) But the losses weren't permanent. Even after weeks on this junk food-like diet, an animal's microbial diversity would mostly recover if it began consuming fiber again.

This was good news for Americans—our microbial communities might re-diversify if we just ate more whole grains and veggies. But it didn't support the Sonnenburgs' suspicion that the Western diet had triggered microbial extinctions. Yet then they saw what happened when pregnant mice went on the no-fiber diet: temporary depletions became permanent losses.

When we pass through the birth canal, we are slathered in our mother's microbes, a kind of starter culture for our own community. In this case, though, pups born to mice on American-type diets—no fiber, lots of sugar—failed to acquire the full endowment of their mothers' microbes. Entire groups of bacteria were lost during transmission. When Sonnenburg put these second-generation mice on a fiber-rich diet, their microbes failed to recover. The mice couldn't regrow what they'd never inherited. And when these second-generation animals went on a fiberless diet in turn, their offspring inherited even fewer microbes. The microbial die-outs compounded across generations.

Many who study the microbiome suspect that we are experiencing an extinction spasm within that parallels the extinction crisis gripping the planet. Numerous factors are implicated in these disappearances. Antibiotics, available after World War II, can work like napalm, indiscriminately flattening our internal ecosystems. Modern sanitary amenities, which began in the late 19th century, may limit sharing of disease- and health-promoting microbes alike. Today's houses in today's cities seal us away from many of the soil, plant, and animal microbes that rained down on us during our evolution, possibly limiting an important source of novelty.

But what the Sonnenburgs' experiment suggests is that by failing to adequately nourish key microbes, the Western diet may also be starving them out of existence. They call this idea "starving the microbial self." They suspect that these diet-driven extinctions may have fueled, at least in part, the recent rise of non-communicable diseases. The question they and many others are now asking is this: How did the microbiome of our ancestors look before it was altered by sanitation, antibiotics, and junk food? How did that primeval collection of human microbes work? And was it somehow healthier than the one we harbor today?



he National Institutes of Health's Human Microbiome Project, the first phase of which finished in 2012, was billed as a "road map" of human microbes. But as Maria Gloria Dominguez-Bello, a microbiologist at New York University who studies remote Amerindian communities, told me, the effort is "really the *American* microbiome project; it's not the *human* microbiome project."

So a remarkable and somewhat quixotic effort has begun to catalog and possibly preserve, before they disappear, the microbes of people who live in environments thought to resemble humanity's past—people whose microbiomes may approximate an ancestral state. Researchers are motoring down rivers in the Amazon, off-roading in the East African savanna, hiking into the mountain villages of Papua New Guinea. They see themselves as rushing to catalog an ecosystem that may soon disappear.

“It’s really our last chance to harvest a lot of these microbes from around the world,” Rob Knight, a microbiologist at the University of California, San Diego, told me. “We have to do it before it’s too late—and it’s very nearly too late.”

He and others suspect these populations won’t retain their traditional ways much longer. Antibiotics, thought to deplete microbes, are already used frequently in some communities. And as modernization and acculturation progresses—as these peoples move toward the sanitized, indoor-dwelling, junk food-eating reality that characterizes much life in developed nations today—some human microbes, or perhaps certain configurations of those microbes, may be lost forever.

For now, scientists are careful to characterize the quest as purely descriptive; they want to know how these human microbiomes affect our bodies. Yet a kind of microbial ark—a storage vault for potentially endangered human microbes—is perhaps implied. Martin Blaser, a microbiologist at New York University and Dominguez-Bello’s husband, argues that because Westernized peoples may have lost important microbes, we may have to repopulate ourselves with microbes derived from more traditional-living populations—from, say, Amazonian Amerindians or African hunter-gatherers.

That’s certainly a long way off. No one understands much about the dizzying variety documented so far—which microbes are good, which harmful, which irrelevant. One constant, though, is that people living subsistence lifestyles have tremendous diversity compared to westernized populations—up to 50 percent more species than North Americans or Europeans. That includes not only bacteria but eukaryotes—single-cell protists and large, multicellular worms. These organisms, which are often missing in the West, have historically been considered pathogens. But some evidence now suggests that they can favorably shape the microbiome, benefiting the host.



FAMILY GARDEN: The Sonnenburgs, to boost their own microbial diversity, took up gardening, got a dog, and began hand-milling grain to make bread. Erica Sonnenburg, a microbiologist, works in the family garden with daughters Claire and Camille.

Photography by Peter van Agtmael/Magnum Photos, from Stanford University’s #nextgreatdiscovery Series

The other constant relates to diet and the soluble fiber that Sonnenburg studies. Whereas North American microbes orient toward degrading fat, simple sugars, and protein, the microbes of subsistence communities so far studied are geared toward fermenting fiber.

Most study subjects live in the tropics; their microbial communities may reflect tropical environments, not an ancestral human state. Yet even “extinct” microbiomes from higher latitudes—including from a frozen European mummy—are similarly configured to break down plant fiber, adding to the sense that the Western microbiome has diverged from what likely prevailed during human evolution.

The Sonnenburgs think fiber is so important that they’ve given it a new designation: microbiota-accessible carbohydrates, or MACs. They think that the mismatch between the Westernized, MAC-starved microbiome and the human genome may predispose to Western diseases.

Scientists studying these communities suspect that while mortality is high from infectious diseases, chronic, non-communicable diseases are far less prevalent. At the same time, researchers since the late 20th century have repeatedly observed that even in the West, people who grow up on farms with livestock, or exposed to certain fecal-oral infections, like Hepatitis A and sundry parasites—environments that, in their relative microbial enrichment, resemble these subsistence communities—have a lower risk of certain Western afflictions, particularly hay fever, asthma, and certain autoimmune disorders.

Many who study the microbiome suspect we are experiencing an extinction within that parallels the extinction gripping the planet.

No one wants to bring back the killers of yore. But the suspicion—and the hope—is that beneficial microbes can be separated from the dangerous ones, and that “good” ones can be restored. Or perhaps we can simply treat the community we already harbor better by feeding it healthier fare.

The United States Department of Agriculture recommends between 25 and 38 grams of fiber for adults daily; most Americans consume substantially less fiber-rich food, including nuts, whole grains, certain fruits, and vegetables. The guideline stems, in part, from the research of an Irish-born physician named Denis Burkitt. While working in Uganda in the 1960s, Burkitt became convinced that the high-fiber African diet explained the Africans’ relative lack of colon cancer.

The problem with the fiber hypothesis, however, has always been twofold. People who eat plenty of fiber seem to have a lower risk of many diseases, including heart disease and diabetes. But when scientists have fed fiber to volunteers, they haven’t historically observed much benefit. And this underscores the real mystery: By what mechanism does fiber improve health?

Soluble fiber is an umbrella term for complex plant sugars—including some polysaccharides, oligosaccharides, and fructans. The molecules consist of simple sugars linked together in long, hard-to-dismantle chains. If you dump a load of fiber—or microbiota-accessible carbohydrates—onto a colonic community of microbes, those that specialize in fermenting it will bloom. And they’ll start churning out short-chain fatty acids, including butyrate, whose smell you might recognize from aged cheese, and acetate, which gives vinegar its sharpness.

These acids, Sonnenburg thinks, are one of the long-sought mechanisms by which fiber prevents disease. Rodent studies suggest that as they diffuse into circulation, they stimulate the anti-inflammatory arm of the immune system—cells that help you *not* attack tree pollen and other harmless proteins—preventing allergies and other inflammatory diseases. The calming effect reaches as far as the bone marrow and lungs, where, as a recent *Nature Medicine* study showed, the acids reduced animals’ vulnerability to asthma.

As Justin Sonnenburg put it, “We have this unsupervised drug factory in our gut.” The question facing microbiologists today is how to properly tend to that factory.

Here, studies of populations living more traditional lifestyles may provide clues. In the past, most people likely imbibed many times more fiber than today. If you eat minimally processed plants, which humans have for millions of years, you can’t avoid fiber. Modern

hunter-gatherers and horticulturalists certainly eat loads of it. The Hadza of Tanzania, for instance, consume at least 10 times more than Americans, in tubers, baobab fruit, and wild berries. Agriculturalists, like those Burkina Fasans, also eat more fiber than Western populations, in porridges and breads made from unrefined grains.

Given this constant supply of microbiota-accessible carbohydrates, human microbiomes of the past, the Sonnenburgs argue, likely produced a river of these short-chain fatty acids. That probably changed some with the transition to agriculture, which made diets less diverse. But an even more drastic shift occurred quite recently, with the advent and widespread adoption of refined foods. As a result, westernized populations, the Sonnenburgs think, have lost healthful, fiber-fermenting microbes. And we suffer from a kind of fermentation byproduct deficiency.



HUNGRY MICROBES: A healthy gut hosts a number of microenvironments. A fatty diet lacking in fiber causes some of our internal, ancestral microbes to devour a mucus lining, potentially leading to inflammatory bowel disease.

Kristen Earle/Sonnenburg Lab

So why can't we supplement our diet with short-chain fatty acids? When I visited Sonnenburg, he showed me one reason why: The ecosystem that produces the acids may be as important as the acids themselves. He brought up two cross-sectional images of fecal pellets still in mice intestines. Most microbiome analyses take a tally, from genetic markers, of what microbes are present and in what abundance. That's equivalent to imagining what a forest looks like from a pile of wood chips, and gives little sense of how the forest was organized. By some ingenious tinkering, though, one of Sonnenburg's post-docs had developed a way to freeze the ecosystem in place, and then photograph it.

The resulting picture was unlike any rendition of the microbiome I'd seen before. One animal had eaten plenty of fiber, the other hadn't. In the fiber-fed ecosystem, similar bacteria clustered with one another, not unlike schools of fish on a reef ecosystem. An undulating structure prevailed across space. But in the non-fiber diet, not only was diversity reduced, the microbes were evenly distributed throughout, like a stew boiled for too long.

At this point, Sonnenburg sat back in his chair and went quiet, waiting for me to notice something. To one side of both images, microbes were mostly absent—the mucus layer on the lining of the gut. But that layer was twice as thick in the fiber-fed mice than the non-fiber fed. That difference amounted to about 30 nanometers, far less than the width of a human hair. But one day we may

look back and shake our heads that Western diseases—from diabetes to colon cancer—stemmed from 30 nanometers of mucus that, somewhere along the way, went missing in the developed world.

We think of the Western diet—high in unhealthy fats, sugar, and proteins—as overly rich. But what’s missing from the diet may be just as, and perhaps more, important than what’s abundant.

Years ago, while still a post-doc, Sonnenburg discovered that something very odd occurs when those MAC-loving microbes go hungry. They start eating mucus. “This is the stage where you say, ‘Oh my God. They’re eating me.’” Sonnenburg said. “You can see it.”

Our ancestral microbe variety may have faded over time due, simply, to our fiber-poor diet.

We need that mucus. It maintains a necessary distance between us and our microbes. And as it erodes with a poor diet, the lining of the gut becomes irritated. Microbial detritus starts leaking through. One of the more striking discoveries in recent years is that you can see this stuff, called endotoxin, increase in the bloodstream immediately after feeding people a sugary, greasy, fast-food meal. The immune system responds as if under threat, leading to the “simmering inflammation” the Sonnenburgs think drives so many Western diseases.

We need inflammation to combat infections, or aid tissue repair. But chronic inflammation—a danger signal blaring indefinitely—can lead to all manner of cellular dysfunction, contributing to many degenerative diseases.

I came away from Sonnenburg’s office with a sense that I’d glimpsed a principle underlying our relationship with microbes. Wringing calories from wild, fibrous fare required a village—microbes specialized in distinct tasks, but each also dependent on its neighbors. The difficulty of the job encouraged cooperation between microbes. When you withheld fiber, though, you removed the need for that close-knit cooperation. The mutually beneficial arrangements began to fray.

Sonnenburg’s experiments help contextualize what others are finding in peoples who hunt and forage. The Hadza, one of the last remaining hunter-gatherers on Earth, live near Lake Eyasi in Tanzania, a region of east Africa thought to be the birthplace of our species. An analysis of their microbes published last year detailed an immensely diverse community, including a number of microbes new to scientists.

The Hadza harbor a variety of bacteria called treponema, which are absent in the developed world. They’re spirochetes related to the pathogen that causes syphilis. Every rural, non-westernized group studied so far, including various Amerindian groups, also have treponemas, as do our primate relatives.

Cecil Lewis, a geneticist at the University of Oklahoma in Norman who studies the microbiomes of native people, including of Amerindian populations, suspects they may belong to an “ancestral microbiome”—a community that accompanied us since before we were human. Maybe anti-syphilis medication wiped them out in the West, Knight speculates. When I asked what they might do, or what their loss might mean, Lewis and others responded that no one really knows.

Yet the treponemas have genes that help in breaking down complex carbohydrates, suggesting a role in fermentation. And that dovetails with the other striking feature of the Hadza and Amerindian microbiomes. Where we have just a few strains of, say, prevotella bacteria, the Hadza have a kaleidoscopic variety. Again, diet is implicated. Breaking down tough, wild plants may require a diverse team of microbes. What happened to Western diversity? It’s possible we’ve inadvertently killed that wealth, or never

possessed it at all. But another possibility, as Sonnenburg's experiments suggest, is that because we haven't fed those microbes, we've lost them. Our ancestral variety may have faded over time due, simply, to our fiber-poor diet.



HEALTHY FIBER: In the past, most people likely consumed many times more fiber than today. Modern hunter-gatherers eat loads of it, more than Western populations. The Hadza of Tanzania consume at least 10 times more than Americans, in baobab fruit, (seen here), tubers, and wild berries.

Ingetje Tadros

Sonnenburg's mice live in plastic bubbles, cut off from new sources of microbes. Humans do not. One outstanding question is whether, if I began eating wild tubers and baobab fruit, the microbial complexity necessary to ferment the new fare would simply appear, seeded from the environment.

Trials testing prebiotics, food for the fiber-fermenting bacteria, suggest that you can increase microbial richness with more fiber, and improve metabolic function. But here's the wrinkle: In studies from Europe, only individuals who already harbored a baseline diversity benefitted from these dietary interventions. Those whose microbial communities were too impoverished didn't—or couldn't—respond to the new diet. They seemed to lack the ability.

The Sonnenburgs point to these studies as evidence that we need the right microbes—their unique alchemical talents—to unlock nutrients from food. Where do we get them? Our particular genes can influence the makeup of our microbiome, perhaps influencing our propensity to develop disease or put on weight by shaping our microbial community. But another reason for lacking a bacterium is more straightforward: We may never have encountered it in the first place.

Those environments where a relatively prolific sharing of microbes still occurs—daycares, cowsheds, homes with lots of siblings, and homes with dogs—seem to protect against allergies, asthma, some auto-immune diseases, and certain cancers. These observations, often grouped under the rubric of the “hygiene hypothesis,” appear to highlight a phenomenon separate from diet: access to microbial wealth, and possibly to unique microbial heirlooms.

Consider the spiral-shaped, stomach-dwelling bacterium *Helicobacter pylori*. For at least a century, *H. pylori* has been declining in the developed world. Most of our great-great grandparents probably had it; now less than 6 percent of children do. Unlike the microbes that interest Sonnenburg, *H. pylori* doesn't eat what we eat. It eats us, its host. And unlike microbes thought to jump

aboard from food, water, soil, or other animals, *H. pylori* only comes from other people—particularly, scientists think, our mothers. It's a human-adapted microbe that's passed between generations.

H. pylori is infamous for causing ulcers and gastric cancer, but mounting evidence also suggests that, by subverting the immune system to ensure its own survival, the bacterium may protect against asthma, obesity, and possibly other inflammatory diseases. If there's an ecosystem restoration project implicit in the study of the ancestral microbiota, *H. pylori* serves as an important counterpoint to the emphasis on diet. You can eat all the fiber you want (unless your food is contaminated with feces) and you'll never re-acquire microbes like *H. pylori*. The only way to restore such microbes may be to deliberately reintroduce them.

Even that idea is complicated. Years ago, Dominguez-Bello discovered a unique Amerindian strain of *H. pylori* in an isolated Amazonian tribe, a bacterium whose ancestors had presumably come over the Bering land bridge with the forebears of native Americans some 15,000 years ago. The native strain was disappearing, however. When people of different ancestries mixed in South America, Dominguez-Bello found, imported strains outcompeted native ones. African and European *H. pylori* strains were driving Amerindian ones extinct.

Why did that matter? We may fare better with “our” particular microbes. A study on Colombians last year found that when people of primarily native American ancestry harbored imported European or African *H. pylori* strains, their risk of gastric cancer increased dramatically. The introduced bugs didn't match the native genotype. And that mismatch seemed to increase the risk of malignancy.

“This type of thing could be happening in many microbes,” Barbara Schneider, molecular biologist at Vanderbilt University in Nashville, and coauthor on the study, told me. “There's no reason to think that helicobacter should be unique.”

We might call this the “family heirloom” problem. Some fraction of our microbes may be uniquely adapted to our particular genetic quirks—to our particular branch of the human family. Once they're lost, there may be no recovering these microbes. Meaning that, because I was born and grew up in the U.S., “my” helicobacters and treponemas may be gone forever.

In their recent book, *The Good Gut: Taking Control of Your Weight, Your Mood, and Your Long-term Health*, the Sonnenburgs argue forcefully that boosting fiber intake is the best way to cultivate a healthier community of microbes. Given the many unknowns, their advocacy surprised me. The science wasn't settled; what if they were wrong?

They'd fretted over this scientific uncertainty, they said, but decided that the diet they pushed—really a variant of the Mediterranean diet—would probably not cause harm, and would likely benefit adherents, even if everything they thought about the microbiome was wrong.

Not long after we spoke, Stephen O'Keefe, a gastroenterologist at the University of Pittsburgh, published what may be the best evidence yet (in people) that supports the Sonnenburgs' microbiota-accessible carbohydrates hypothesis.

O'Keefe has long puzzled over the high risk of colon cancer among African-Americans compared to native Africans. Like Burkitt 60 years ago, he suspected that a diet rich in fiber might explain what he quantified as a 65-fold disparity. To prove it, he put 20 rural South Africans on a high-fat, high-meat diet—including hot dogs, hamburgers, and fries; and he put 20 African-Americans on a high fiber African diet, including corn porridge, beans, and fruit. In contrast to earlier studies, however, his team visited the subjects at home, preparing their meals and supervising them.

Changes occurred quickly. Inflammation of the colon, which increases the risk of cancer, decreased in the African-Americans on the African diet; and it increased in the Africans on the American diet. Production of the fermentation by-product butyrate, thought to prevent colon cancer, increased in those eating African fare, and declined in those eating American-style. And here's what struck me: In the fiber-poor, meat- and fat-fed microbiome, O'Keefe saw a “loosening” of those tight-knit communities oriented toward fermenting fiber. He'd done in people what Sonnenburg had done in rodents—rattled the ecosystem—and it took just two weeks on

an American-type diet. He also demonstrated that regardless of the microbes you may not have inherited, what you feed the microbes you have can make a big difference in how they behave.

Years ago, impelled in part by their oldest daughter's constipation problems, the Sonnenburg family revamped its diet. They threw out all processed food-stuffs, and began eating plenty of veggies and whole grains. They bought a dog. Justin Sonnenburg began hand-milling his own wheat berries for bread. He took up gardening. And when he compared his archived microbes from years ago with recent ones, he discovered that his microbial diversity had increased by half. "That's a huge difference," he told me, "as big as the difference between Americans and Amerindians."

It remains to be seen what detailed analysis will reveal about this diversification—how many came from his dog, from soil, from the sourdough he handles; how many might have been there all along in depressed numbers, and bloomed on a fiber-rich diet. What it showed the Sonnenburgs, however, was that without fully understanding how the microbiome works, you can still push it in a healthier direction.

"If we wait to the point where we are beyond a shadow of a doubt, with double-blind studies translated to regulations, we're going to be waiting decades," Sonnenburg told me. "But right now, all the arrows are pointing in the same direction, toward fiber."

Moises Velesquez-Manoff is a journalist and author of An Epidemic of Absence: A New Way of Understanding Allergies and Autoimmune Diseases.

Peter van Agtmael's photos are from Stanford University's #nextgreatdiscovery Series



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Felicia Etzkorn • 10 months ago

Great stuff, very encouraging. I was diagnosed with ulcerative colitis in 1992, which was changed to Crohn's disease in 1996. Since 1993 I gradually healed myself by moving to vegetarianism, later eliminating corn. Then I eliminated all sources of sulfites, mainly found in processed foods, but also green peppers, grapes, wine, wine vinegars, and shrimp. Finally I added plenty of fiber and fermented foods--oatmeal, walnuts, blueberries and plain yogurt for breakfast every morning, beans at least once a day, whole vegetables, whole grains, no refined flour or sugar, real fermented saurkraut, pickles, and kombucha. The fermented foods and probiotics are so important. If I accidentally eat something with sulfites at a restaurant, I take probiotics, eat plenty of fermented foods, and in a couple of days, my gut has healed. I am completely off all

medications: asacol, delsicol, entocort, even Humira no more!

20 ^ | v • Reply • Share ›

Anechidna → Felicia Etzkorn • 10 months ago

Congratulations. I know of one person who had Chron's and now after ten years and diet changes like yourself there is no longer any visible sign of Chron's and the specialist concerned has said it is effectively in remission long may it remain so for those who reach that state and those striving to do so.

3 ^ | v • Reply • Share ›

Jacob Spencer → Felicia Etzkorn • 10 months ago

Very inspiring changes you have made. Thanks for sharing...

3 ^ | v • Reply • Share ›

Owen Cooper → Felicia Etzkorn • 10 months ago

Hey Felicia, you said what you eat for breakfast in your routine. Do you mind sharing a typical lunch and dinner? Thanks!

2 ^ | v • Reply • Share ›

Felicia Etzkorn → Owen Cooper • 10 months ago

Lunch and dinner are much more varied. I often have an Amy's bean and cheese burrito that has a whole wheat tortilla, almonds, and an apple when I'm at work for lunch. At home, I've been eating raw milk cheese and fermented sauerkraut on whole wheat toast, with almonds and fruit. Dinner is usually roasted, steamed or stir-fried vegetables with whole grain pasta, brown rice, or fresh potatoes. In the summer, dinner is often a salad, like Nicoise, with an egg and lots of fresh vegetables, only bottled dressings without sulfites (trickier). In the winter, it's bean chili, minestrone soup, homemade pizza, standard vegetarian fare, just not from a package. Owen, what's your story?

3 ^ | v • Reply • Share ›

bitrat → Felicia Etzkorn • 10 months ago

You're making me hungry!

1 ^ | v • Reply • Share ›

Owen Cooper → Felicia Etzkorn • 10 months ago

My family has history, so I am learning how to never have colon diseases. Thank you for sharing your thoughts.

^ | v • Reply • Share ›

Naum Rusomarov → Felicia Etzkorn • 10 months ago

IBD isn't that simple. Some individuals do indeed benefit from mostly vegetarian diet high in soluble fiber, others do not tolerate fiber at all and are much better off with diet rich in proteins and fats. There is statistical evidence that UC sufferers are much more likely to experience flare-ups whose frequency and intensity depend on alcohol and red meat intake. There is also a third group that reacts very well to probiotics, as a matter of fact many sufferers of IBD regularly take probiotics. The symptomatically weaker IBS also reacts well to probiotics and a vegetarian diet rich in fiber.

It's great that you have been in remission for so long, but I doubt that there is a silver bullet to UC or Chron's disease. It strongly depends on the individual.

^ | v • Reply • Share ›

Felicia Etzkorn → Naum Rusomarov • 10 months ago

Yes, I'm very aware of the individual nature of IBD. I hope no one is taking my story as a general prescription for a cure. I am just thrilled that it is working for me after 23 years of suffering with it. There were times I wanted to die. There was nothing in my story to suggest a silver bullet. It's just my story. If someone else can benefit from my story, great.

3 ^ | v • Reply • Share ›

George Gantz • 10 months ago

The work on the microbiome, and the reporting by Moises Velasquez-Madoff, is incredibly important and revolutionary - the way we think about our human relations with the larger ecosystem has recently taken a profound and much more intimate turn! It is sadly ironic that the very success of our fundamentally palliative medicine has caused so many of the chronic medical maladies of the modern era. But the solution is simple - feed the body and its microbiome properly.

6 ^ | v • Reply • Share ›



Andy Madan • 10 months ago

Ours is a joint extended Family in Delhi , India. Just 2 years before my Father passed away at the age of 93 years in 2007, we asked him the secret of his long healthy life. His simple reply was -- I never visited a Doctor. We never realized the depth of that statement at that time but now realize it better. He was a vegetarian all his life , never went to a Clinic for any of the small health problems , managed things with home remedies unlike the present day situation where on a sneeze , we run to a Doctor . He used to do yoga & believed in naturopathy & as long as we remember , he never fell ill .He passed away peacefully having his meal on a sunny day in Feb.

After reading this article , we realize the difference between the quality of life our Elders lived & how we are living.

5 ^ | v • Reply • Share ›

Ben Pottinger → Andy Madan • 10 months ago

And my grandfather is 94 and still alive and had no problems going to the doctor. Has anyone considered the hypothesis that maybe

the west see's more non-communicable diseases because so many more of us make it past childhood? I love research into gut related things because I have UC and it can only benefit me in the long term, but I don't see rural african communities through the hipster colored glasses so many seem to see them through. I see a bunch of sick people dying at much younger ages than in the west. What if they have less of these conditions simply because the children who would have grown up to have them died as children instead of being saved by modern medicine?

The poster at the top suggests that her diet has healed her of UC/Crohns, and it might well have, but plenty of us have had no changes from diet and some of us get quite a bit worse when adding in "raw" foods like salads. Like the biologist pointed out, each person is likely to have microbes specific to the individual and I suspect those effect which diets will work and won't work.

3 ^ | v • Reply • Share >

lilymanx → Ben Pottinger • 10 months ago

I agree - I just read a book by a woman who grew up on a farm in Iowa at the turn of the century. Life was very different then - more exposure to bacteria no doubt, but many other differences, too - more physical activity, more time outside, etc. She talks about her grandparents, aunts, uncles, etc. - all lived long lives and stayed healthy and active into their 90s. However, at one point, the author mentions that half the children born in her extended family died in infancy. She speculates that the infants who survived must have been tougher and stronger - so the fact that they all lived long, healthy lives is perhaps not so surprising. Had those infants who died young had access to antibiotics, etc., they might have survived into adulthood but with more chronic illness, etc.

^ | v • Reply • Share >

Alone: bad. Friend: good! → lilymanx • 10 months ago

Yes, it is NOT survival of the fittest anymore -- it is survival of everything.

1 ^ | v • Reply • Share >

Eric Hiatt • 10 months ago

Cool stuff. I hope humanity comes to grips with interdependencies - from the micro-ecology we harbor to the earth systems harboring us. We need to attain understanding at all scales to have a chance at living well. We can not survive with self-conceptual isolation.

4 ^ | v • Reply • Share >



MizzisPotatoHed • 10 months ago

MrKamikaze: Your summary reflects neither the nuance of this article or of present research. The point here is that our diet, which obviously impacts our microbial community, has resulted in the permanent loss of functionally important, human-specific bacterial species over time. The author correctly suggests, as most research suggests, that there is a relationship between microbiome diversity and human health, and admits that diversity itself seems to be fairly plastic depending on diet. The point here is that long-term dietary shifts have led to long-term microbiome shifts resulting in the permanent loss of coevolved bacteria putatively necessary for some function. To suggest "switching to a third world vegetarian diet" as a remedy to the problem would be to fundamentally misunderstand the thesis of this article.

4 ^ | v • Reply • Share >

simplulo • 10 months ago

Rather than "western diet" the title should more accurately blame the western *lifestyle*: few siblings, reduced contact with children, ultra-hygienic conditions, few animals, working in offices instead of farms, excessive use of antibiotics, and yes, non-paleo diet. The article mentioned that we receive our mother's microbes during birth: note that 1/3 of US babies today are delivered via Caesarean section.

8 ^ | v • Reply • Share >

Cammy → simplulo • 10 months ago

I'm tired of the guilting of CSections. In my case it was medically necessary. Not every case is - that's true. Even Michael Pollan felt badly he was bottle fed and not breast fed. Some things we can't control. Yet, I'd think Michael Pollan is a pretty smart, and good eater, and maybe in better health than someone who was breast fed and eating processed food.

A lot of this is cultural. In many countries - we are less work oriented and more family oriented - with more vacations, and time for parents to cook. We as a nation get paid less, work more, and turn to fast food and quick fixes. It can't be sustainable.

So it's true when they say an Amish community and Swiss farming families have more diverse microbiomes. They cook real food, don't eat processed food, are in contact with animals, have limited chemicals in their home/cleaning supplies, are outdoors, have strong community ties - everything we should have as a society and have lost to a large extent.

Education is the key - education for parents - education in schools. And dare I say health school lunches? A lot of parents stick a bologna sandwich and chips in their kids lunches. We need a school program with universal salad bars, healthy soups, etc... In some countries like Switzerland, kids even go home for cooked lunches. Obviously it can't happen here, but there are some school districts like Boulder that are making great changes.

We should see advertisements for eating fruits and veggies on TV rivaling all the drug ads for high blood sugar. Our doctors should ask all parents what they feed their children, and offer suggestions (yes they should be nutritionists too).

5 ^ | v • Reply • Share >

angesichts → Cammy • 10 months ago

You may be tired of the guilting of CSections, but simplulo (the person you're replying to) certainly isn't engaging in it. How is pointing out statistics and making cause-and-effect connections "guilting"? Since simplulo can read and write, I'm sure she/he recognizes that some percentage of CSections are medically necessary.

I agree with you about the necessity of education and I think one part of this should be educating people about possible

I agree with you about the necessity of education, and I think one part of the strategy should be educating people about possible microbiome losses from CSections, so that they can make the best decision based on the specifics of their situation.

7 ^ | v • Reply • Share ›

Legend79 → Cammy • 10 months ago

I didnt see any shaming at all in Simplulo's post. He merely mentioned a statistic.

A tad touchy are we?

How many times do American adults need to be told that fast food is junk food? That a diet from bags and boxes is not a healthy one? Its all over TV, the internet, and everyplace else there's space to say it. But yet so few give it up. Always making more excuses. Stopping for a bag of soggy bun'd meat patties and salty deep fried potatoes might be easier, but getting groceries and making a meal is easy too! Its that for some god-awful reasons American adults have vilified those actions as equal to sticking hot pokers in ones ears while being bitten by red ants. "Oh its too hard...its just so hard!" Everything is so hard on American adults. Everything MUST be made easy and so simple even the Village idiots can do it.

One could flip the script and look at those Rx commercials as blatant reminders to eat right and exercise - just move a lot more - and lead a less ridiculously inane life looking down at your electronic brain-dulling device. Why do you need to be reminded to eat right? Why do so many people need to be reminded to do the right things? Those commercials are the best reminders of what I want to avoid - and work hard at avoiding! Those Rx commercials are prescriptions for doing all you can not to end up actually "asking your doctor" about their products.

Regular family practitioners are simply not schooled in nutrition. And for them to stay up on all the quick changes in the field would only justify them raising their rates. Besides there is no true one size fits all when it comes to nutrition. It truly is a personal thing. But that too takes work on the part of the individual. And too many adults - as you clearly example - especially in the US, want to be told what to do, when to do it, how to do it and if they should do it. Life by list. Life by the Bureau of Daily Oversight and Annoyance.

3 ^ | v • Reply • Share ›

spenyc → Legend79 • 8 months ago

I'm seeing this article late and don't expect anyone will see this, but I have to note that "getting groceries and making a meal is easy too!" is a point of view that does not take into account the hard lives that many people lead. Fixing meals from scratch is expensive and time-consuming for someone getting home from low-pay, exhausting work. And for many, fast food is comfort food in lives with little comfort.

I don't deny that many people who could easily do better make idiotic choices--I too often do it myself--but even they are responding to the culture into which they were born. Empathy and education will have more impact than blame and sneering.

^ | v • Reply • Share ›

Anechidna → spenyc • 8 months ago

It seems our lives have all become mission critical. No time to prepare meals at home, we need that book from amazon in two hours but will take a month before we read it. If we could have things before we need them that would be great then we would have the time as in this case.

Taking time allows us to think, to reflect and to recall all important aspects of living. Going digital with everything (re speed of living) is not beneficial, although wwe think it is everything has a price and often not the \$ cost.

^ | v • Reply • Share ›

Anechidna → Legend79 • 10 months ago

We are really only beginning to understand our Biome and have only a glimmer of understanding on our Holobiont, and that what we eat has an impact upon us via our Biome and the Holobiont. But not only food but our famed antibiotics are equally as dangerous to us as they are beneficial and indiscriminate use like eating a diet of fast food impacts upon our auto immune system in ways that Research is only now beginning to flesh out.

Unfortunately aas you point out Legend79 people are sensitive to having these dangers highlighted especially when the truth fails to match up with their perceived view of reality. Put simply in 20 years when we know more the reaction to eating too many highly processed foods and junk foods will be similar to ho we now view smoking. Of course by then the reactionaries will be casting around for someone else to blame than looking at themselves.

Some 40 years ago med schools paid little attention to the bacteria in side of us but now they are devoting time and effort to educate the new Drs progressing through Med School, so they have gone from acknowledging literally only two bacteria to almost millions and how they impact upon our health in a positive manner when not abused via medications and foods they have not evolved to digest.

^ | v • Reply • Share ›

HD23 → Cammy • 10 months ago

Totally agree. My daughter gets made fun of for eating tabulleh salad whereas her other classmates have chips&ketchup or lunchables for lunch.

2 ^ | v • Reply • Share ›

Cammy → HD23 • 10 months ago

Wow. She gets made fun of? That's awful. You should be in contact with the school to see if they can get a program set

wow. she gets made fun of? that's awful. you should be in contact with the school to see if they can get a program set for parents. Or contact the wonderful "renegade" chef Ann Cooper. She's worked wonders with the Boulder, Co school district. Keep doing what you're doing. Your daughter is very lucky.

2 ^ | v • Reply • Share ›

Thom Foolery → Cammy • 10 months ago

As a former Boulderite, I fear that what works there might not be exportable to much of the rest of the States. At my daughter's middle school, half of the 1,000 students have breakfast and lunch provided by the school district. To keep the costs down (in order to appease the taxpayers) these meals are food only in the most generous sense. It's arguably better than going hungry, to paraphrase John Oliver.

^ | v • Reply • Share ›

Barb → Cammy • 10 months ago

You can stop it simply on the basis of bullying, which can get a school sued.

^ | v • Reply • Share ›

Legend79 → Barb • 10 months ago

So we bully the Bullies with lawsuits. One could look at normal bullying, the usual teasing we do with friends and family, even in school and work - as healthy. (extremism is not what I refer to, which is altogether a different subject)

Like a diverse gut biome...if we dont expose children to diversity in ALL its forms, make sure they grasp that LIFE is not easy, its not a Disney TV show, where everyone gets to work things out in less than 30 mins, and make sure they understand, thru real experience - that a person has to learn many, many lessons to survive. And that one cant get away with shutting people up because its uncomfortable. Even jerks have freedom to speak and express themselves.

2 ^ | v • Reply • Share ›

Thom Foolery → HD23 • 10 months ago

My daughter was made fun of as well for her lunches. Exposure to the teasing and harassment, combined with love and encouragement from her folks, has worked wonders for her emotional and social "biome." She has come to realize that most of the teasers do so because they, like their parents, are more or less automatons, and she pities them now rather than resenting or fearing them.

^ | v • Reply • Share ›

lilymanx → simplulo • 10 months ago

The use of C sections, like that of antibiotics, can save lives. Obviously, it is better to have a C-section and/or take antibiotics than to die of an infection!!! A healthy microbiome won't help you if you're dead. The point is that docs should consider these interventions to be "last resorts" that have serious downsides. Of course, as I said above, there are times when the benefit is absolutely worth the cost, but the overuse of C sections and antibiotics needs to be curbed.

^ | v • Reply • Share ›

simplulo → lilymanx • 10 months ago

Yes, Cammy made the same observation more than a week ago, and others responded to it adequately. This is like saying that if you are dying of hunger it is better to eat a hamburger and fries than nothing at all. Yes, hamburgers can save lives, but their risks should be recognized and considered in one's dietary decisions. Captain Obvious would also point out that Caesarians are being slightly overused.

^ | v • Reply • Share ›

lilymanx → simplulo • 10 months ago

LOL, I was trying to say to Cammy that nobody was arguing that life-saving C sections were a bad thing since obviously the benefits outweigh the costs in those cases - only that they should be used with more discretion. Sorry to hear my attempt to defend your post seemed unnecessary. If only doctors found the point so obvious.

^ | v • Reply • Share ›

simplulo → lilymanx • 10 months ago

Sorry I missed your point, even though you labeled it as "the point". My bad. ;)

1 ^ | v • Reply • Share ›

Christopher Roy York • 10 months ago

Why didn't they put a group on pastured beef veg and raw dairy? Fairly obvious the hot dog group would be l'll. I bet if you put a group of junk eating vegans you would get an l flamatory reaction. Also note that the Africans ate mainly tubers not grains and I bet they prepared them by fermenting them prior to eating unlike us.

3 ^ | v • Reply • Share ›

JT → Christopher Roy York • 10 months ago

Raw dairy has been a miracle worker for me. Glad to see someone mentioning it.

3 ^ | v • Reply • Share ›

EP_2012 → Christopher Roy York • 10 months ago

"Why didn't they put a group on pastured beef veg and raw dairy?"

Perhaps because the microbes would respond exactly the same way regardless of the meat? We see the same shift in microbes in both carnivorous and herbivorous animals eating their natural diet of wild meat and plant matter, so why do you expect different results in humans eating pastured beef?

"I bet if you put a group of junk eating vegans you would get an inflammatory (sic) reaction."

You'd be wrong in that assumption. It's been shown that "western" vegans score lower on inflammatory markers than even people on paleo diets. Cordain had a study that was suppose to show benefits for people eating paleo, and it clearly shows higher inflammation in his group.

There are already studies where regular people eating meat were fed similar, plant-based diets and experienced a dramatic shift in beneficial gut flora.

1 ^ | v • Reply • Share ›

papertiger • 10 months ago

"If the Burkina Faso microbiome represented a kind of ancestral state for humans..." This is a common assumption -- that modern but not 'Western' people are like humans in prehistory -- that is not supported by any facts. The people in Burkina Faso are modern humans who live differently -- but not at a different time or evolutionary state -- than European and American humans. This does not of course mean that we shouldn't adjust our diet as suggested, just that the Burkina Faso's biome and diet aren't evidence for a previous state of homo sapiens, or that there is anything evolutionary going on. The researchers story could be true, but the assumption that any current humans are like a previous state of our evolution is just that: an assumption that is presented without evidence.

2 ^ | v • Reply • Share ›

Naum Rusomarov • 10 months ago

What about people such as the Inuit whose diet is very high in fat and protein, and generally low in fiber? Do they have significantly different (and richer) gut flora? What about the occurrence of autoimmune inflammatory diseases among them?

Great article, nonetheless.

p.s. This is not criticism, just curiosity.

2 ^ | v • Reply • Share ›

Ginko • 10 months ago

It's of course absurd to not mention pesticides! They are designed to kill little critters. They have found glyphosate in over 30% of nursing mother's breast milk. Hello! How about they go test the Amish that farm organically. That would be interesting.

2 ^ | v • Reply • Share ›



J • 10 months ago

There are a lot of people trying to fix this part: 'Those whose microbial communities were too impoverished didn't—or couldn't—respond to the new diet.' by doing at home Fecal Microbiota Transplant (FMT). I wish these articles addressed this more as it's obvious and seems ridiculous not to mention. I assume it's omitted because it's not FDA approved for anything other than C Diff infections and we don't know the possible side effects because for instance 'Some fraction of our microbes may be uniquely adapted to our particular genetic quirks' which could mean bad news in a stranger i.e. cancer. Well noone knew all the myriad possible issues with over prescription of antibiotics but who'd that stop? If you are staring down the barrel of a neurodegenerative disease that's progressing slowly, that flares when you eat food and started years ago after those antibiotics you took how could you not give poop a chance? We could talk about siblings/family donors but after what i've seen happening to me 5 years on and all that i've read I'll take my chances with the screened donor sample please.

2 ^ | v • Reply • Share ›

TheEvilBlight → **J** • 10 months ago

Should we be worried that the soil ecology of an industrial farm has already affected the environmental microbial diversity versus a unfarmed area used mostly by hunter gatherers? How much of the food chain should we be reclaiming to bootstrap our microbiomes? It would almost seem like we should be growing our vegetables to collect the environmental microbes best suited to fiber catabolism, then eat them ourselves without overly sterilizing them (since sterilization renders our attempt to collect new and diverse gut microbes moot).

1 ^ | v • Reply • Share ›



J → **J** • 10 months ago

with a side of fiber of course.

1 ^ | v • Reply • Share ›



Mary • 10 months ago

The other interesting thing with the modern American diet is the introduction of "non-foods" such as high fructose corn syrup and various non-calorie sweeteners over the past what, twenty years. Our bodies did not evolve to eat these kind of substances, which are not really food. Some time ago there was a graph published that tracked the inclusion in the food supply of such substances over time compared with a graph of the percentage of the population with obesity and related diseases such as diabetes. The two graphs ran neck-and-neck, almost the same percentages. Also, recently there was a science teacher who purchased an (unnamed fast food) burger, placed it on a shelf in the science room of the school and left it the entire school year. That burger looked exactly the same at the end of the nine months: the bread did not mold and the meat did not rot; scary. A nurse did the same thing with the same result. I would not touch a burger from any fast food restaurant after gaining such information and would advise all people to follow my example. Is it any wonder that people are fatter and more unhealthy now?

2 ^ | v • Reply • Share ›

Jim Stuart • 10 months ago

I owned a horse that cut his leg really bad. My vet gave him an oral antibiotic that was very strong which in turn killed off the friendly bacteria in his stomach and two days later he coliced and had to suffer an operation where his belly was sliced open and his entire intestinal track was laid out on the table and a blockage removed. The surgeon told me off the record that the vet that gave him the oral antibiotic made a mistake and should have injected a milder antibiotic. For the record we did everything in our power to prevent this surgery including oiling him and thorough enemas. The total cost of saving his life cost over ten thousand dollars and months of expensive daily hand walks with a horse trainer due to high his spirited Saddlebred blood. Looking back on this it makes me angry that well intentions cost so much suffering and expense but since no one would stand up and take responsibility there was no recourse.

1 ^ | v • Reply • Share ›

Mark8888 • 10 months ago

I'd be interested for commentary on why people on traditional Asian diets are so healthy. Sure, those diets include good quantities of vegetables, but they also typically consume large proportions of white rice (simple carbs) and fish (protein). I don't understand their diets to be that high in fiber.

1 ^ | v • Reply • Share ›

Thea → **Mark8888** • 10 months ago

Mark8888: One of the "blue zones" is the traditional Okinawan diet, with a huge percentage of the population happily living to 100+ years old. The breakdown of their diet contradicts what you are saying. (Copied from a post from "Rami" some time ago):

Back in the 1950's the Japanese rural Okinawan group of people had the most centenarians per capita. How did they live so long? Here is their diet

Caloric Restriction, the Traditional Okinawan Diet, and Healthy Aging

The Diet of the World's Longest-Lived People and Its Potential Impact on Morbidity and Life Span

Ann. N.Y. Acad. Sci. 1114: 434–455 (2007).

TABLE 1. Traditional dietary intake of Okinawans and other Japanese circa 1950

Total calories 1785

Total weight (grams) 1262

Caloric density (calories/gram) 1.4

Total protein in grams (% total calories) 39 (9)

Total carbohydrate in grams (% total calories) 382 (85)

Total fat in grams (% total calories) 12 (6)

[see more](#)

^ | v • Reply • Share ›

Mark8888 → **Thea** • 10 months ago

Thea, thanks for finding this data and posting it. It surely doesn't look anything like a paleo diet! There are other factors that may have affected the longevity of the Okinawans of this period. For one thing, they went through an extended period of starvation under Japanese occupation that became known as "cycad hell", where they were reduced to eating cycads, a type of palm plant that is poisonous unless processed carefully to remove neurotoxins. I gather from one Okinawan I know who endured it, that it isn't that tasty a food besides. Starvation diets can extend longevity, although they are not popularly recommended for that! In the early 1950's, Okinawans were still rebuilding their farms, homes, and lives from the destruction of the bombardment and battles of WWII, and their diet may not have returned to pre-Japanese occupation levels in terms of variety and abundance. (Side note: many starving Okinawans were given Spam by American GIs after they arrived, and Spam remains very popular among Okinawans today.) Also, there are some vegetables that hold a unique or larger place in Okinawan cuisine than in others - the goya, or bitter melon for example is more common (I believe) in Okinawan fare than in other regions where it is eaten.

From personal observation, rice is a larger percentage of the diet of Okinawans today than in the 1950's data you cite. In other Asian cultures, for example the Japanese mainland, I believe rice is, and has been, a larger percentage of total calories than for the 1950's Okinawans, and mainland Japanese tend to have also respectable longevity and low levels of systemic inflammation. So if simple carbs (and rice fits that definition) are so toxic as many have been saying, then there is something either less problematic with rice, or something else in the diet - perhaps fish - that is protective and mitigates against the insulin response from the rice. I have also wondered if the Okinawan practice of rinsing the rice four or more times to remove the excess starch affects the glycemic index or not. The total amount of starch removed is probably irrelevant, but different processing techniques for foods can sometimes make a measurable difference there (e.g., baked versus boiled potatoes, or boiled versus boiled, chilled, and reheated).

I am also curious about the differences, such as they might be, of the Okinawan sweet potato versus the varieties we are familiar with. Sweet potatoes in the west are moderate on the glycemic index scale, whereas yams, a close relative, are significantly lower.

Again, thanks for your post. Very interesting.

^ | v • Reply • Share ›

Anechidna • 10 months ago

An article that is most impressive in its examination of what is rapidly being recognized as a very important environment, the Biome.

1 ^ | v • Reply • Share >



Anjum • 10 months ago

Thanks for the valuable information. I am from India ..Bombay again a city. Our diet include lot of fibre compared to Western diet since we don't eat bread . we eat 'roti' that is made of whole grain.. But our future generation is addicted to junk food.. Your article created awearnes. I would forward it to as many people as I can. Thanks again

1 ^ | v • Reply • Share >

Gonzo Angrymonkey • 10 months ago

Antibiotics should be avoided unless medically necessary for your survival-- they really are an indiscriminate fire-bomb to your gut flora. Can take probiotic supplements afterward to replenish some of the lost flora, but at best you are only restoring a few strains, vs. dozens (hundreds?) lost to the antibiotics. Best way to restore, pull a carrot out of the dirt in your own garden, brush off most of the loose dirt, and eat it! And daily fiber is a must-- Metamucil capsules daily if you are not eating right.

1 ^ | v • Reply • Share >

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