

## “Wheat Belly” and “Grain Brain” Synopses

“Wheat Belly”

William Davis, MD

In *Wheat Belly*, Davis exposes the truth about modern-day wheat, deconstructing its historical role in the human diet. No longer the sturdy staple our forefathers who ground it into their daily bread, today's wheat has been genetically altered to provide processed-food manufacturers the greatest yield at the lowest cost; consequently, this once benign grain has been transformed into a nutritionally bankrupt yet ubiquitous ingredient that causes blood sugar to spike more rapidly than eating pure table sugar and has addictive properties that cause us to ride the roller coaster of hunger, overeating, and fatigue. Dr. Davis sheds light on its connection to weight gain and fat buildup in the wrong places, as well as a host of adverse health effects from diabetes to heart disease to immunologic and neurological disorders like celiac disease, rheumatoid arthritis, and dementia. Finally, he presents a compelling argument for eliminating wheat products from the diet entirely, with strategies for making the transition both simple and permanent.

Informed by decades of clinical research and backed by case studies of men and women who truly transformed their lives after waving goodbye to wheat, *Wheat Belly* is an illuminating look at a familiar food and a positive course of action to regain health and lose unwanted pounds for good.

You will see that what we are eating, cleverly disguised as a bran muffin or onion ciabatta, is not really wheat at all but the transformed product of genetic research conducted during the latter half of the twentieth century. Modern wheat is no more real wheat than a chimpanzee is an approximation of a human. While our hairy primate relatives share 99 percent of all genes found in humans, with longer arms, full body hair, and lesser capacity to win the jackpot at Jeopardy, I trust you can readily tell the difference that that 1 percent makes. Compared to its ancestor of only forty years ago, modern wheat isn't even that close.

I recognize that declaring wheat a malicious food is like declaring that Ronald Reagan was a Communist. It may seem absurd, even unpatriotic, to demote an iconic dietary staple to the status of public health hazard. But I will make the case that the world's most popular grain is also the world's most destructive ingredient.

In centuries past, a prominent belly was the domain of the privileged, a mark of wealth and success, a symbol of not having to clean your own stables or plow your own field. In this century, you don't have to plow your own field. Today, obesity has been democratized: *Everybody* can have a big belly. Your dad called his rudimentary mid-twentieth-century equivalent a beer belly. But what are soccer moms, kids, and half of your friends and neighbors who don't drink beer doing with a beer belly?

I call it wheat belly, though I could have just as easily called this condition pretzel brain or bagel bowel or biscuit face since there's not an organ system unaffected by wheat. But wheat's impact on the waistline is the most visible and defining characteristic, an outward expression of the grotesque distortions that humans experience with consumption of this grain.

A wheat belly represents the accumulation of fat that results from years of consuming foods that trigger insulin, the hormone of fat storage. While some people store fat in their buttocks and thighs, most people collect ungainly fat around the middle. This "central" or "visceral" fat is unique: Unlike fat in other body areas, it provokes inflammatory phenomena, distorts insulin responses, and issues abnormal metabolic signals to the rest of the body. In the unwitting wheat-bellied male, visceral fat also produces estrogen, creating "man-breast."

The consequences of wheat consumption, however, are not just manifested on the body's surface; wheat can also reach deep down into virtually every organ of the body, from the intestines, liver, heart, and thyroid gland all the way up to the brain. In fact, there's hardly an organ that is *not* affected by wheat in some potentially damaging way.

The sad truth is that the proliferation of wheat products in the American diet parallels the expansion of our waists. Advice to cut fat and cholesterol intake and replace the calories with whole grains that was issued by the National Heart, Lung, and Blood Institute through its National Cholesterol Education Program in 1985 coincides precisely with the start of a sharp upward climb in body weight for men and women. Ironically, 1985 also marks the year when the Centers for Disease Control and Prevention (CDC) began tracking body weight statistics, tidily documenting the explosion in obesity and diabetes that began that very year.

**An interesting fact: Whole wheat bread (glycemic index 72) increases blood sugar as much as or *more than* table sugar, or sucrose (glycemic index 59).**

I once measured the length of the bread aisle at my local supermarket: sixty-eight feet. That's sixty-eight feet of white bread, whole wheat bread, multigrain bread, seven-grain bread, rye bread, pumpernickel bread, sourdough bread, Italian bread, French bread, bread sticks, white bagels, raisin bagels, cheese bagels, garlic bagels, oat bread, flax bread, pita bread, dinner rolls, Kaiser rolls, poppy seed rolls, hamburger buns, and fourteen varieties of hot dog buns. That's not even counting the bakery and the additional forty feet of shelves packed with a variety of "artisanal" wheat products.

And then there's the snack aisle with forty-some brands of crackers and twenty-seven brands of pretzels. The baking aisle has bread crumbs and croutons. The dairy case has dozens of those tubes you crack open to bake rolls, Danish, and crescents.

Breakfast cereals fill a world unto themselves, usually enjoying a monopoly over an entire supermarket aisle, top to bottom shelf.

There's much of an aisle devoted to boxes and bags of pasta and noodles: spaghetti, lasagna, penne, elbow, shells, whole wheat pasta, green spinach pasta, orange tomato pasta, egg noddles, tiny-grained couscous to three-inch-wide pasta sheets.

How about the frozen foods? The freezer has hundreds of noodle, pasta, and wheat-containing side dishes to accompany the meatloaf and roast beef au jus.

In fact, apart from the detergent and soap aisle, there's barely a shelf that *doesn't* contain wheat products. Can you blame Americans if they've allowed wheat to dominate their diets? After all, it's in practically everything.

So why has this seemingly benign plant that sustained generations of humans suddenly turned on us? For one thing, it is not the same grain our forefathers ground into their daily bread. Wheat naturally evolved to only a modest degree over the centuries, but it has changed dramatically in the past fifty years under the influence of agricultural scientists. What strains have been hybrid-ized and cross-bred to make the wheat plant resistant to environmental conditions, such as drought, or pathogens, such as fungi. But most of all, genetic changes have been induced to increase *yield per acre*. The average yield on a modern North American farm is more than tenfold greater than farms of a century ago. Such enormous strides in yield have required drastic changes in genetic code, including reducing the proud "amber waves of grain" of yesteryear to the

rigid, eighteen-inch-tall high-production "dwarf" wheat of today. Such fundamental genetic changes, as you will see, have come at a price.

*Triticum* wheat of today is the product of breeding to generate greater yield and characteristics such as disease, drought, and heat resistance. In fact, wheat has been modified by humans to such a degree that modern strains are unable to survive in the world without human support such as nitrate fertilization and pest control. (Imagine this bizarre situation in the world of domesticated animals: an animal able to exist only with human assistance, such as special feed, or else it would die.)

Courtesy of modern human-designed hybridizations, *Triticum* species of today are hundreds, perhaps thousands, of genes apart from the original einkorn wheat that bred naturally.

People are usually shocked when I tell them that whole wheat bread increases blood sugar to a higher level than table sugar (sucrose). Aside from some extra fiber, eating two slices of whole wheat bread is really little different, and often worse, than drinking a can of sugar-sweetened soda or eating a sugary candy bar.

This information is not new. A 1981 University of Toronto study launched the concept of the glycemic index, i.e., the comparative blood sugar effects of carbohydrates: the higher the blood sugar after consuming a specific food to glucose, the higher the glycemic index (GI). The original study showed that the GI of white bread was 69, while the GI of whole grain bread was 72 and Shredded Wheat cereal was 67, while that of sucrose (table sugar) was 59. Yes, the GI of whole grain bread is higher than that of sucrose. Incidentally, the GI of a Mars bar - nougat, chocolate, sugar, caramel, and all - is 68. That's *better* than whole grain bread. The GI of a Snickers bar is 41 - *far* better than whole grain bread.

People who eliminate wheat from their diet typically report improved mood, fewer mood swings, improved ability to concentrate, and deeper sleep within just days to weeks of their last bite of a bagel or baked lasagna. These sorts of "soft" subjective experiences on our brains, however, are tough to quantify. They are also subject to the placebo effect - i.e., people just *think* they're feeling better. I am, however, impressed with how consistent these observations are, experienced by the majority of people once the initial withdrawal effects of mental fog and fatigue subside. I've personally experienced these effects and also witnessed them in thousands of people.

It is easy to underestimate the psychological pull of wheat. Just how dangerous can an innocent bran muffin be, after all? There is no doubt: for some people, wheat is addictive. And, in some people, it is addictive to the point of obsession.

Some people with wheat addiction just *know* they have a wheat addiction. Or perhaps they identify it as an addiction to some wheat-containing food, such as pasta or pizza. They already understand, even before I tell them, that their wheat-food-addiction-of-choice provides a little "high." I still get shivers when a well-dressed, suburban soccer mom desperately confesses to me, "Bread is my crack. I just can't give it up!"

Wheat can dictate food choice, calorie consumption, timing of meals and snacks. It can influence behavior and mood. It can even come to dominate thoughts. A number of my patients, when presented with suggestion of removing it from their diets, report obsessing over wheat products to the point of thinking about them, talking about them, salivating over them constantly for weeks. "I can't stop thinking about bread. I *dream* about bread!" they tell me, leading some to succumb to a wheat-consuming frenzy and give up within days after starting.

There is, of course, a flip side to addiction. When people divorce themselves from wheat-containing products, 30 percent experience something that can only be called withdrawal.

I've personally witnessed hundreds of people report extreme fatigue, mental fog, irritability, inability to function at work or school, even depression in the first several days to weeks after eliminating wheat. Complete relief is achieved by a bagel or cupcake (or, sadly, more like four bagels, two cupcakes, a bag of pretzels, two muffins, and a handful of brownies, followed the next morning by a nasty case of wheat remorse). It's a vicious circle: Abstain from a substance and a distinctly unpleasant experience ensues; resume it, the unpleasant experience ceases - that sounds a lot like an addiction and withdrawal to me.

#### WHEAT: APPETITE STIMULANT

Crack heads and heroin addicts shooting up in the dark corners of an inner-city drug house have no qualms about ingesting substances that mess with their minds. But how about law-abiding citizens like you and your family? I'll bet your idea of mind bending is going for the strong brew rather than the mild stuff at Starbucks, or hoisting one too many Heinekens on the weekend. But ingesting wheat means you have been unwittingly ingesting the most common dietary mind-active food known.

In effect, wheat is an appetite *stimulant*: It makes you want more - more cookies, cupcakes, pretzels, candy, soft drinks, more bagels, muffins, tacos, submarine sandwiches, pizza. It makes you want both wheat-containing foods and non-wheat containing foods. And, on top of that, for some people wheat is a drug, or at least yields peculiar drug-like neurological effects that can be reversed with medications used to counter the effects of narcotics.

If you balk at the notion of being dosed with a drug such as naloxone, you might ask, "What happens if, rather than blocking the brain effect of wheat chemically, you simply remove the wheat altogether?" Well, that's the very same question I have been asking. Provided you can tolerate the withdrawal (while unpleasant, the withdrawal syndrome is generally harmless aside from the rancor you incur from your irritated spouse, friends, and coworkers), hunger and cravings diminish, calorie intake decreases, mood and well-being increase, weight goes down, wheat belly shrinks.

Understanding that wheat, specifically exorphins from gluten, have the potential to generate euphoria, addictive behavior, and appetite stimulation means that we have a potential means of weight control: **Lose the wheat, lose the weight.**

It might be the lack of exorphins, reduction of the insulin-glucose cycle that triggers hunger, or some other factor, but **elimination of wheat reduces total daily calorie intake by 350-400 calories** - with no further restrictions on calories, fats, carbohydrates, or portion sizes. No smaller plates, prolonged chewing, or frequent small meals. Just banishing wheat from your table.

There's no reason to believe that weight loss with wheat elimination is peculiar to celiac disease sufferers. It's true for people *with* gluten sensitivity and for people *without* gluten sensitivity.

So when we extrapolate wheat elimination to people who don't have celiac disease, as I have done thousands of patients, we see the same phenomenon: dramatic and immediate weight loss, similar to that seen in the obese celiac population.

It makes perfect sense: If you eliminate foods that trigger exaggerated blood sugar and insulin responses, you eliminate the cycle of hunger and momentary satiety, you eliminate the dietary source of addictive

exorphins, you are more satisfied with *less*. Excess weight dissolves and you revert back to physiologically appropriate weight. You lose the peculiar and unsightly ring around your abdomen: kiss your wheat belly good-bye.

#### BE GLUTEN-FREE BUT DON'T EAT "GLUTEN-FREE"

Gluten is the main protein of wheat, and as I have explained, it is responsible for some, though not all, of the adverse effects of wheat consumption. Gluten is the culprit underlying inflammatory damage to the intestinal tract in celiac disease. People with celiac disease must meticulously avoid food containing gluten. This means the elimination of wheat, as well as gluten-containing grains such as barley, rye, spelt, triticale, kamut, and perhaps oats. People with celiac disease often seek out "gluten-free" foods that mimic wheat-containing products. An entire industry has developed to meet their gluten-free desires, from gluten-free bread to gluten-free cakes and desserts.

However, many gluten-free foods are made by replacing wheat flour with cornstarch, rice starch, potato starch, or tapioca starch (starch extracted from the root of a cassava plant). This is especially hazardous for anybody looking to drop twenty, thirty, or more pounds, since gluten-free foods, though they do not trigger the immune or neurological response of wheat gluten, still trigger the glucose-insulin response that causes you to gain weight. Wheat products increase blood sugar and insulin more than most other foods. **But remember: Foods made with cornstarch, rice starch, potato starch, and tapioca starch are among the few foods that increase blood sugar even *more* than wheat products.**

So gluten-free foods are not *problem-free*. **Gluten-free foods are the likely explanation for the overweight celiac sufferers who eliminate wheat and fail to lose weight.** In my view, there is no role for gluten-free foods beyond the occasional indulgence, since the metabolic effect of these foods is a little different from eating a bowl of jelly beans.

The economic costs of such trends are staggering. Gaining weight is exceptionally costly, both in terms of health care costs and the personal toll on health. Some estimates show that, over the next twenty years, an incredible 16 to 18 percent of all health care costs will be consumed by health issues arising from excessive weight: not genetic misfortune, birth defects, psychiatric illness, burns, or post-traumatic stress disorder from the horrors of war - no, just getting fat. The cost of Americans becoming obese dwarfs the sum spent on cancer. More money will be spent on health consequences of obesity than education.

#### DIABETES

Physiologically, the relationship of wheat to diabetes makes perfect sense. Products made with wheat dominate our diet and push blood sugar higher than virtually all other foods. This sends measures such as HbA1c (reflecting the average preceding sixty to ninety days' blood glucose) higher. The cycle of glucose-insulin reaching high levels several times every day provokes growth of visceral fat. Visceral fat - wheat belly - is closely aligned with resistance to insulin that, in turn, leads to even higher levels of glucose and insulin.

The early phase of growing visceral fat and diabetes is accompanied by a 50 percent *increase* in pancreatic beta cells responsible for producing insulin, a physiologic adaptation to meet the enormous demands of a body that is resistant to insulin. But beta cell adaptation has limits.

High blood sugars, such as those occurring after a nice cranberry muffin consumed on the car ride to work, provide the phenomenon of "glucotoxicity," actual damage to pancreatic insulin-producing beta cells that results from high blood sugars. The higher the blood sugar, the more damage to beta cells. The effect is progressive and starts at a glucose level of 100 mg/dl, a value many doctors call normal. After two slices of

whole wheat bread with low-fat turkey breast, a typical blood glucose would be 140 to 180 mg/dl in a non-diabetic adult, more than sufficient to do away with a few precious beta cells - **which are never replaced.**

Your poor, vulnerable pancreatic beta cells are also damaged by the process of lipotoxicity, loss of beta cells due to increased triglycerides and fatty acids, such as those developing from repeated carbohydrate ingestion. Recall that a diet weighted toward carbohydrates results in increased VLDL particles and triglycerides that persist in both the after-meal and between-meal periods, conditions that further exacerbate lipotoxic attrition of pancreatic beta cells.

Pancreatic injury is further worsened by inflammatory phenomena, such as oxidative injury, leptin, various interleukins, and tumor necrosis factor, all resulting from the visceral fat hotbed of inflammation, all characteristic of pre-diabetic and diabetic states.

Over time and repeated sucker punches from glucotoxicity, lipotoxicity, and inflammatory destruction, beta cells wither and die, gradually reducing the number of beta cells to less than 50 percent of the normal starting number. **That's when diabetes is irreversibly established.**

In short, carbohydrates, especially those such as wheat products that increase blood sugar and insulin most dramatically, initiate a series of metabolic phenomena that ultimately lead to irreversible loss of the pancreas's ability to manufacture insulin: **Diabetes.**

The wheat-as-guilty-culprit is causing obesity and diabetes reminds me of the O.J. Simpson murder trial: evidence found at the scene of the crime, suspicious behavior by the accused, bloody glove linking murderer to victim, motive, opportunity . . . but absolved through clever legal sleight of hand.

Wheat looks every bit the guilty party in causing diabetes: It increases blood sugar more than nearly all other foods, providing ample opportunity for glucotoxicity, lipotoxicity, and inflammation; it promotes visceral fat accumulation; there is a fits-like-a-glove correlation with weight gain and obesity trends over the past thirty years - yet it has been absolved of all crimes by the "Dream Team" of the USDA, The American Diabetes Association, the American Dietetic Association, etc., all of whom agree that wheat should be consumed in generous quantities. I don't believe that even Johnnie Cochran could have done better.

Can you say "mistrial"?

In the court of human health, however, you have the opportunity to redress the wrong by convicting the guilty party and banishing wheat from your life.

**Forget everything you've learned about "healthy whole grains."** For years we've been told they should dominate our diet. This line of thinking says that a diet filled with "healthy whole grains" will make you vibrant, popular, good-looking, sexy, and successful. You will also enjoy healthy cholesterol levels and regular bowel movements. **Stay on whole grains and you will be unhealthy, malnourished, and succumb to heart disease or cancer.**

Instead, remember that the need for "healthy whole grains" is pure fiction. Grains such as wheat are no more a necessary part of the human diet than personal injury attorneys are to your backyard pool party.

Let me describe a typical person with wheat deficiency: slender, flat tummy, low triglycerides, high HDL ("good") cholesterol, normal blood sugar, normal blood pressure, high energy, good sleep, normal bowel function.

In other words, the sign that you have "wheat deficiency syndrome" is that you're normal, slender, and healthy.

Contrary to popular wisdom, including that of your friendly neighborhood dietitian, there is no deficiency that develops from elimination of wheat - **provided that the lost calories are replaced with right foods.**

If the gap left by wheat is filled with vegetables, nuts, meats, eggs, avocados, olives, cheese - i.e., *real* food - then not only won't you develop a dietary deficiency, you will enjoy better health, more energy, better sleep, weight loss, and reveal of all the abnormal phenomena we've discussed. If you fill the gap left by excising wheat products with corn chips, energy bars, and fruit drinks, then, yes, you will simply have replaced an undesirable group of foods with another undesirable group; you've achieved little. And you may indeed become deficient in several important nutrients, as well as continue in the unique American shared experience of getting fat and becoming diabetic.

"Grain Brain"

David Perlmutter, MD.

Tell me what you eat, I'll tell you who you are. -Antheime Brilliat-Savarin (1755-1826)

Your brain . . .

weighs three pounds and has one hundred thousand miles of blood vessels.

contains more connections than there are stars in the Milky Way.

is the fattest organ in your body.

could be suffering this very minute without your having a clue.

When I tell people that gluten sensitivity represents one of the greatest and most under-recognized health threats to humanity, the response I hear is pretty much the same: "You can't be serious. Not everyone is sensitive to gluten. Of course, if you have celiac disease, but that's a small number of people." And when I remind people that all the latest science points to the bane of gluten in triggering not just dementia but epilepsy, headaches, depression, schizophrenia, ADHD, and even decreased libido, a common thread prevails in the response: "I don't understand what you mean." They say this because all they know about gluten focuses on intestinal health - not neurological wellness.

Gluten isn't just an issue for those with bona fide celiac disease, and autoimmune disorder that strikes a small minority. As many as 40 percent of us can't properly process gluten, and the remaining 60 percent could be in harm's way. The question we need to be asking ourselves: What if we're all sensitive to gluten from the perspective of the brain? Unfortunately, gluten is found not only in wheat products but also in the most unexpected products - from ice cream to hand cream.

Researchers have known for some time now that the cornerstone of all degenerative conditions, including brain disorders, is inflammation. But what they don't have documented until now are the instigators of that inflammation - the first missteps that prompt this deadly reaction. And what they are finding is that gluten, and a high-carbohydrate diet for that matter, are among the most prominent stimulators of inflammatory pathways that reach the brain. What's most disturbing about this discovery, however, is that we often don't

know when our brains are being negatively affected. Digestive disorders and food allergies are much easier to spot because symptoms such as gas, bloating, pain, constipation, and diarrhea emerge relatively quickly. But the brain is a more elusive organ. It could be enduring assaults at a molecular level without your feeling it. Unless you're nursing a headache or managing a neurological problem that's clearly evident, it can be hard to know what's going on in the brain until it's too late. When it comes to brain disease, once the diagnosis is in for something like dementia, turning the train around is hard.

If gluten is so bad, how have we managed to survive so long while eating it? The quick answer is that we haven't been eating the same kind of gluten since our ancestors first figured out how to farm and mill wheat. The grains we eat today bear little resemblance to the grains that entered our diet many years ago. Ever since the nineteenth century, when Gregor Mendel described his famous studies of crossing different plants to arrive at new varieties, we've gotten good at mixing and matching strains to create some wild progeny in the grain department. And while our genetic makeup and physiology haven't changed much since the time of our ancestors, our food chain has had a rapid makeover during the past fifty years. Modern food manufacturing, including bioengineering and specifically hybridization, have allowed us to grow structurally-modified grains that contain gluten that's less tolerable than the gluten that's found in grains cultivated just a few decades ago. Whether this has been intentional to increase yield, appeal to people's palates, or both is anyone's guess. But one thing we do know: Modern gluten-containing grains are more problematic than ever.

If you've ever felt a rush of euphoric pleasure following the consumption of a bagel, scone, doughnut, or croissant, you're not imagining it and you're not alone. We've known since the late 1970s that gluten breaks down the stomach to become a mix of polypeptides that can cross the blood-brain barrier. Once they gain entry, they can then bind to the brain's morphine receptor to produce a sensorial high. This is the same receptor to which opiate drugs bind, creating their pleasurable, albeit addicting, effect. The original scientists who discovered this activity, Dr. Christine Zioudrou and her colleagues at the National Institutes of Health, named these brain-busting polypeptides exorphins, which is short for exogenous morphine-like compounds, distinguishing them from endorphins, the body's naturally produced painkillers. What's most interesting about these exorphins, and further confirms their impact on the brain, is that we know they can be stopped by opiate-blocking drugs like naloxone and naltrexone - the same drugs used to reverse the action of opiate drugs such as heroine, morphine, and oxycodone. Dr. William Davis describes this phenomenon well in his book *Wheat Belly*: "So this is your brain on wheat: Digestion yields morphine-like compounds that bind to the brain's opiate receptors. It induces a form of reward, a mild euphoria. When the effect is blocked or non exorphin-yielding foods are consumed, some people experience a distinctly unpleasant withdrawal. Given what I've just explained, is it any wonder that food manufacturers try to pack as much gluten into their products as possible? And is it any surprise to find so many people addicted to gluten-filled foods today - fanning the flames of not just inflammation but the obesity epidemic? I think not. Most of us have known and accepted the fact that sugar and alcohol can have feel-good properties that entice us to come back for more. But gluten-containing foods? Your whole-wheat bread and instant oatmeal? The idea that gluten can change our biochemistry down to our brain's pleasure and addiction center is remarkable. And scary. It means we need to re-think how we categorize these foods if they are indeed the mind-altering agents that science proves they are.

High blood sugar, you'll recall, produces high insulin, which is released by the pancreas to move sugar into the body's cells. The higher the blood sugar, the more insulin must be pumped from the pancreas to deal with the sugar. And as the insulin increases, cells become less and less sensitive to the insulin signal. Basically, cells cannot hear insulin's message. What the pancreas does as anyone would do if a person couldn't hear your

message, is speak louder - that is, it increases its insulin output further, again to maintain a normal blood sugar. Even though the blood sugar is normal, the insulin level is climbing.

Since cells are resistant to the insulin signal, we use the term "insulin resistance" to characterize this condition. As the situation progresses, the pancreas finally maximizes its output of insulin, but it's still not enough. At that point, cells lose their ability to respond to the insulin signal, and ultimately, blood sugar begins to rise, resulting in type 2 diabetes. The system is essentially broken down and now requires an outside source (i.e., diabetes drugs) to keep the body's blood sugars balanced. Remember, though, that you don't have to be diabetic to suffer from chronic high blood sugar.

It's important to note that the rise of gluten sensitivity is not only the outcome of hyper-exposure to gluten in today's engineered foods. It's also the result of too much sugar and too many pro-inflammatory foods. We can also make a case for the impact of environmental toxins, which can change how our genes express themselves and whether or not autoimmune signals start to fire. Each of these ingredients - gluten, sugar, pro-inflammatory foods, and environmental toxins - combines to create a perfect storm in the body, and especially the brain.

As I've already described, having normal blood sugar levels may mean that the pancreas is working overtime to keep that blood sugar normal. Based upon this understanding, you can see that high insulin levels will happen long before blood sugar rises and a person becomes diabetic. That's why it's so important to check not only your fasting blood sugar, but also your fasting insulin level. An elevated fasting insulin level is an indicator that your pancreas is trying hard to normalize your blood sugar. It's also a clear signal that you are consuming too much carbohydrate. And make no mistake about it: Even being insulin resistant is a powerful risk factor for brain degeneration and cognitive impairment. It's not good enough to look at the diabetes data as it relates to brain disease and be confident that your risk has been ameliorated because you are not diabetic. And if your blood sugar happens to be normal, the only way you will know if you are insulin resistant is to have your fasting blood insulin level checked. Period.

It's well documented that visceral fat is uniquely capable of triggering inflammatory pathways in the body as well as signaling molecules that disrupt the body's normal course of hormonal actions. This, in turn, keeps the cascade of negative effects from visceral fat going. In addition, visceral fat does more than just generate inflammation down the road through a chain of biological events; visceral fat itself becomes inflamed. This kind of fat houses tribes of inflammatory white blood cells. In fact, the hormonal and inflammatory molecules produced by visceral fat get dumped directly into the liver, which, as you can imagine, responds with another round of ammunition (i.e., inflammatory reactions and hormone-disrupting substances). Long story short: More than merely a predator lurking behind a tree, it is an enemy that is armed and dangerous. The number of health conditions now linked to visceral fat is tremendous from the obvious ones such as obesity and metabolic syndrome to the not-so-obvious -- cancer, autoimmune disorders, and brain disease.

The dots connecting excessive body fat, obesity, and brain dysfunction are not hard to follow given the information you've already learned in this book. Excessive body fat increases not only insulin resistance, but also the production of inflammatory chemicals that play directly into brain degeneration.

If sugars and gluten-filled carbs, including your daily whole-grain breads and favorite comfort foods, are slowly impinging on your brain's long-term health and functionality, what else can these ingredients do on a more short-term basis? Can they trigger changes in behavior, seize control of focus and concentration, and underlie some tic disorders and mood conditions like depression? Can they be the culprit in chronic headaches and even migraines?

Yes, they can. The facts of "grain brain" go far beyond just hampering neurogenesis and increasing your risk for cognitive challenges that will progress stealthily over time. As I've already hinted at throughout the previous chapters, a diet heavy in inflammatory carbs and low in healthy fats messes with the mind in more ways than one -- affecting risk not just for dementia but for common neurological ailments such as ADHD, anxiety disorder, Tourette's syndrome, mental illness, migraines, and even autism.

The removal of gluten from the diet and the adoption of a grain-brain-free way of life is often the surest ticket to relief for these brain ailments that plague millions, and this simple "prescription" can often trump drug therapy.

I've known about the "achievement effect" from going gluten-free for a long time, but thankfully the scientific proof is finally catching up to the anecdotal evidence. One study that really stood out for me was published in 2006; it documented a very revealing "before" and "after" story of people with ADHD who went gluten-free for six months. What I love about this particular study is that it examined a broad spectrum of individuals - from the age of three to fifty-seven years - and it employed a well-respected behavioral scale of ADHD called the Conner Scale Hypescheme. After six months, the improvements were significant:

"No close attention to details" was reduced by 36 percent.

"Difficulty sustaining attention" was reduced by 12 percent

"Fails to finish work" diminished by 30 percent.

"Often blurts out answers and quotes" diminished by 11 percent.

The overall "average score" for those studied was lowered by 27 percent.

Increasing numbers of studies are confirming the link between gluten sensitivity and neurological dysfunction. This is true even for people who have no problems digesting gluten and who test negative for gluten sensitivity. I see this every day in my practice. Many of my patients reach me once they have "tried everything" and have been to scores of other doctors in search of help. Whether it's headaches and migraines, Tourette's syndrome, seizures, insomnia, anxiety, ADHD, depression, or just some odd set of neurological symptoms with no definite label, one of the first things I do is prescribe the total elimination of gluten from their diets. And the results continue to astound me.

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