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CHAPTER 21

Food Addictions

There's no doubt that we eat more than we used to. But why? We have a negative feedback system in our brains called *leptin,* which, until fifty years ago, told us that we had enough energy to burn, and therefore prevented us from overeating. However, as I explained in Chapter 2, insulin blocks leptin signaling (leptin resistance) at the hypothalamus, mimicking brain starvation, which causes us to overeat in an attempt to drive the leptin level higher. That being said, if insulin and leptin were the only problems, then we would overeat all types of foods—but we don't usually overconsume fruits, vegetables, or beans/ legumes/lentils. No, the foods we overeat are all found as components of fast food.

Often we're not consuming food just because we're hungry. It's become the easy "reward" and a balm for chronic stress. Which begs the question: is fast food addictive, and if so, what about it is addictive? Recent revelations in popular literature have alluded to this signature aspect of the Western diet, driving excessive consumption. Addiction is one of those bandied-about terms that changes depending on context.

So what do scientists mean? Very simple—there's *liking,* there's *wanting,* and then there's *needing.* Addiction occurs when you need a stimulus and there are physiological, behavioral, and/or social consequences. Scientists have validated the Yale Food Addiction Scale (YFAS), which demonstrates that specific foods possess addictive properties. Furthermore, a pediatric YFAS argues that food addiction is common, especially among obese children.

Yet, not everyone subscribes to the idea that specific foods or ingredients can function in this way. For instance, a group of academics in Europe called NeuroFAST doesn't accept the concept of food addiction; they prefer to label it as "eating addiction." In contrast to the YFAS, this group has proffered its own eating addiction scale in which all foods are treated similarly. NeuroFAST claims that it's not the food, but rather the behavior that distinguishes the phenomenon.

This isn't just a semantic argument—if it's about the food, then the food industry bears some culpability; but if it's about eating, then it's your fault and the industry gets off scot-free. NeuroFAST also states that even though specific foods can generate a reward signal in the brain, they still can't be considered addictive because food is essential to survival. How could something essential be addictive? After all, nicotine, alcohol, heroin, and cocaine are not essential (although alcohol is debatable, especially after the nightly news).
From their website, in their own words:

> *In humans, there is no evidence that a specific food, food ingredient or food additive causes a substance based type of addiction (the only currently known exception is caffeine) . . . Within this context we specifically point out that we do not consider alcoholic beverages as food …*

So NeuroFAST acknowledges caffeine's addictive properties, but they separate it from food. NeuroFAST also recognizes alcohol as addictive, but they also separate it from food. Why? Natural yeasts constantly ferment fruit while still on the vine or tree, causing it to ripen, yet NeuroFAST says that purified alcohol isn't a food. Rather, alcohol is a drug—we used to give it to women to stop premature labor. Once it's processed and purified, its properties change.

New Definition, New Rules

So what is it about processed food that makes it addictive? First, let's define addiction. In the past, the concept of food addiction was eschewed by the American Psychiatric Association (APA), but the DSM-IVpublished in 1994 categorized "substance use disorder" as requiring both tolerance and withdrawal, but no foodstuff (apart from caffeine or alcohol) elicited withdrawal. However, as the public health difficulties stemming from addiction expanded, the definition did as well. The *DSM-5* published in 2013 reclassified the criteria so as to include "behavioral addictions" such as gambling, video games, social media, and pornography. In the extreme, these behaviors can activate the same reward pathways as heroin, cocaine, and nicotine, but don't have the same physiologic effects that lead to withdrawal. All you need now for addiction is tolerance and dependence (engaging despite conscious knowledge and recognition of their detriment), with resultant misery. Thus, a revised set of criteria was proffered by

the APA, including:

1. Craving or a strong desire to use;
2. Recurrent use resulting in a failure to fulfill major role obligations (work, school, home);
3. Recurrent use in physically hazardous situations (e.g., driving);
4. Use despite social or interpersonal problems caused or exacerbated by use;
5. Taking the substance or engaging in the behavior in larger amounts or over a longer period than intended;
6. Attempts to quit or cut down;
7. Time spent seeking or recovering from use;
8. Interference with life activities;
9. Use despite negative consequences.

Our UCSF research group has explored the question of addiction to specific components of food by using the opiate antagonist naltrex-one, which blocks the reward system and is often prescribed for other addictions including alcoholism. From these studies, we've defined a phenomenon called *reward eating drive* (RED), which induces people to consume "tasty" foods unrelated to hunger or caloric needs. In a series of clinical research experiments, we showed that some people experience a loss of control with certain foods, and those that do tend to binge on high-sugar/high-fat foods (think chocolate cake). This aberrant behavior is driven by dysfunction of the reward system.

Fast Food Nation

Americans are fast food junkies—up to 37 percent of adults eat some form of it every day. Fast food is highly processed, nearly all fiber and nutrients have been stripped, and it's designed to tickle your taste buds in colorful packaging.

Is it just the calories, or is there something specific about fast food that generates the addictive response? Fast food contains four specific chemicals that have been examined for addictive qualities: salt, fat, caffeine, and sugar. Let's look at the data that supports or refutes each one.

Salt

In humans, salt intake has traditionally been conceived as a learned preference

rather than as an addiction. Four-to-six-month-old infants establish a salt preference based on the sodium content of breast milk, water used to mix formula, and diet. Fast foods are relatively high in salt, energy density, and caloric intake. On the other hand, studies show that people can reset their preference for less salty items. This has been demonstrated in adolescents deprived of salty pizza and hypertensive adults who were retrained to consume a lower sodium diet over eight to twelve weeks.

Furthermore, salt intake is tightly regulated. For example, patients with a pediatric disease called *salt-losing congenital adrenal hyperplasia* (which I specialized in treating) lack the hormone that retains salt by acting on the kidneys. These kids urinate salt constantly, taking water with it, leading to low blood pressure and eventually shock. They drink the pickle juice right out of the jar. But when we give them back the missing hormone, called fludrocortisone, this craving stops.

Last, the UK government engaged in a secret mass campaign with food manufacturers to reduce public salt consumption, and saw a 40 percent reduction in hypertension and stroke without signs of addiction. Why aren't we doing that in the US?

Fat

The high fat content of fast food is vital to its rewarding properties. There may be a high-fat phenotype among some people, characterized by a preference for specific high-fat foods and weak satiety in response to them, which acts as a risk factor for obesity. However, it's unlikely for most people, who get **full from drinking whole milk as opposed** to low-fat. So-called high-fat foods preferred by people are almost always also high in carbohydrate (e.g., potato chips, pizza, donuts)—then add sugar, and preference for high-fat foods goes up even more. Conversely, if you take the carbs out and just eat the fat (as in low-carb and ketogenic diets), people eat less.

Caffeine

Caffeine is a model drug of dependence, meaning it meets all the criteria for addiction in children, adolescents, and adults. People not only become tolerant of caffeine, but also experience physiological withdrawal when they try to kick it. However, in today's fast-paced world, we've leaned even more into caffeine and as

a result are sleep-deprived. To add insult to injury, most people ingesting caffeine do so with sugar—look at Red Bull, Coca-Cola, and low-fat vanilla lattes with two extra pumps of syrup. Starbucks and its signature Mocha Frappuccino have gone global. These drinks provide impetus for caffeine-dependent customers to frequent fast food franchises to get even more of their fix.

Sugar

Other than caffeine, the foodstuff with the highest score on the YFAS is sugar. In fact, adding a soda to a fast food meal increases the sugar content tenfold; multivariate analysis demonstrates that only soft drink intake, not animal products, is correlated with changes in BMI. Sugar has also been used for its analgesic effect in neonatal circumcision, suggesting a link between sugar and opioid tone in the brain's reward center. Some, but not all, self-identified food addicts describe sugar withdrawal as feeling "irritable," "shaky," "anxious," and "depressed," symptoms also seen in opiate withdrawal. Other studies demonstrate the transference of addiction from one toxic addictive substance to caffeine, nicotine, and/or sugar—meaning sometimes when you stop smoking, you start drinking. Sometimes when you stop drinking, you start eating. All of these behaviors activate the same dopamine reward system.

Human imaging studies also support the contention that sugar, and specifically the fructose molecule, is addictive. Fat activates sensory areas where you experience mouthfeel, while sugar activates the limbic system, the emotional part of the brain, where you experience reward. Taking the sugar molecule apart, glucose and fructose activate different parts of the brain, with fructose specifically lighting up the reward center. Sucrose establishes hardwired pathways for craving in these areas that can be identified by fMRI. Furthermore, the effects of fructose on dopamine are attenuated in obese adolescents, suggesting that they have fewer receptors due to tolerance.

Animal studies also show that sugar, and specifically the fructose molecule, is addictive. Sugar administration induces behavioral alterations consistent with dependence (i.e., bingeing, withdrawal, craving, and cross-sensitization to other drugs of abuse, consistent with addiction). Indeed, sweetness surpasses cocaine as a reward in rats. In fact, addicting rats to opioids makes them binge on fructose instead, because of alterations in the reward center, and especially in adolescent rats. All in all, while sugar doesn't exhibit the DSM-IVstandards of tolerance and

withdrawal, it sure as hell meets the *DSM-5* standards of tolerance and dependence. So, whatever criteria you decide to use, it's now obvious—sugar is addictive and many of us are junkies.

CHAPTER 23

The Party Line

As demonstrated in the film *Merchants of Doubt* (2014), the tobacco industry followed a consistent playbook for several decades to keep the world smoking. Ultimately, the science caught up with the industry, and the law caught up with everyone (even though the tobacco executives themselves weren't found to be personally culpable). However, it took forty-four years from the first report of tobacco and lung cancer to the Mississippi attorney general suing Big Tobacco for re-coupment of Medicaid costs related to lung cancer. As dramatized in *Dark Waters* (2019), E. I. du Pont consistently stonewalled for nineteen years to avoid litigation regarding its use of perfluorooctanoic acid (PFOA or Teflon) in pots and pans. We learned the hard way that big money industries will do anything they can to turn a profit at whatever cost to lives, the environment, and society at large.

The sugar industry is one of the most egregious villains in the bunch. Based on our current recognition of sugar's toxicity and their responses to litigation thus far, one might assume that Big Sugar learned its tricks from Big Tobacco. But it's actually the other way around—the Sugar Research Foundation was founded in 1943, and one of its executives, Dr. Robert Hockett, peddled his manipulation tactics to the Tobacco Industry Research Committee in 1954. In any case, the playbooks are almost identical—deny, deflect, distract, delay. The entire processed food industry has adopted this policy. Some tactics involve influencing scientists, others influence public opinion, and even more influence governments and the courts. The UCSF Industry Documents Library now hosts a food industry section open to the public, with a particular focus on sugar, which has been used by my colleagues to document the extent and magnitude of food industry subterfuge.

Influencing Scientists

"More doctors smoke Camels over any other cigarette . . ." This was just one of many advertising efforts of Big Tobacco to co-opt the public by co-opting

scientists, as documented by Stanford research Robert Proctor in his book *Golden Holocaust* (2012). True to the corporate playbook, the processed food industry has similarly co-opted their most influential, but not necessarily knowledgeable, critics using four different strategies.

Distracting away from the real problem. As we explored in Chapter 10, we have the data to demonstrate that processed food is a primary causative factor for diabetes, fatty liver disease, heart disease, and tooth decay; correlative for cancer, dementia, hypertension, addiction to other substances, and depression; as well as plausible for autoim-mune disease and anxiety. But when the food industry addresses these issues in public, they only refer to the "obesity epidemic." Until about 2010, they ignored the problem entirely, deflecting the issue back to the consumer and using the tobacco industry meme of "personal responsibility." When they couldn't deny culpability any longer, they chose to divert the public health conversation specifically toward obesity, for two reasons: because for them and the dietitians, it's still all about calories, and the public still believes it (hopefully I've done a good enough job with this book to finally *kill the calorie).* The data for sugar and obesity is also relatively weak, or at least it has been until recently.

One study showed that soda and desserts rank below French fries and potato chips as a cause of weight gain. You'll notice that all are processed foods and that French fries are generally consumed with loads of sugar-sweetened tomato ketchup and most flavored potato chips have lots of sugar, even if they aren't technically a dessert. This is the crux of the food industry's overarching message—if sugar is only *one* of *many* causes of obesity, then why pick on it specifically? The industry regurgitates its mantra that "a calorie is a calorie"; therefore it's about energy balance, gluttony and sloth, diet and exercise, and if you're fat, it's your fault. Yet, when weight and calories are factored out, the correlation between sugar consumption and diabetes becomes much stronger—in other words, the effect of other calories on weight gain dilutes out the specific effects of sugar on diabetes. In addition, there are countries where diabetes rates are astronomical while obesity rates are low—such as India, Pakistan, and China—yet their sugar consumption has increased by 15 percent in the past six years alone.

Of course, fast food is more than just sugar. Maybe it's the hamburgers, maybe it's the French fries, maybe it's the Filet-O-Fish sandwiches; it could even be the salad dressing. Roberto De Vogli at UC Davis wanted to know which component was the real culprit, so his team assembled the cash register receipts for eighteen years in all thirty-seven OECD countries (a mean feat to be sure), categorized what was consumed, and correlated each with weight gain over time. His research revealed it was the sugar-sweetened beverages that drove the weight gain over the processed animal- and plant-based products. Of course, this study was retrospective, not prospective, and it doesn't prove causation. Nonetheless, the sugar remains a constant.

To date, the food industry refuses to engage in a rational discussion about the role of added sugar in chronic metabolic diseases exclusive of its effects on obesity, because the message of obesity works for them. Or at least it worked for them until 2019, when the reason for this paradox was unraveled. It turns out that sugar has two effects on weight gain. One is an immediate function, where year by year consumption predicts year by year weight gain; the second function is what your mother ate before you were even born. As explored earlier, mother's consumption of sugar reaches across the placenta, goes to the liver to turn sugar into liver fat, and to the pancreas to make extra insulin, which drives fetal fat cell development. This is why obesity rates keep going up in the US, even though sugar consumption has dropped slightly in the last decade—the current generation is still paying for the previous generation's SpaghettiOs. That Coke wasn't just the "real thing" for you, but for your unborn kids, too.

Following the money. The sugar industry has a long history of co-opting scientists. My UCSF colleagues Cristin Kearns, Laura Schmidt, and Stanton Glantz have discovered the paper trail of influence by the Sugar Research Foundation. The foundation engaged in a coordinated disinformation effort to exonerate sugar and divert attention toward saturated fat as a cause of cardiovascular disease in 1967, and away from sugar as a cause of dental caries in 1971. Since then, sugar, high-fructose corn syrup, beverage, and processed food industry concerns have paid scientists to be complicit in marketing sugar as healthy, or at least benign. More recently, an analysis of Web of Science citations from 2008 to 2016

identified 779 articles with Coca-Cola conflicts of interest regarding funding. A subsequent comparison with Coca-Cola's own transparency website (established in 2016 after the *New York Times* exposé on the Global Energy Balance Network) identified 128 articles and 471 authors who weren't disclosed by Coca-Cola, as well 19 academic investigators who had direct email contact with the company. The question is whether academia and industry should be allowed to work together, especially if academia can be so easily co-opted by money.

Espousing the alternate view, Dr. John Sievenpiper of St. Michael's Hospital in Toronto, in the documentary *Sugar Coated* (2015), stated, "Academics, as much as people believe they are biased, they want to do good research, and if they can't get the money to answer important questions as they see them, in their labs and clinics, from the government, they'll look to other sources." But what if those sources have their own agendas?

Obfuscating scientific research. One would expect the totality of evidence on the detrimental effects of sugar to be reflected in systematic reviews or meta-analyses; however, many of these publications yield inconsistent results. It's a classic rewrite of the tobacco playbook. One problem is that many of these studies are funded by the food industry, with the intention of diluting the available data, specifically to paper over any significant effects. However, these inconsistencies are exposed completely when food industry sponsorship is taken into account. We shouldn't be surprised to find that studies funded by industry are 7.4 times more likely to show a favorable conclusion, and in cases when the data didn't fit the industry's narrative, they just deep-sixed it. The industry's influence in distorting public health messages even extends to institutions and organizations that have a responsibility to scientific integrity, such as the University of Sydney protecting scientists who used a faulty dataset in order to exonerate sugar as a cause of obesity.

Co-opting public health experts. For years as part of their public relations machinery, soft drink companies would push lack of physical activity as a cause of obesity. However, the evidence reveals that the impact of physical activity on chronic disease is minimal. You just can't outrun a bad diet. The beverage companies have sponsored a total of ninety-six public health efforts, with the

proviso that they don't address soft drinks. For example, Dr. Brenda Fitzgerald, the recently disgraced director of the U.S. Centers for Disease Control, wouldn't divest her portfolio from tobacco stocks and had also taken money from Coca-Cola. Coca-Cola also bankrolled the now-defunct Global Energy Balance Network, a consortium of three academics "on the take" to promulgate lack of exercise as the cause of obesity. In their own words, "an energy balance framework is the only framework that makes sense in addressing obesity." Even Michelle Obama caved to food industry pressure in the president's second term, shifting her focus away from the importance of a healthy diet exclusively toward promoting physical activity. Even the Academy of Nutrition and Dietetics (AND), British Dietetic Association (BDA), and the Dieticians Association of Australia (DAA) all receive annual contributions from food industry concerns. After all, you shouldn't bite the hand that feeds you.

Influencing Public Opinion—the Meme of "Personal Responsibility"

The most egregious corollary to energy balance, which follows directly from it, is the meme of "personal responsibility"—just another way of saying "it's your fault that you're fat." It's an ideology that requires four separate prerequisites to be in play: knowledge, access, affordability, and externalities (or how your behavior impacts other people). If any of the four are not met, then you can't invoke personal responsibility.

But who invented personal responsibility anyway? It's an ideology, but is it a human right? Some people believe it was handed down by God; after all, take the risks, suffer the consequences. Very American. But where did this idea actually come from? The Declaration of Independence? The Constitution? The Magna Carta? Maybe Hammura-bi's Code? No, this came from the tobacco industry, who embraced this concept wholeheartedly in 1962 to deflect from corporate responsibility, and used it as a reason to keep on smoking. They were getting killed on the science of lung cancer, and had to invent another reason to keep people smoking. No one put that cigarette in your mouth, right? No one lit it for you? You did all that on your own.

Then, Big Tobacco made it look cool—who didn't want to be or sleep with the

Marlboro Man? It's all personal responsibility—you smoked it, you bought it. The food industry just co-opted this ideology. It still markets well, because you don't have to smoke, but you do have to eat. And you may as well enjoy it. But you don't have to eat poison. Let's dig deeper into these personal responsibility prerequisites:

1. **Knowledge.** Can you trust the food industry to tell you when something is healthy or not? People have no idea what they're eating. The Nutrition Labeling and Education Act of 1990 gave us our current food label, which was supposed to provide information to the consumer of what's in the food, but of course says nothing about what's been done to render it poisonous. The food label is currently unintelligible in part because the industry skirts the rules (see Chapter 17). What the public needs to know *(protect the liver, feed the gut)* is what's been done to the food—but that's exactly the information that's withheld.

2. **Access.** With 74 percent of foods in the supermarket containing added sugar, it has become almost unavoidable that you will, knowingly or unknowingly, consume contaminated food in your daily life. Processed foods are quick, easy, and have permeated workplaces, gyms, schools, and your refrigerator. People in poor neighborhoods live in "food deserts," without access to Real Food because grocery stores are hard to come by. But the problem of food deserts becomes magnified when those same areas are rife with fast food outlets and convenience stores that provide only processed items (because of shelf life and depreciation). Sometimes these are called "food swamps," the density of which predict obesity and chronic disease in poor populations even better than food deserts. And why not? You can drown in a swamp faster than you can starve in a desert.

3. **Affordability.** Assuming one wants to buy healthy food and has access to it, they have to be able to afford it. Analysis of the cost of food demonstrated that Real Food (fresh produce, eggs, and meat) was twice as expensive as processed food (Cheetos and Pop-Tarts) in 2002, and increased by 17 cents per pound of food per year over the next decade, as compared with processed food, which only increased 7 cents per pound per

year. However, the cost of obesity to the individual ends up much higher. The amount of money that they pay directly for healthcare is double that of a person of normal weight. Furthermore, if you're working three jobs and have kids, then you need something quick and easy. Affordability is coming from a place of privilege not just in cost of food, but in time for menu planning, etc. It's one of many social justice issues—if you don't have the time or the money to procure and prepare Real Food, what options do you have? And the processed food industry has positioned itself to perfectly fill the gap. Cheap food seems like a no-brainer—but not really.

4. **Externalities.** The belief that your actions can't harm anyone else needs reconsideration. For example, if you smoke, you not only hurt yourself, you hurt your employer, as the cost to that employer is $5,816 per year just to carry you. The cost to employers as a result of the obesity epidemic adds an extra $2,751 per employee. There are double the workers who are obese (45 percent) as there are smokers (23 percent)—never mind the costs of the diseases of metabolic syndrome. The medical costs of chronic metabolic disease due to processed food consumption will cause a doubling of social network costs in the next decade. In the US, Medicare will be bankrupt by 2029 and Social Security will be bankrupt by 2034, bankrupting healthcare systems around the world. There's the additional burden of diet-related harm experienced by children who are especially vulnerable to poor diet at critical developmental stages.

Clearly, the ideology of personal responsibility falls apart when we're dealing with public health problems. Let's take the last healthcare personal responsibility issue as an example—HIV. Patient Zero was 1979, the term AIDS was coined in 1981, Robert Gallo and Luc Montagnier discovered the virus in 1984, and Surgeon General C. Everett Koop called attention to it in 1986. But when did HIV go from being a personal responsibility issue to a public health crisis?

On November 7, 1991, Magic Johnson declared he had HIV—and the whole world went, *"Wow,* this could happen to me." Up to that point, HIV was thought to infect homosexuals, hemophiliacs, and drug addicts. Easy enough to marginalize them. Then, all of a sudden, a straight basketball player contracts it, and the public does a 180-degree turn because it finally dawned on them that everyone is at risk. That's

the nature of a public health crisis. Well, anyone can get the chronic diseases of type 2 diabetes or heart disease or Alzheimer's disease or cancer. Nonetheless, Big Food will continue to push the obesity argument to sell their products, and Big Pharma will back them up to sell theirs.

Influencing Government and the Courts

In the 1960s Ralph Nader and *Unsafe at Any Speed* (1965) spearheaded the American consumer movement. Environmentalism was gaining speed. Regulatory agencies like OSHA and the EPA were founded. Distrust of Big Business was at its peak. But then in the 1970s somethinghappened. Big Industry, of which Big Food is a major player, started to wage a propaganda war in the halls of Congress and the Supreme Court to take back what they viewed was rightfully theirs. How did they do it?

Disinformation campaigns and legislation. In 1972, Sugar Information, Inc., ran a public disinformation campaign to deflect criticism from its product. The U.S. Federal Trade Commission (FTC) engaged in a damaging court battle, which shuttered their efforts. However, in the late 1970s, efforts to ban junk food marketing on television led to a corporate power struggle pressuring Congress to "declaw" the FTC (take away its enforcement powers), which eventually occurred in 1980; the FTC has never been heard from again. The 1970s also saw the rise of the American Legislative Exchange Council (ALEC), a bill mill that writes legislation beneficial to the oil, pharma, tobacco/alcohol, and food industries. Through contributions from affiliated groups and individuals, it effectively pays off congressmen tointroduce these bills in order to make sure the playing field is not kept level, that these industries are protected. This goes all the way to the top. One example was the privatization of the FDA's Generally Recognized as Safe (GRAS) list in 1997. Most recently, the Trump administration limited even more information on junk food labels at the bidding of Big Food.