"I've learned to recognize overeating in restaurants," writes David Kessler in *The End of Overeating: Taking Control of the Insatiable American Appetite.*

"It's not hard, because people who have been conditioned to overeat behave distinctively. They attack their food with a special kind of gusto. Certain foods seem to exert a magical pull on them, and they rarely leave any on their plates."

Kessler, a physician, lawyer, and former commissioner of the U.S. Food and Drug Administration who is now at the University of California, San Francisco School of Medicine, set out to understand that magical pull. "Sugar, fat, and salt are hijacking the brains of millions of people by activating their neural circuits," he concludes.

Here's what Kessler has learned about why he and so many others overeat...and what you can do about it.

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Why We Overeat

David A. Kessler

In 1960, when weight was relatively stable in America, women ages 20 to 29 averaged about 128 pounds," writes David Kessler in The End of Overeating. "By 2000, the average weight of women in that age group had reached 157." Among women 40 to 49, the trend was similar. "The average weight had jumped from 140 pounds in 1960 to 169 in 2000."

Two out of three American adults are now either overweight or obese. One in six children aged 2 to 19 is obese. Excess weight increases the risk of diabetes, heart disease, cancer (of the breast, colon, esophagus, kidney, and uterus), stroke, gallbladder disease, arthritis, and more.

Americans spend billions on weight-loss schemes, yet most diets fail over the long term. "That is because we have not understood why eating certain foods only makes us want to eat more of them," says Kessler. "No one has recognized what's really happening."

Here's how the food industry leads us to overeat...and how to fight back.

Q: Why did you write The End of Overeating?
A: There was a fundamental mystery that I wanted to understand. Why is it so hard for so many of us to resist eating even if we're not hungry? Why does that chocolate chip cookie have so much power over me? Why do we engage in behavior we don't want to engage in?

I started listening to people say, "I eat when I'm hungry, I eat when I'm not hungry, I eat when I'm happy, I eat when I'm sad." And I'd ask, "Do you understand why?" And they'd say "No."

Q: Do people blame themselves?
A: Yes. The result is a lot of misinformation and myths or people feeling bad about themselves or just throwing in the towel and saying, "There's nothing I can do."

I wanted to help people understand why it's so hard to resist food. And for the first time, we now have the science to say to people, "It's not your fault, and there are things you can do to control it."

Q: What does the science say?
A: First, we know what drives overeating. We published a paper called "Deconstructing the Vanilla Milkshake." We asked: Is it sugar or fat or the flavor that drives intake?

We gave rats a series of solutions containing combinations of sugar, corn oil, and vanilla, and found that sugar was the prime driver. But when you add fat to sugar, you increase the drive synergistically.

Q: The rats pressed a lever more times to get it?
A: Yes. If you combine sugar and fat, animals will work harder to get it. They'll want it more. If you give sugar alone, you'll get some dopamine spike, but if you put sugar and fat together, you stimulate more brain activation. And we know that humans prefer sugar mixed with cream more than the same amount of sugar mixed with skim milk.

Q: How is dopamine—a neurotransmitter that conveys messages from one nerve cell to another—part of overeating?
A: Dopamine focuses your attention. As human beings, we are wired to focus on the most important stimuli in our environment. If a bear walked into your office right now, your dopamine would spike. If your child is sick today, that's what you're thinking about. That's what captures your attention.
For some, alcohol can be a salient stimulus. Or illegal drugs, gambling, sex, smoking. But for many of us, it’s food.

Of all the cues in this room right now, of all the things I could be thinking about, those little chocolate chip cookies are there capturing my attention. Why? Because of my past experience, chocolate chip cookies will activate my brain.

Q: Before you take the first bite?
A: Yes. I’m not tasting them. It’s not genuine hunger, but the anticipation, that makes us eat long after our calorie needs are satisfied.

Q: And the sight of the cookies is the cue?
A: Yes, but I could also be cued by the location, the time of day, or just getting in my car because it anticipates the consumption.

I could be walking down Powell Street in San Francisco and I start thinking about chocolate-covered pretzels because six months earlier I went into a store on Powell Street that had chocolate-covered pretzels. I didn’t even remember that, but the street itself was a cue. And we’re such effective learners.

The street cue stimulates brain activation. It causes arousal. And then it becomes part of working memory. You’re thinking about it. You want it.

FOOD OR DRUG?

Q: Do some foods keep the brain activated more than others?
A: Yes. We’ve known that dopamine would spike—and stay elevated—in response to drugs like cocaine or amphetamines. But with food, we thought you would get a little dopamine elevation and then we would habituate—that is, the food would lose its capacity to activate our brains.

But if you combine sugar and fat, that brain activation doesn’t always habituate. And as you make food more multisensory, some people don’t get habituation. Their dopamine stays elevated.

Q: What do you mean by multisensory?
A: I mean that the food is more complex. For example, ice cream combines sugar and fat and cold. But if you add Heath bars, Reese’s Peanut Butter Cups, crumbled cookies, and hot fudge, that adds more texture and aroma and temperature. The more multisensory you make food, the more reinforcing it becomes. The more people come back for more.

Q: So it gets harder to resist over time?
A: For some people, yes. I was talking to an individual who works in publishing. Big guy. The hardest thing for him to do every day, he says, is to get past the newstand on the way to the train because the newstand sells Kit Kat candy bars. For each of us, it’s something different. But at its core, fat, sugar, and salt are highly salient stimuli.

Q: How does salt make us want to eat more?
A: A food industry executive told me that the industry creates dishes to hit what he called the three points of the compass. Sugar, fat, and salt are what make food compelling and indulgent. The most palatable foods have two or three of them. [See photos.] They lead to a roller coaster in the mouth—the total orosensory experience. We get captured.

Q: What’s the roller coaster?
A: It’s the cycle of cue-activation- arousal-release. We get cued—by sights, sounds, smells, time of day, location. The brain circuits get activated. There’s arousal. And then you either distract yourself with something that’s more important or you consume it and there’s a release.

Q: So eating is a thrill ride?
A: Yes. If I gave you a pack of sugar and said, “Go have a good time,” you’d look at me and say, “What are you talking about?”

Now I add to that sugar some fat, I add texture, color, temperature, mouthfeel, the outward appearance, the smell, and I put it on every corner, make it available 24/7.

Then I add the emotional gloss of advertising. I say you can eat it with your friends. Have a good time. I make it into a food carnival, and what do you expect to happen?

Q: It’s hard to resist.
A: Right. Let me give you another example. Nicotine alone is a moderate reinforcing substance in animals. I add to that nicotine the smoke, the cellophane crinkling of the pack, the color of the pack, the image of the cowboy, the sexiness, the glamour that the industry created 50 years ago, the emotional gloss of advertising.

And what did I do? I took a moderately reinforcing substance and made it into an addictive product. So sugar alone is not enough.

Q: Is everyone equally vulnerable to these foods?
A: No. You can ask people if they have these three characteristics:

One: Do you lose control in the face of highly palatable foods? Is it very hard to resist them?

Two: Do you feel a lack of satiety—a lack of feeling full—when you’re eating?

Three: Do you have a preoccupation? Do you think about foods in between meals? Or as you’re eating something, are you thinking about what you’ll be eating next?

When you ask these questions, some people have no idea what you’re talking about. But about 50 percent of obese, 30 percent of overweight, and 20 percent of healthy-weight individuals score very high on those three characteristics.
Food Rehab

Here's some of the advice David Kessler gives in *The End of Overeating* (Rodale, $25.95) to help you resist the pull of unhealthy foods.

1. **Replace chaos with structure.** Determine ahead of time what you’ll eat for meals and snacks. Block out everything else.

2. **Practice just-right eating.** Figure out how much food you need. (Odds are, it's less than you think.) Put it on your plate and don't go back for more.

3. **Pick foods that will satisfy, not stimulate, you.** What satisfies you is personal, but try foods that occur in nature, like whole grains, beans, non-starchy vegetables, and fruit, combined with lean protein and a small amount of fat.

4. **Rehearse.** Anticipate your moves like an elite athlete before a competition. For example, tell yourself, “If I encounter chocolate-covered pretzels, I’ll keep walking.”

5. **Seize control.** Stay alert to emotional stressors or other stimuli that trigger automatic behavior. Recognize emotions (like sadness, fatigue, or anxiety) that might lead you to overeat.

6. **Stop that thought.** Change the channel. Turn off the image of the trigger food before you start to debate whether to eat it.

7. **Think negative.** Pair the unhealthy food with a stream of (unappealing) images. “That’s the flip side of what advertising agencies do when they link an Olympic athlete to a pair of sneakers or an attractive woman to a new piece of technology,” says Kessler.

Q: **Are these normal people?**

A: Yes. We’re not talking about eating disorders. This is in the normal spectrum. There’s no psychopathology. So when you add them up, it’s some 70 million Americans who have this constellation of characteristics. It’s not a disease. It’s a syndrome that I call conditioned hyper-eating.

Q: **Is there evidence of what’s going on in their brains?**

A: Yes. If you expose these people to the cues—a picture of chocolate, say—and you scan their brains, you see elevated activation in a part of the brain called the amygdala.

Q: **What does the amygdala do?**

A: That’s where we process and store memories of emotions. When individuals who aren’t conditioned hypereaters start to consume chocolate, for example, the activation shuts off. But in conditioned hypereaters, the activation remains elevated and it doesn’t stop until they stop consuming the chocolate.

So the reason some foods are so hard for conditioned hypereaters to resist is that the reward circuits of the brain are in overdrive, and they’re overriding the body’s homeostatic mechanisms.

Q: **Those mechanisms should have made them stop eating?**

A: Yes. If you look at children at the age of two or three, they compensate. If you give them more calories in one meal, they’ll eat less later in the day. But if they get exposed to sugar, fat, and salt all day for a few years, they lose the ability to compensate. By age four or five, they’re eating all the time.

Q: **So eating these foods changes your brain?**

A: Yes. Every time you get cued and consume the stimulus, you strengthen the neural circuits, so the next time you’re more likely to do it again. Strengthening those circuits is what we define as learning, even though it’s not the kind of conscious learning we think about.

Q: **Does that explain why it’s tough to keep weight off?**

A: Yes. Why don’t diets work? Sure, I can deprive someone by cutting their calories for 30, 60, or 90 days. And they’ll lose weight. But, first of all, deprivation increases the reward value of food unless you substitute something you want more. And after you lose the weight, the old circuitry is still there. Unless you’ve replaced it with new circuitry—new learning—if you’re put back in your old environment, you continue to get bombarded by the old cues, so of course you’ll gain the weight back.

Buffalo Chicken Wings. Fried wings (fat), hot sauce (salt), butter (fat), dressing (fat, salt).

Bacon Cheeseburger. Ground beef (fat), bacon (fat, salt), cheese (fat), sauce (fat, salt).
Q: Because the old circuitry remains?
A: Yes. And if I become stressed, fatigued, hungry, if I'm trying to catch a plane and there's nothing else around, I will still grab those chocolate-covered pretzels. For most of us, the trick is to learn new circuitry. (See "Food Rehab," p. 5.)

THE FOOD INDUSTRY

Q: How does the food industry take advantage of conditioned hypereating?
A: They understand that sugar, fat, and salt drive consumption. They've layered and loaded it into foods. They understand the combinations that will drive intake by giving you the greatest neural activation.

Industry also knows the bliss points—how much sugar, fat, and salt is just enough and not too much. And they understand the outputs—that people keep coming back for more.

They haven't necessarily understood the black box in between—the neuroscience. Industry would say that it's just giving consumers what they want. But what they're giving consumers is food that excessively activates the brains of millions.

Q: So we get a fatty, salty food like french fries smothered in cheese and bacon, which adds even more fat and salt?
A: Right. They've optimized those ingredients to maximize the drive for food. We used to eat for nutrition—to satisfy ourselves. Now we eat for stimulation.

We're getting cued. We get that arousal. That attention. That release. The food isn't satisfying us. It's taking us on a roller coaster ride.

Q: It's food as entertainment?
A: Yes. If you go at 5 p.m. to a food court like the one at Washington D.C.'s Union Station, it's a food carnival. You optimize sugar, fat, and salt to drive consumption and add the emotional gloss, which amplifies the reinforcing value.

You'll want it. You'll love it. You'll have a good time. They make it into a carnival.

Who doesn't want to get on the rides?

Q: How can people fight back?
A: How do you cool down the stimulus? The same way we did it with tobacco. We used to look at tobacco as something we wanted, something that would make us feel better, that would make us cool, sexy.

The real success was that we changed how people viewed the stimulus. We changed from seeing tobacco as glamour to perceiving it as a deadly, disgusting product.

When you're dealing with a reinforcing stimulus, that's important. If you view it as something that you want, something that's going to comfort you, you'll approach it. If you view it as something you don't want, that's your enemy, you're going to avoid it. So social norms and attitudes do affect us and affect brain impulses.

Q: Did it help to tell teens that the tobacco industry was trying to hook them?
A: Yes. And if our behavior is becoming conditioned and driven, that has immense policy implications. Then you start seeing advertising not just as information protected under the First Amendment, but as a cue that stimulates and drives consumption.

Once our kids become conditioned and their behavior is driven by sugar, fat, and salt, then that vending machine in the hallway and that fast food restaurant are cues.

Q: Don't we want the food industry to make good-tasting food?
A: Yes. We need foods that are rewarding. Food has to be pleasurable. But we've taken highly reinforcing substances and made them more reinforcing. And we've taken down the barriers by putting fat, sugar, and salt on every corner, making it socially acceptable and available 24/7.

Q: What policies could help people?
A: First, restaurants should list calories on the menu. We also need well-funded campaigns to let people know that big food—food that's layered and loaded with fat, salt, and sugar—is unhealthy. And we need to rethink advertising for highly palatable foods.

Q: How?
A: Advertising is not just neutral information. It's a cue that amplifies the reward value of highly stimulating foods. It affects how the brain responds. Once you understand that, then I think that's a legitimate reason to limit advertising of foods that have excess fat, sugar, and salt. And we need to go to the next step on food labeling.

Q: Beyond Nutrition Facts?
A: Yes. I was recently in the cafeteria at Google's headquarters. It was striking. They have red, yellow, or green in front of each lunch item. Green means have as much as you want. Yellow means have a moderate amount. Red means taste it but be careful how much you eat. It had a real effect on me.

We need something like that on the front of food packages. It's not just about individual ingredients any more.

Also, the industry needs to set responsible portion sizes. The reality is that we're going to finish the package because once our brains are activated, it's virtually impossible to stop.

Q: How have people responded to the book?
A: It takes courage for people who weigh 300 pounds to come to these book events. But to see them shake their heads and say, "Finally, someone is explaining to me why I do this," that's why I wrote the book.