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THE WALL STREET JOURNAL.

WSJ.com

HEALTH JOURNAL | JULY 13, 2010

Eating to Live or Living to Eat?

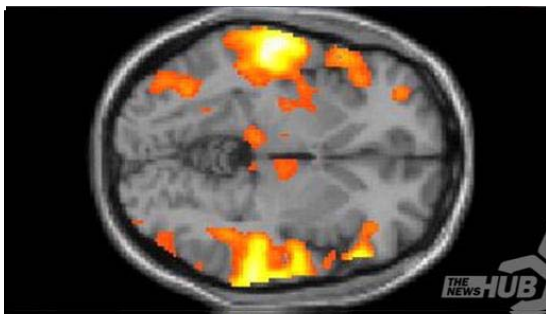
Stomach vs. Brain: Discovering Why Some People Can Resist Dessert While Others Can't

By MELINDA BECK



Imagine the typical office birthday party.

It's after lunch, so everybody is full. Then, in comes a luscious chocolate confection. The sight, the smell—even the sound of the word "cake!"—stimulate the reward-and-pleasure circuits of the brain, activating memory centers and salivary glands as well.



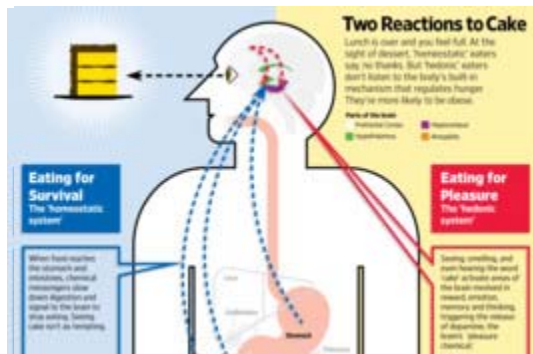
Melinda Beck asks the age-old question: Do you eat to live, or live to eat? Scientists, it turns out, have learned much more about how appetite works in the brain—and the findings have major consequences.

Those reactions quickly drown out the subtle signals from the stomach that are saying, in effect, "Still digesting down here. Don't send more!" Social cues add pressure and permission to indulge. Soon, everybody is having a slice—or two.

Scholars have understood the different motives for eating as far back as Socrates, who counseled, "Thou shouldst eat to live, not live to eat." But nowadays, scientists are using sophisticated brain-imaging technology to understand how the lure of delicious food can overwhelm the body's built-in mechanism to regulate hunger and fullness, what's called "hedonic" versus "homeostatic" eating.

One thing is clear: Obese people react much more hedonistically to sweet, fat-laden food in the pleasure and reward circuits of the brain than healthy-weight people do. Simply seeing pictures of tempting food can light up the pleasure-seeking areas of obese peoples' brains.

Two Reactions to Cake



Two conferences this week on obesity are each examining aspects of how appetite works in the brain and why some people ignore their built-in fullness signals. Scientists hope that breakthroughs will lead to ways to retrain people's thinking about food or weight-loss drugs that can target certain brain areas.

In a study presented this week at the International Conference on Obesity in Stockholm, researchers from Columbia University in New York showed pictures of cake, pies, french fries and other high-calorie foods to 10 obese

women and 10 non-obese women and monitored their brain reactions on fMRI scans. In the obese women, the images triggered a strong response in the ventral tegmental area (VTA), a tiny spot in the midbrain where dopamine, the "desire chemical," is released. The images also activated the ventral pallidum, a part of the brain involved in planning to do something rewarding.

"When obese people see high-calorie foods, a widespread network of brain areas involved in reward, attention, emotion, memory and motor planning is activated, and all the areas talk to each other, making it hard for them to resist," says lead investigator Susan Carnell, a research psychiatrist at the New York Obesity Research Center at Columbia University.



The Power of Cake?

This Power-of-Food Scale helps gauge how vulnerable you are to 'hedonic' eating. Indicate from 1-5 which of the following best describes you:

- 1 Don't agree at all
- 2 Agree a little
- 3 Agree somewhat
- 4 Agree
- 5 Strongly agree

- 1. I find myself thinking about food even when I'm not physically hungry.
- 2. I get more pleasure from eating than I do from almost anything else.
- 3. If I see or smell a food I like, I get a powerful urge to have some.
- 4. When I'm around a fattening food I love, it's hard to stop myself from at least tasting it.
- 5. It's scary to think of the power that food has over me.
- 6. When I know a delicious food is available, I can't help myself from thinking about having some.
- 7. I love the taste of certain foods so much that I can't avoid eating them even if they're bad for me.
- 8. Just before I taste a favorite food, I feel intense anticipation.

Similar brain reactions occurred in the obese subjects even when researchers merely said the words "chocolate brownie"—but not when they saw or heard about lower calorie foods such as cabbage and zucchini. Reactions were far less pronounced in the non-obese subjects.

More such studies are being presented in Pittsburgh this week at the annual meeting of the Society for the Study of Ingestive Behavior. In one, neuroscientists from Yale University's John B. Pierce Laboratory had 13 overweight and 13 normal-weight subjects smell and taste chocolate or strawberry milkshakes and observed their brains with fMRI scans.

The overweight subjects had strong reactions to the food in the amygdala—the emotional center of the brain—whether they were hungry or not. The healthy-weight subjects showed an amygdala response only when they were hungry.

"If you are of normal weight, your homeostatic mechanisms are functioning and controlling this region of the brain," says lead investigator Dana Small. "But in the overweight group, there is some sort of dysfunction in the homeostatic signal so that even though they weren't hungry, they were vulnerable to these external eating cues."

Studies have found that a diet of sweet, high-fat foods can indeed blunt the body's built-in fullness signals. Most of them emanate from the digestive tract, which releases chemical messengers including cholecystokinin, glucagon-like peptide and peptide YY when the stomach and intestines are full. Those signals travel up to the brain stem and then the hypothalamus, telling the body to stop eating.

Obesity also throws off the action of leptin, a hormone

___ 9. When I eat delicious food I focus a lot on how good it tastes.

___ 10. Sometimes, when I'm doing everyday activities, I get an urge to eat "out of the blue" (for no apparent reason).

___ 11. I think I enjoy eating a lot more than most other people.

___ 12. Hearing someone describe a great meal makes me really want to have something to eat.

___ 13. It seems like I have food on my mind a lot.

___ 14. It's very important to me that the foods I eat are as delicious as possible.

___ 15. Before I eat a favorite food my mouth tends to flood with saliva.

Scoring: Add up your responses and divide the total by 15.

1.0 - 2.3: You're unlikely to be preoccupied with food or lose control over eating.

2.4 - 3.6: You're somewhat preoccupied with food but are unlikely to have a problem unless you're significantly overweight.

3.7 - 5.0: You're frequently preoccupied with food and at risk of losing control over your eating. This is especially problematic if you are also significantly overweight.

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secreted by fat tissue that tells the hypothalamus how much energy the body has stored. Leptin should act as a brake against overeating, and it does in normal-weight people. But most obese people have an overabundance of leptin, and somehow their brains are ignoring the signal.

All these findings beg the question, which came first? Does obesity disrupt the action of leptin, or does a malfunction in leptin signaling make people obese?

Similarly, are some people obese because their brains overreact to tempting food, or do their brains react that way because something else is driving them to overeat?

Researchers at Yale and elsewhere are turning to such questions next. "It's possible that these changes reflect how the brain has adapted to eating patterns in obese people, and that could create a vicious circle, putting them at risk for even more disordered eating," says Dr. Small.

There are plenty of other metabolic mysteries, too: Why are some "foodies" who get intense pleasure from eating able to stop when they're full and others aren't? Is the tendency to eat way past fullness genetic or learned behavior, and how much can it be changed?

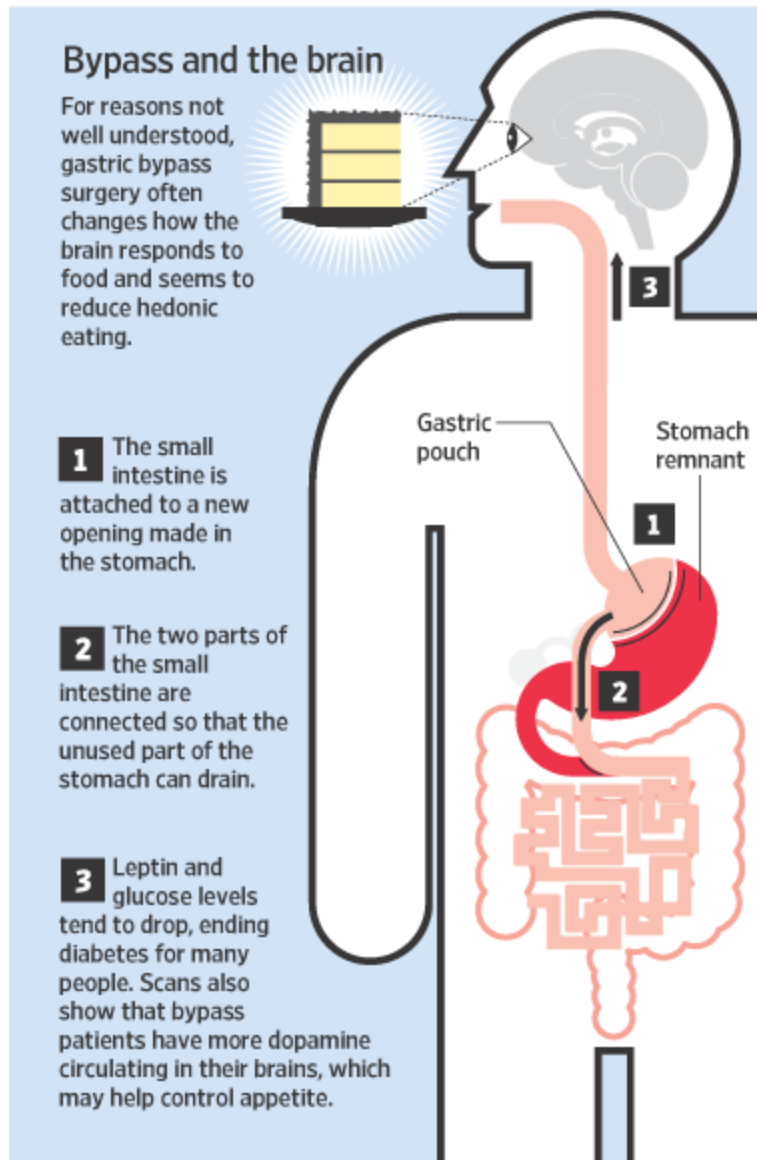
The answers are still elusive, but neuroscientists and behavioral experts are finding some tantalizing clues.

Some fMRI studies have found that while tempting food stimulates the release of dopamine in obese people, they actually have fewer dopamine receptors than normal weight subjects do, so they may derive less pleasure from actually eating, setting up a craving for more.

Curiously, several studies have shown that some forms of gastric bypass surgery can actually create changes in the brains of formerly obese people—and not just because their stomachs are smaller and fill up more quickly. Levels of leptin and glucose tend to drop in bypass patients, ending diabetes for many of them. PET scans also show that bypass patients have more dopamine circulating in their brains, which may help control appetite as well.

Bypass surgery seems to make food less tempting, too. In a study in the American Journal of Clinical Nutrition last month, Swiss researchers had 123 severely obese, 110 non-obese and 136 bypass patients take a test that measures vulnerability to hedonistic eating, known as the "Power of Food Scale." The bypass patients and the non-obese had scores far lower than those who were currently obese. (Exactly why is still unclear, but some experts think it could relate to "dumping syndrome," in which high fat and sweet food creates nausea and dizziness in bypass patients. They may have learned to associate such foods with discomfort rather than pleasure.)

Some of the most intriguing imaging studies have peered into the brains of people who have lost significant



weight and kept it off through diet and exercise alone—although researchers say they're hard to find.

"They are very controlled individuals, and they are very rare. We had to fly some in from Alaska," says Angelo Del Parigi, a neuroimaging scientist who finally located 11 "post-obese" subjects who had dieted down to the lean range. In his studies for the National Institutes of Health's diabetes research center in Phoenix, Dr. Del Parigi found that food still elicited strong responses in the middle insula and the hippocampus, brain areas involving addiction, reward, learning and memory, just like the 23 obese subjects did.

Bonds

What's For Dinner, Sweetie? Heartburn

to counteract these strong predispositions is by having a very controlled lifestyle, with restrained food intake and exercise."

He and his colleagues at the NIH have observed that in PET scans, too. In another study, 17 people who had successfully lost weight had more activity in the dorsal lateral prefrontal cortex, a part of the brain involved in impulse-control in response to food than people who were still obese.

In short, successful weight losers seemed to have having second thoughts about eating on impulse, says Dr. Del Parigi. "These people see a piece of pie that is very inviting, but they think, 'No, I have to diet. Otherwise, I will become obese again. I will suppress that pleasure,'" he says.

This suggests that the temptation to see food as pleasure doesn't go away. "Post-obese people are extremely prone to regain weight," says Dr. Del Parigi. "The only way they have

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Printed in The Wall Street Journal, page D1

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