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The New Hope: Restoring Control

The roller-coaster ride gets old. You've plunged through its jerks and twists a thousand times. You successfully resist cravings for several weeks. Then comes a momentary lapse in vigilance and, once again, eating spins out of control. The needle on the scale that you watched descend just days ago inches back up again. A critical inner voice berates you for your lack of willpower and plays in your head like a broken record. This scenario, an all-too-familiar roller-coaster ride, seems hopeless.

No matter how many times you have ridden this roller coaster, there is good reason to hope that this time you WILL get your appetite under control. You have failed in the past because you—with the help of the medical profession and the food environment of our culture—have misplaced the blame for your disordered eating. You may have explained your overeating as the result of a weak will or bad character. But the problem you struggle with is not a moral or character weakness; it is a biochemical one. Recognizing that cravings for food come from deep within our biochemistry and outside our conscious control should lead us to see disordered eating through a different lens. And just as we have misdiagnosed the problem of binge eating and overeating in the past, until now we have missed finding effective, permanent solutions.

But things have changed, and you can change, too. We now have a much more accurate understanding of the complicated, neurochemical process of appetite. We now know that food cravings are the manifestations of a genetically based biochemical disorder that skews the body's natural signals of hunger and satiety.

As the problem we once attributed to laziness or lack of self-discipline is actually

biochemical, so is the solution. That is the New Hope. In this book I will explain how we can adjust individual biochemistry to return appetite to normal levels. When biochemistry is adjusted, you can control your appetite without constant vigilance and self-restraint. You will actually lose interest in overeating!

Does this seem impossible to believe? The definition of hope is belief in things you cannot yet see, so I am asking you now to take hope based on my experience. As a psychiatrist in practice for more than twenty years, I have witnessed thousands of patients regain a normal relationship with food and appetite. It can happen to you, too.

First, a brief look at biochemistry will explain why cravings for food can be so intense. Palatable foods rich in sugar and fat stimulate the reward and pleasure centers of the brain. When you experience intense pleasure associated with sugar-laden foods, your brain produces a rush of dopamine in the reward pathway. This dopamine release creates the cycle of craving, followed by withdrawal, making you quickly crave food again. This craving is so strong for some of us that it overrides the brain's signals of fullness and satisfaction and the rational intention for self-care. Therefore, you keep eating even when you are not hungry. Although you eat more, food satisfies you less and less. This is the definition of tolerance, a hallmark condition of addiction.

According to the American Society of Addiction Medicine, addiction is a primary, chronic disease of brain reward, motivation, memory and related circuitry. Dysfunction in these circuits leads to characteristic biological, psychological, social and spiritual manifestations. The individual hyperfocuses on pursuing reward and relief by ingesting more of the addictive substance. Eventually, life is an out-of-control roller-coaster ride. Food addiction is specifically defined as a chronic, relapsing problem that encompasses three phases: 1) binge intoxication, 2) withdrawal and 3) craving.

If you think "addiction" is too strong a word to apply to food, you might find very enlightening the research studies in rats. Scientists often use rats in their research because rats' brains react to addictive substances in much the same way that human brains do. Studying rats has yielded an astonishing wealth of insight about appetite, particularly on the effects of rats' sugar consumption on levels of dopamine in pleasure centers of the brain. Chapter 6 in this book discusses the undeniable evidence from research of the addictive power of sugar. One of the strongest neurochemical commonalities between sugar binges and alcohol binges is their effects on dopamine. When hungry rats drink a sugar solution, dopamine is released in a region of the

brain known as the nucleus accumbens. This triggers motivation to consume more. More sugar provokes another surge of dopamine. After a month of daily sugar consumption, the structure of rats' brains adapts to the increased dopamine levels. They have fewer dopamine receptors than they had before; consequently, they need more of the substance to produce the same sense of satisfaction. When they again have access to sugar, their consumption increases. Essentially, they learn to binge. Finally, when sugar water is introduced to their cages, they drink it all at once. In fact, they are drawn to sugar water even more urgently than to cocaine. Rats that consume sugar solutions develop all three phases of addiction: binge intoxication, withdrawal and craving.

The effects of sugar on rats are mirrored in humans. Overeating blunts the dopamine reward response, encouraging overeating. When people eat large amounts of processed junk foods, which are purposely engineered to excite the dopamine system, over time the brain down-regulates dopamine receptors, producing less of the neurotransmitter dopamine. This decrease leads to a yearning for reinforcement, which both weakens the ability to resist temptation and diminishes the satisfaction from food. A study conducted in 2011 revealed that women who gained significant amounts of weight over six months experienced a reduced dopamine response to highly palatable foods, which prompted them to eat more to stimulate dopamine production. Therein lies the vicious cycle of addiction!

Not everyone who eats sugar becomes addicted to it, just as not everyone who drinks alcohol becomes an alcoholic. During the last couple of decades, genetics researchers identified a gene marker for alcoholism that is associated with dopamine receptors in the brain. More recent investigation has concluded that most overeaters have the same genetic marker as alcoholics.

Palatable foods activate other neural systems besides dopamine. The opioids also play a major role in the reward circuit by stimulating opioid receptors in the brain. Humans produce opioid peptides as a derivative of digesting excessive sugar and fat. This cycle begins as the individual eats an excessive quantity of sugar or fat, then restricts intake, then binges again. The body produces increasing amounts of opioids, leading to a phenomenon called endogenous opioid dependency. This means that the brain of someone addicted to food produces a substance with the same chemical structure as the chemically active ingredient in morphine, heroin and other narcotics. Individuals experience a high, followed by withdrawal and craving, similar to the feeling they would experience from ingesting an opiate drug such as heroin.

The power of the biochemical effects of palatable food is even more striking when those

effects are blocked. An important study investigated the effects of the medication naltrexone, a common opiate blocker, on disordered eating. The participants in the study were addicted to junk food and when they were given the drug naltrexone, they simply lost interest in it**.** The results of this original study have since been replicated, revealing without a doubt that the opiates were the culprits in fueling a yearning for food.

Also implicated in the addictive potential of food are morphine-like substances derived from dairy and wheat. Casomorphins, created from the milk protein casein, are morphine analogs that have neuroactive properties. As casein molecules are digested, they break apart to release opiate-like molecules. The evolutionary purpose behind casomorphins is clear: mother's milk has a calming effect. But in cheese, which is ten times more concentrated than milk, the opiate dose is much higher. Gliadorphins are protein fragments of peptides from gluten that are also neuroactive. These can react with opiate receptors in the brain, mimicking the effects of opiate drugs like heroin and morphine. Casomorphin and gliadorphin are food-derived molecules that are normal byproducts of digestion when they can be properly broken down to amino acids.

The casomorphins and gliadorphins are examples of the problematic interaction of food substances with individual biochemistry. Not everyone is susceptible to the addictive potential of opiates from these foods. The levels become elevated only when casein and gluten are partially digested and cross into the brain. If they are not broken down into amino acids and safely absorbed into the blood stream, the gliadorphin or casomorphin can cause addictive cravings for wheat or dairy products. Casomorphin and gliadorphin will be discussed in more detail in chapter 7.

Even though not everyone has the same susceptibility to these peptides, everyone with the biochemistry that makes them vulnerable will likely develop symptoms. Three-fourths of the calories we consume as part of the Standard American Diet come from dairy and wheat products. In fact, the Standard American Diet and the current food environment in the United States set the stage for vulnerable individuals to become addicted to foods that are a part of our daily routine. We have a bountiful universe of food options that have been engineered to deliver sugar and fat as cheaply as possible. Dr. David Kessler, former Commissioner of the FDA, considers salt an additional substance that tips the reward system of the brain to overwhelm rational choice. The trio of sugar, fat and salt, he contends, is mutually reinforcing. These are the foods that lead to chemical imbalances and trigger binges; after all, no one binges on broccoli. Our brains are ill

equipped to manage these chemical imbalances. Over time, brain circuitry gone awry crystallizes as addiction.

The fascinating research into the effects of sugar on experimental rats provides clear evidence of the process and power of addiction to food. Fortunately, although the human brain can be held hostage to addiction, we also have the ability to stand back, observe ourselves and change. Following an individualized plan to stabilize biochemical imbalances with food can break the addictive cycle of bingeing and restore a trustworthy appetite.

Our ability to realize we have misattributed the source of the problem and then to shift course and change is fundamental to the New Hope model. Overeating is a biologically based disorder that requires biologically based solutions. In this book, I will explain more about types of foods that can trigger addiction. I will show you how to address nutritional deficiencies that may contribute to disordered eating and binge eating. I will also suggest lifestyle changes that will help you find your own way out of food addiction and disordered eating. You WILL get off the roller coaster.

Over many years, I have treated thousands of patients suffering from appetite disturbances. I have developed a science-based approach to binge eating. This is an integrative approach founded on the insights from current medical research combined with natural strategies. Because appetite disorders are caused by a combination of many factors, an integrative approach provides the best and most lasting solution. This multi-faceted approach offers real hope to the millions who struggle with binge eating and other eating disturbances.

Integrative medicine is a therapeutic approach to healing that treats the whole patient as an individual. It is based on biochemical individuality and on the understanding that the body, mind and spirit are interconnected. The goal is to restore balance in the body by adjusting and strengthening the factors, both internal and external, which allow the body to function optimally. Integrative medicine differs from conventional medicine, which views each body system as an isolated entity and the mind as separate from the body.

While integrative medicine leverages important tools that most physicians would never think of because they are outside the confines of the traditional discipline, it is also solidly based in scientific medicine. It begins with a scientific assessment to determine your nutritional needs—what nutrients are missing, in excess or out of proportion. This is coupled with an evaluation of any coexisting conditions that may contribute to your disordered eating.

It makes sense: Before you can find a solution to a problem, you need to understand its exact contours. Fundamental to success is a comprehensive metabolic evaluation to uncover any physical or nutritional abnormalities that might be contributing to your appetite problems. The test results reveal your unique metabolic and nutritional profile, which will then become the foundation of your program.

Understanding the neurobiology of addiction and your own genetic make-up should help you stop blaming yourself! Recognizing that we are all influenced, but not determined, by our genes should help you see the importance of an individualized strategy for appetite control. Addressing the challenges of co-occurring conditions like depression and ADHD are part of tailoring a program for you.

Once you identify genetic, emotional and nutritional factors that may lead you to overeat, you can shift the blame for overeating from your character to your biochemistry, where it rightly belongs. From this foundation, you can treat disordered eating patterns, attacking problems at their source rather than simply—and temporarily—eradicating symptoms.

Just as there is rarely only one contributing factor to disordered eating, there is rarely one simple solution. The forces that fuel binge eating and food addiction are complex. Beware of books or speakers that promise One True Way to regaining control over appetite! I have found that once the nature of an individual's eating patterns have been carefully identified, recovery is most successful with a combination of three interventions: (1) nutritional supplementation, (2) medications if needed and (3) lifestyle changes. You can use one or all of these interventions, depending on how your body responds.

Nutritional Supplementation

When the body lacks certain nutrients, brain chemistry and even brain structure are affected. Nutritional deficiencies routinely cause physical and emotional problems that complicate the diagnosis and treatment of disordered eating. Nutritional deficiencies can trigger symptoms of disordered eating, delaying treatment and fostering the chronic cycle of relapse after periods of recovery.

There are several reasons nutritional deficiencies are ignored in mental health treatment programs. Chief among them is that most doctors lack nutritional knowledge, and while textbooks offer precise lists of symptoms caused by lack of specific nutrients, the real-world

relationship between nutrient deficiencies and symptoms is often not clear.

In the middle of the twentieth century, Roger Williams, PhD, formulated the concept of biochemical individuality, based on the idea that each person needs different levels of nutrients for optimal health and functioning and has a unique response to nutritional deficiencies. Specific evidence of this phenomenon has been around for centuries. For instance, in the eighteenth century, sailors on long voyages sometimes developed scurvy, a disease caused by lack of vitamin C. A seafaring chaplain, Richard Walter, observed that the disease seemed to have as many different symptoms as people who suffered from it: "…for scarcely two persons have the same complaints and where there is found some conformity in symptoms, the order of their appearance has been totally different."

In my practice, I see tremendous individual variation in physical and psychological symptoms among people with the same nutritional deficiencies. Erratic eating, fasting and purging can lead to nutritional deficiencies with both physical and psychological complications. For instance, a deficiency in essential fatty acids is associated with depression, bipolar disorder and ADHD. A lack of B vitamins and vitamin C contributes to depression and fatigue and too little magnesium can result in anxiety, constipation and insomnia. Chromium deficiency has been linked to depression and increased appetite. Taking the nutritional supplements your body needs to correct these problems can help regulate cravings and disordered eating.

In Chapter 8, you'll learn about laboratory testing to determine your individualized biochemical profile. Chapter 10 will help identify nutritional supplements helpful for appetite regulation and food cravings.

In addition to needing vitamin and mineral supplements, I have found that most of my patients who struggle with disordered eating also need supplementation with amino acids. Amino acids are the raw materials your body uses to produce the neurotransmitters and neuropeptides responsible for controlling appetite. Low levels of neurotransmitters can result in depression, anxiety, sugar and carbohydrate cravings, overeating and bingeing. Amino acid supplementation can normalize both appetite and mood. Amino acid supplements will not simply mask the symptoms of eating disturbances but will target the root causes.

In Chapter 9, you'll learn about the amino acids that can stop cravings and binge eating—including 5-HTP, phenylalanine and tyrosine—and amino acid blends I've found most effective in treating disordered eating. Many patients have found that nutritional supplements in

combination with amino acids are enough to transform their relationship with food.

Medications

Only one medication is currently approved by the FDA for a type of disordered eating: fluoxetine (Prozac) for treating bulimia. Other problems related to eating, including anorexia, obsessive dieting, binge eating and compulsive overeating, have no approved pharmaceutical treatment. Research has provided clear evidence that individual medications for patients with appetite disturbances have limited value. However, medication combinations can provide tremendous biological relief from out-of-control eating behaviors and halt the roller-coaster ride.

While there is no one magic pill, medication is also not the enemy! Sometimes a medication or combination of medications is a necessary augmentation to the nutritional treatments for appetite disturbances. Chapter 11 describes the medications I have found most helpful, especially the selective serotonin reuptake inhibitors (SSRIs), Topamax, Zonisamide and Naltrexone. Recent research has shown that medications helpful in treating coexisting psychiatric problems, such as depression and ADHD, can have tremendous benefit for binge eating, too.

Lifestyle Changes

We are bombarded with fad diets that promise answers to achieve weight loss and longevity. The problem is that the perfect diet changes with the next new celebrity book. Most of you are already aware of what a healthy diet looks like. The problem is not knowing what to do, but doing what you know. The third intervention for appetite control involves lifestyle changes. The first of these is avoiding foods that trigger your particular biochemical sensitivities and eating foods that normalize appetite and metabolism**.** Chapters 12 and 13 describe the importance of avoiding food additives, including high fructose corn syrup (HFCS) and monosodium glutamate (MSG). High fructose corn syrup throws the brain's reward system out of kilter, setting in motion a process that can lead to addiction. The glutamate in MSG stimulates insulin production, leading to overeating. Chapter 14, *Controlling Appetite with an UN-Diet*, explains how eating under stressful circumstances can hinder optimal digestion. Eating regular meals and snacks in a relaxing environment will set the stage for you to control your appetite while living diet-free.

Another important lifestyle change you can make is to recognize that you are not alone

and to seek support from others. Participating in individual therapy, group therapy or Twelve-Step programs can make the difference in achieving long-term relief from disordered eating and finding enjoyable human connections along the way. Psychotherapy can help you explore emotions that may have fueled disordered evening. Cognitive-behavioral therapy (CBT), which trains the individual to recognize faulty patterns of thinking and replace unhealthy thoughts with healthier ones, has been shown to be especially effective in people struggling to regain control over appetite. Group therapy and mindfulness offer perspective to help solve the problems that keep disordered eating patterns in play. Recent research suggests that participation in a Twelve-Step program not only helps participants find a sense of belonging with others who have similar struggles, but that the program's philosophy of shifting the problem away from a defect in will power and reframing one's personal story also activates the dopamine system in ways that are even visible on brain scans. A religious orientation is not a prerequisite to participating in a Twelve-Step program.

Chapter 15 tells you more about types of therapy that might help you.

Finally, make sure you balance movement and rest. Movement and rest are the yin and yang of health. Exercise is critical for all of us. Strenuous aerobic exercise, including jogging, tennis, basketball, skating, cycling, etc., suppresses the appetite during the exercise session and at least for a brief time afterward. This is because aerobic exercise alters certain hormone levels. Specifically, it decreases levels of the hormone ghrelin, which fuels hunger, while increasing the appetite-quelling hormone PYY. In addition, aerobic exercise eases anxiety and stress, other triggers of uncontrolled eating. Sleep is known to be a factor in helping to control appetite, as sleep stimulates the production of leptin, which curbs appetite. Conversely, loss of sleep interferes with the body's ability to metabolize carbohydrates and contributes to the storage of fat throughout the body.

In Chapter 16, you'll read about exercise and sleep and how they can help you regulate your body's appetite controls.

I have watched many people joyfully reclaim control over their appetite and enjoy all the health benefits that come from ending a pattern of disordered eating. This integrative approach, which treats an appetite gone wild as the complex problem it is, offers New Hope to the millions who struggle day after day, year after year, to keep their eating under control. The particular approach I have outlined is not new; what *is* new is the combination of interventions brought

together in an integrative program to solve a complicated, multi-faceted problem.

Following the New Hope model, you can get off the roller coaster and approach food with pleasure unclouded by guilt and shame. This has been your goal. Even if you have lost hope and this sense of enjoyment for years or even decades, it is yours to reclaim. The New Hope can become your new reality.

Summary

Millions of people struggle with appetite control, binge eating, and other eating disturbances. Tormented by food cravings, those who suffer from chronic overeating are left on an anguishing roller-coaster ride of difficult emotions, social challenges and destructive physical consequences. Many have found the flashy diets and popular weight loss programs advertised in the media to be ineffective, only increasing their feelings of guilt, isolation and utter hopelessness.

Traditional treatment approaches for appetite problems have failed because our culture and beliefs about food have prevented us from recognizing the biochemical imbalances at the foundation of disordered eating. Food addictions cannot be resolved by willpower alone. It is only by understanding the complex physiological phenomenon of appetite and the genetic, emotional and nutritional factors controlling it that a solution is possible.

By combining the latest in medical research with over thirty years of psychiatric experience, the following chapters offer an integrative solution for those caught in patterns of disordered eating. Using a holistic model, this book describes the combination of metabolic testing, nutritional supplementation, medications and lifestyle changes needed to rebalance biochemistry and make it possible to rediscover a healthy relationship with food. For many, this book will be the New Hope they have been waiting for.

Key Points

- Chronic overeating can be a tormenting roller-coaster ride of cravings, restraint, guilt, isolation and hopelessness.

- Many treatment approaches are ineffective because they do not recognize that appetite disturbance is actually a deep biochemical phenomenon that cannot be resolved by effort and willpower alone.

- This book explains how to treat disordered eating by healing the whole person and recognizing that complex genetic, emotional and nutritional factors all influence food behaviors.

- Genetic and biochemical factors powerfully influence our individual responses to food, making certain items desirable and highly addictive.

- Palatable foods rich in sugar, fat and salt stimulate the rewards centers in the brain, triggering a rush of dopamine that trips the cycle of craving.

- Some of the most popular foods in the Standard American Diet, such as wheat and dairy, contain morphine-like compounds that can be overwhelmingly habit-forming in sensitive individuals.

- Research has shown that the additives in many processed foods act like opioids in the body, creating food obsessions and skewing natural signals of hunger and satiety.

- Erratic eating habits, fasting and purging create metabolic disturbances and nutrient deficiencies that result in complicating physical and emotional symptoms.

- Similar to other types of chemical dependency, addictions to food involve three chronically relapsing phases: binge intoxication, withdrawal and craving.

- The New Hope model explained in this book describes an integrative approach for treating food addiction and binge eating disorder, which draws on the neurobiology of addiction as a scientific foundation.

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Controlling Appetite with Amino Acid Supplements

You should be relieved to learn that appetite control does not have to entail a lifelong battle. You can give up slavish counting of calories and the daily rituals and resolutions to be more self-disciplined. Since disordered eating is often related to biochemical imbalances, the solution has to incorporate biochemical interventions. To control appetite, you need to experience a sense of fullness rather than a continual craving for more. Amino acids can do just that.

The amino acids are organic compounds that combine in various ways to make proteins. The amino acids form the molecular basis for neurotransmitters and neuropeptides, the keys to appetite control in the human body.

Supporting the diet with amino acids is the first step toward controlling appetite. Many patients experience a dramatic decline in cravings and in the desire to binge soon after they begin taking amino acid supplements. In my twenty years of clinical practice, I've found amino acids especially helpful in cases of binge eating, chronic cravings, depression and anxiety. In fact, I will go so far as to say that supplemental amino acids are the most helpful intervention I've found in treating these illnesses.

The amino acids are the building blocks of proteins. Along with carbohydrates and fats, proteins are the raw materials we take into our bodies. While carbohydrates and fats are simply structured, the proteins are more complicated. Amino acid molecules, which contain carbon, hydrogen, oxygen and nitrogen atoms in specific configurations, are strung together in unique sequences called peptides, which then combine to form proteins. Our bodies manufacture more

than 50,000 different proteins. All of these are comprised of different combinations of just 20 amino acids.

Essential and Nonessential Amino Acids

The twenty amino acids are classified as “essential” and “nonessential”. The liver manufactures eleven of these twenty amino acids, while the remaining nine must be obtained through the diet. These category names are actually somewhat misleading. All the amino acids are essential to health; it’s just that nine of them must be obtained from outside the body, either from food or from supplements. If these nine are supplied in adequate quantities, the body can manufacture the other eleven.

Amino Acids

Nonessential	Essential
Alanine	Histidine (in infants)
Arginine	Isoleucine
Asparagine	Leucine
Aspartate	Lysine
Carnitine	Methionine
Cysteine	Phenylalanine
Glutamate	Threonine
Glutamine	Tryptophan
Glycine	Valine
Histidine	
Proline	
Serine	
Taurine	
Tyrosine	

How the Amino Acids Work

Once amino acids are ingested into the body, they enter the digestive tract, where they are stripped from the protein molecules. Then they are distributed as raw materials that, with enzymes, vitamins and minerals, spark the chemical reactions that keep our bodies functioning. The metabolic pathways formed by amino acids build and repair muscle tissue and produce

enzymes and hormones. In fact, they have thousands of functions within the body. Many of these involve appetite regulation.

Our thoughts, emotions and behaviors are influenced and regulated by neurotransmitters and neuropeptides. These chemical messengers relay information from one nerve cell to another throughout the brain. As neurotransmitters are released from nerve cells, the resulting electrical impulses affect how we think, feel and act. Amino acid levels that are too low can result in abnormally low neurotransmitter and neuropeptide levels. When levels of the neurotransmitters serotonin, dopamine and norepinephrine are low, appetite disturbances and eating problems can develop. In fact, all psychiatric medications affect the functioning of neurotransmitters and neuropeptides.

Neuropeptides

The neuropeptides are small molecules used by neurons to communicate with each other. The many neuropeptides in the human body have a wide range of brain functions; some play critical roles in appetite and appetite control.

The neuropeptides are now the focus of the most promising research in appetite and obesity. This is because all of the triggers of hunger and satiety in our bodies can be traced to them. Ghrelin, neuropeptide Y and the opioid peptides stimulate hunger, while leptin and cholecystokinin (CCK) decrease hunger and induce the feeling of satiety.

When your stomach is empty, cells in its lining produce the peptide *ghrelin*, which increases hunger. Ghrelin is a peptide made up of twenty-eight amino acids and signals the brain that it is time to eat, sharpening appetite and increasing the secretion of gastric acid. It also stimulates peristalsis, the rippling motion of muscles in the stomach and intestine. An easy way to remember the function of this peptide: “Ghrelin gets the stomach growlin’.”

Ghrelin levels play a role in determining how quickly hunger returns. Low ghrelin levels are also associated with insufficient sleep. This may help to explain why getting enough sleep is critical to resuming control over appetite. We’ll explore how getting adequate sleep plays an important role in maintaining appetite control in Chapter 16.

High ghrelin levels challenge appetite control because they have a powerful effect on making high-calorie foods more appealing. The effects of high ghrelin levels mimic the effects of fasting, so urgent is the desire for food. In one study, a dose of ghrelin was administered to

half of a group of healthy volunteers; the other group had placebo. High-calorie foods were more difficult to resist among those who had taken ghrelin. The researchers explained that the part of the brain known as the orbital frontal cortex, involved in encoding the reward value of food, was strongly stimulated by ghrelin. They concluded that ghrelin may explain the biological basis of food's appeal and that how pleasurable or irresistible we find foods may be explained by levels of ghrelin in our bodies.

The neuropeptide *leptin*, in contrast, turns off hunger. When researchers discovered this appetite-suppressing neuropeptide in 1994, they confirmed the hypothesis of a physiological basis for obesity. Leptin may help regulate ghrelin levels. When leptin levels are low, food seems more rewarding. With high leptin levels, the reward pathway signal is extinguished. High levels of leptin, therefore, decrease food intake, increase energy expenditure and help lower body weight.

Low levels, often seen especially in people who binge at night, increase hunger and stimulate the pleasure centers of the brain when food is present. Leptin can also challenge dieters. As fatty tissue is lost, leptin production diminishes, which leads to an even stronger urge for food.

The body's "adipostat", a sort of thermostat that monitors the level of fat in cells, is regulated by leptin. In general, the more body fat you have, the more leptin there is in your blood. However, many people who are overweight develop what is called leptin resistance; the brain does not pick up the signals that supposedly curb appetite.

This phenomenon also occurs in laboratory animals. One study of rats showed that when they were given leptin, they ate less, but that the effect lasted only two weeks, after which the leptin no longer signaled their brains to stop eating. Leptin is not effective when taken as a supplement by people who have leptin resistance.

Neuropeptide Y (NPY), found in high concentration in the hypothalamus, has just the opposite effect of leptin. While leptin signals the brain that you have eaten enough, NPY powerfully stimulates the desire to eat. In one study, when NPY was injected into the brains of rats that had just eaten their fill, it induced subsequent uncontrolled eating. Moreover, it increased the cells' storage of fat and decreased the rate of fat burning. Other studies of laboratory animals have shown that overweight rats have high NPY levels. NPY levels rise after food deprivation, prompting the animals to eat more to replenish fat stores. After repeated doses

of NPY, rats in lab studies become overweight, demonstrating all of the expected hormonal and metabolic changes associated with obesity.

Peptide YY (PYY), in contrast, extinguishes hunger. It is secreted by the digestive tract in response to food to signal the brain that the stomach is full. PYY slows down gastric emptying and both pancreatic and gastric secretions, producing a sense of satiety. It also inhibits production of the hunger-promoting NPY. Injecting PYY into lab animals inhibits their intake of food and reverses weight gain. In the average person, PYY levels increase immediately after eating and remain elevated for as long as six hours. Low levels of PYY, on the other hand, take the brakes off appetite control and lead to disordered eating. In overweight people, levels of PYY are relatively low and in response to eating, less PYY is produced than in people of normal weight.

GABA, or gamma-aminobutyric acid, is the body's primary inhibitory neuropeptide. While excitatory peptides push a cell to action, inhibitory peptides calm you down. GABA is synthesized in the brain from glutamate with the aid of vitamin B6. It increases relaxation, reduces stress and improves focus. GABA has been used to relieve anxiety, prevent convulsions and elevate mood. Benzodiazepine medications such as Valium, Xanax and Ativan work by stimulating the uptake of GABA.

Low GABA levels are present in people with diabetes and impaired glucose tolerance. These conditions force the body to secrete extra insulin to accomplish the task of getting rid of excess blood sugar. Afterward, if the kidneys and liver don't do away with the extra insulin quickly, the blood sugar will drop too low, increasing the appetite and the urge to binge. GABA can reduce an overactive appetite. Its calming effects can also help those who eat in response to stress, anxiety or depression.

The neuropeptides, like the neurotransmitters, play a key role in appetite and appetite control. I briefly described a few peptides involved in appetite regulation, but there are actually many more. Our appetite is regulated by multiple complex neurochemical systems that have evolved to manage hunger. Although the science is complicated and detailed analysis of the functions of many peptides is beyond the scope of this book, keep in mind that abnormal activity of these neuropeptides is a major factor in disordered eating. All neuropeptides are dependent on optimal availability of amino acids.

Tryptophan and 5-Hydroxytryptophan (5-HTP)

The amino acid tryptophan is the precursor from which serotonin is made. The body's synthesis of serotonin depends directly on the amount of tryptophan available in the brain. Serotonin has been called the master appetite controller, as it inhibits the appetite by activating cells in the hypothalamus, an area of the brain responsible for satiety and calm. Merely the sight, smell or thought of food causes a release of serotonin in the hypothalamus. As eating continues, serotonin levels continue to rise until you feel full and satisfied. Then, high levels of serotonin turn off the appetite. When the body does not get enough serotonin, binge eating, irritability and anxiety can result. Serotonin deficiency is linked to the brain's perception of starvation and hunger.

Many research studies have confirmed a link between low tryptophan and poor appetite control. One study involving bulimic patients found that as tryptophan levels became depleted, meal size increased. After just one tryptophan-depleted meal, patients experienced a lower mood, were increasingly concerned about body image and reported a loss of control over eating. In a study of overweight participants, tryptophan depletion significantly increased the participants' consumption of sweets and the likelihood that they would choose to eat sweets before any other type of food. These studies show that supplying the brain with enough tryptophan needed for serotonin production appears to be a key to appetite regulation, especially among those with a tendency to binge.

Tryptophan is found in large amounts in high-protein foods, most notably eggs, cheese, fish, poultry, beef and soybeans. Like other amino acids, once tryptophan enters the bloodstream, it is sent wherever the body needs it most at the time: it may become part of a hormone, an enzyme or another protein molecule. Then, when the body's other needs have been satisfied, most of the left over tryptophan will be converted in the brain to 5-hydroxytryptophan (5-HTP), which in turn, with the help of vitamin B6, will be converted to serotonin.

Conversion of amino acids into active neurotransmitters requires the availability of nutrient cofactors that are commonly depleted in individuals as a result of medications, dietary deficiencies and environmental stress. By ensuring that vitamin and mineral cofactors are adequate, we are able to optimize neurotransmitter synthesis in the brain to help with reestablishing appetite control.

Vitamin B3, vitamin B6, vitamin B12 and L-methylfolate are important cofactors

required to convert tryptophan into serotonin. Low levels of B3 will affect serotonin levels in two ways: first, the conversion of tryptophan to 5-HTP will be limited, since vitamin B3 facilitates this step. Secondly, the liver will take up even more tryptophan to compensate for the lack of the vitamin just to convert it to 5-HTP.

When vitamin B6 levels are low, the conversion of 5-HTP to serotonin will be disrupted and less than 1% of the amino acid will actually reach the brain. Low levels of vitamin B6 are usually observed in women who are pregnant, lactating or taking oral contraceptives, or in individuals with alcohol and substance abuse dependencies. When vitamin B6 supplements were given to rats in a study, the amount of 5-HTP in these rats' brains was considerably more than those without vitamin B6 supplementation.

L-methylfolate is a form of folate that readily crosses the blood-brain barrier for use in neurotransmitter production. L-methylfolate is able to increase folate concentrations in the central nervous system and plays an active role in the crucial steps of serotonin and dopamine synthesis. Individuals deficient in L-methylfolate cannot utilize tryptophan appropriately to synthesize serotonin.

Deficiencies in amino acids and vitamin and mineral cofactors may result in decreased production of critical chemicals that affect mood and appetite. Without sufficient cofactors to ensure optimal utilization of amino acids for neurotransmitter synthesis, disordered eating behavior may follow. Conversion of 5-HTP to serotonin will not occur in the absence of these vital cofactors.

For many years, clinicians have found that 5-HTP is effective in treating anxiety and depression. Recently, more studies have shown that 5-HTP may also help with appetite and weight loss. Research results on the effects of 5-HTP on disordered eating are encouraging. The first and most compelling research into the connection between 5-HTP and weight loss has come from Italy. The original Italian study was carried out with twenty overweight women. Half took 5-HTP; the other half received a placebo. The subjects' diets were not restricted. At the end of the study, those taking 5-HTP had lost more weight than the control group and also had consumed significantly fewer calories from carbohydrates—that is, they were eating less starchy, sugary food and less food overall.

The same research team undertook a second study to determine whether 5-HTP would lead to the same positive results with caloric restrictions. The first part of the study was arranged

exactly the same as the original study. Then, during the second 6 weeks, a 1,200 calorie diet was recommended and carbohydrate-rich snacks were prohibited. Patients taking 5-HTP lost an average of four pounds during the first six weeks and nearly twelve pounds during the second six-week period. Patients on placebo lost an average of less than one pound during the duration of the study. Although it might at first seem unsurprising that a calorie-restricted and carbohydrate-free diet would lead to weight loss, the difference in results between the 5-HTP group, who lost sixteen pounds in three months and the control group, who lost just two pounds, is both striking and promising.

More recently, scientists from the University of Pavia in Italy tested the use of sublingual 5-HTP spray on 27 healthy but overweight adult women. The study subjects used either the spray or a spray that contained placebo under the tongue five times a day. Researchers found that the women using the spray with 5-HTP felt a greater sense of fullness than the control group. The 5-HTP group also completed the study with a lower age body mass index than the placebo group.

All of the current research supports the theory that supplying the brain with sufficient 5-HTP can help increase serotonin levels and regulate the appetite. More research for binge eating is clearly needed; however, 5-HTP has been useful as an adjunct to treatment, particularly when it is combined with another essential amino acid, phenylalanine.

Phenylalanine

Another essential amino acid with an important role in appetite control is phenylalanine. Phenylalanine is the precursor for two important neurotransmitters: dopamine and norepinephrine. Norepinephrine is a neurotransmitter that prompts a constellation of reactions collectively labeled the stress response. In times of stress, your heart beats faster, your blood pressure rises, and you accelerate your rate of breathing to enhance mental alertness and trigger the release of glucose into your bloodstream for quick energy. If you experience chronic stress, a sufficient supply of phenylalanine is necessary. Symptoms of phenylalanine deficiency include increased appetite, poor energy, depression, lack of alertness and memory problems.

Phenylalanine comes in two forms, D and L, which are mirror images in structure. The D form is manufactured in a laboratory; the L form is natural. It is the L form that is useful as an appetite suppressant.

Phenylalanine acts in three ways to control appetite. First, it is the precursor to the

synthesis of dopamine. Dopamine improves mood and decreases the urge to binge. Secondly, phenylalanine helps stimulate the production of the hormone cholecystokinin (CCK). This is the hormone that closes the valve leading from your stomach to your small intestine, inducing a feeling of fullness. When CCK is released, the brain receives a signal that the stomach is full. The third benefit of phenylalanine for appetite control is related to stimulation of the thyroid hormones. Phenylalanine is the precursor to tyrosine, and tyrosine is the amino acid required to manufacture thyroxine, the thyroid hormone that is essential in regulating the metabolic rate of the body.

Research in animals fed a diet high in L-phenylalanine showed a significant increase in the release of CCK and a significant decrease in food intake. Later, in a study of six normal-weight, fasting men, half were given 10 grams of L-phenylalanine twenty minutes before a meal, while the other half took a placebo. Those taking the L-phenylalanine consumed approximately one-third fewer calories than the control group because they reported greater feelings of fullness. Finally, a study of L-phenylalanine's effect on food intake in women showed that taking L-phenylalanine reduced caloric intake at lunch and dinner by 10% and total daily caloric intake by 9%.

Phenylalanine inhibits the appetite and decreases food intake by inducing a feeling of fullness. It is important to note, however, that only the L form of phenylalanine induces the release of CCK and helps to depress the appetite. Phenylalanine supplements should always have the L form in the combination known as DL-phenylalanine.

Tyrosine

A third key amino acid related to appetite is tyrosine. This nonessential amino acid is derived from phenylalanine and easily passes into the brain through the blood-brain barrier. There it is converted to dopamine and the stress hormones norepinephrine and epinephrine. Tyrosine has various functions. Tyrosine is the precursor for thyroxine, the thyroid hormone that helps control metabolic rate, growth rate and mental health. Tyrosine also helps ward off stress-related depression.

Because of tyrosine's wide-ranging effects on the body in general and on neurotransmitters in particular, low levels of this amino acid can lead to several problems. A lack of dopamine increases the risk of addictive behaviors such as bingeing, drug use,

alcoholism and risk taking. Too little norepinephrine can interfere with appetite control, increasing hunger while preventing the breakdown of fat stores. As the body's stress hormones become more and more depleted, the risk of depression increases, which can cause appetite disturbances ranging from no appetite at all to intense cravings and bingeing.

There are only a few studies on tyrosine's direct effect on the appetite. Animals fed a meal high in tyrosine released higher amounts of CCK and ate less than the control group, although the results seen with tyrosine were not as significant as those seen with L-phenylalanine. Results of a study involving mice suggest that supplemental tyrosine may help ease the cognitive and mood problems associated with maintaining a newly reduced body weight after dieting. Researchers induced stress in the mice by separating them, which depleted their dopamine and norepinephrine levels, well-known causes of mood problems. However, when the mice were given supplemental tyrosine, their levels returned to normal.

The *Journal of Psychiatry and Neuroscience* reported that L-Tyrosine has been a topic of major interest for many military research studies for its ability to reduce stress. Many animal studies show that the level of L-Tyrosine in the brain influences the amount of dopamine and norepinephrine available, which affect mood and alertness. During physical stress, brain neurons are firing rapidly and this depletion can be normalized by L-Tyrosine supplementation. Dr. Simon Young reports that military test subjects have continued to respond positively to L-Tyrosine supplementation under physical duress. One study investigated whether tyrosine would be able to counteract the adverse environmental conditions with which military personnel are commonly faced. Military personnel were given 1,000 milligrams of L-Tyrosine or a placebo and subsequently exposed to cold and hypoxia. The military personnel who received 1,000 milligrams of L-Tyrosine reported fewer adverse side effects and improved cognitive function and mood. L-Tyrosine can be of important benefit for individuals struggling with environmental stress factors, such as an uncontrollable appetite. In Chapter 14, you will learn more on how stress can hinder digestion and absorption of nutrients, disrupting your body's ability to regulate eating behavior. Relaxation is key when trying to reestablish appetite control.

Glutamine

Glutamine is the most abundant amino acid in the body. Glutamine removes the body's

common waste product, ammonia, aids in immune system function, promotes normal digestion, plays an important part in brain function, serves as a metabolic fuel and acts as a precursor to other amino acids and glucose. It is converted into the excitatory neurotransmitter glutamate, one of the most important neurotransmitters for regulating normal brain function.

Glutamine primarily affects appetite through its role as metabolic fuel for glucose. When the body experiences a shortfall in glucose, it sends powerful signals demanding pumped-up glucose levels. The usual response is to eat sugary foods. Taking glutamine can achieve the same effect. Glutamine suppresses the release of insulin, which halts the decline in blood sugar levels. It also stimulates the release of glycogen and promotes the formation of blood sugar in the liver and kidneys, both of which help refuel the brain. When a person deficient in glutamine takes supplements of this amino acid, sugar cravings diminish.

Glutamine supplies can easily be depleted by stress, whether the stress is due to injuries, burns, surgery, trauma or exhaustive exercise. Stress provokes the release of the hormone cortisol, which depletes glutamine supplies and impairs immunity. Conversely, glutamine supplements strengthen the immune system and reduce infections. Endurance athletes in training typically have depleted glutamine supplies, which may explain why they often develop colds after an event.

Your brain is fueled by glucose and needs a constant supply of it. Any shortfall in fuel is considered an emergency by the brain, which sends powerful messages urging you to eat foods that can quickly increase blood glucose levels. The quickest way to increase glucose and fuel the brain is to eat sugary foods. Glutamine helps replenish glucose supplies to the brain, stabilizing mood and preventing sugar cravings and bingeing. If you have a problem with hypoglycemia or sugar/carbohydrate cravings, supplemental glutamine may help.

Glycine

A nonessential amino acid manufactured from the amino acids serine and threonine, glycine helps convert glucose into energy, maintain the digestive and central nervous systems and create DNA and RNA, the genetic blueprints for every cell in the body. Glycine also helps form and sustain muscle tissue by increasing levels of the muscle-building compound creatine. Because glycine makes up nearly one-third of the body's collagen, it is instrumental in the repair of damaged tissue. It also helps relieve muscle spasticity when combined with the amino

acid taurine. Glycine is a glucogenic amino acid, which means it can create glucose when the body needs it. It also aids in digestion by regulating the manufacture of bile acids, used to break down fats. By modulating certain neuropeptides, glycine can also help normalize sleep patterns and circadian rhythms. It has proved useful in easing the onset of sleep, stabilizing sleep states and reducing daytime fatigue. Glycine helps keep blood sugar stable by mobilizing glycogen, a stored carbohydrate released into the bloodstream as glucose. It recharges energy levels and helps ward off sugar cravings, bingeing, hypoglycemia and chronic fatigue syndrome.

Taurine

Taurine is a nonessential amino acid manufactured from methionine and cysteine in the presence of vitamin B6. Taurine helps regulate the nervous system and plays an important role in modulating our stress response. Taurine is an inhibitory amino acid that balances the excitatory effects of norepinephrine and epinephrine. Taurine supports mental performance and has antioxidant properties, which is why it is commonly found in energy drinks. While taurine can be obtained by eating meat and fish, it is better known as a dietary supplement for athletes and those trying to improve concentration.

The few research studies of taurine and appetite have yielded intriguing results. A study of satiety involving 25 healthy subjects explored the effects of a normal soy protein breakfast compared to a high soy protein breakfast. The high soy protein breakfast produced higher post-meal concentrations of taurine and insulin and was rated as more filling than the normal soy protein breakfast. Researchers concluded that the greater satiety resulted from elevated taurine and insulin levels.

A 2006 study conducted in Japan found that taurine deficiency creates a vicious circle that promotes obesity. Taurine is broken down by an enzyme called cysteine dioxygenase (CDO), which is found in large amounts in white adipose tissue (belly fat). In overweight mice, high levels of CDO lowered blood levels of taurine. But when the mice were given supplemental taurine, their metabolism increased and the obesity normally induced by a high-fat diet was prevented. The researchers concluded that too little taurine may promote obesity, which further depletes taurine through the production of CDO. Dietary taurine supplementation interrupts this vicious circle.

Taurine's possible effect as an anti-obesity agent at the cellular level has been studied. In one study, 30 college students with a body mass index over 25 kg/m were randomly assigned to take 3 grams of taurine or a placebo orally for seven weeks. At the end of the study, triacylglycerol levels and body weight were significantly reduced in the group who took taurine. These results suggest that taurine may have beneficial effects on lipid metabolism and thereby help overweight people lose weight. Taurine has a calming and stabilizing effect on the brain and may help increase the sense of satiety.

Arginine

L-arginine is an amino acid naturally produced by the body. It can also be obtained through foods such as dairy products, beef and some seafood. L-arginine is a precursor to nitric acid production, which helps with dilation of the blood vessels.

The hypothesis that arginine supplementation may increase an individual's ability to burn fat by stimulating nitric oxide production was tested on genetically overweight animals called Zucker diabetic fatty rats. Half of the study rats were given drinking water containing arginine for ten weeks; the other group was given a placebo. At the end of the tenth week, the body weights of arginine-treated rats were 16% lower than those of control rats. The results suggest that arginine supplementation may enhance nitric oxide synthesis to promote fat reduction.

Arginine supplementation may also improve insulin sensitivity in people who are not overweight but who have diabetes. Participants with both diabetes and insulin resistance were divided into two groups: the first was treated with arginine, while the second was given placebo. Both groups ate low-calorie diets and participated in an exercise program; people in both groups lost weight, but those people whose diets were supplemented with L-arginine lost more body weight and had greater decreases in waist circumference than those who took placebo.

Currently, arginine is produced in supplement pills and powders and added to most pre-workout drinks in combination with other performance enhancers. As we age, our bodies' ability to synthesize arginine decreases. Many anti-aging clinics use arginine to help combat negative effects of aging, though few scientific studies have conclusively proven these effects.

Branched Chain Amino Acids

The amino acids leucine, isoleucine and valine are collectively known as branched chain

amino acids (BCAAs). The term *branched chain* refers to their unique chemical structure, which includes a characteristic side chain that stems out into links of carbon atoms. Together, these three essential compounds make up about 35% of the amino acids found in muscle proteins, where they play a crucial role in protein synthesis and metabolism.

The branched chain amino acids are closely involved in the creation and breakdown of proteins in the body. By activating various enzymes, the BCAAs help to turn on and off your body's ability to create proteins. Maintaining adequate protein production is not only necessary for muscle building, but also for proper growth and development, nervous system function and recovery from illness or injury. Studies of the branched-chain amino acid L-leucine conclude that it reduces both food intake and body weight in rats.

In October 2013, findings published in *Diabetes, Metabolic Syndrome and Obesity: Targets and Therapy* demonstrated that a combination of leucine and vitamin B6 supplementation resulted in significant weight loss by 50 to 80% over a 24-week period in overweight participants. Participants were given a nutraceutical containing 2.25 grams of leucine and 30 milligrams of vitamin B6 or a placebo. Those who took the supplement lost up to twice as much weight as the group who didn't take the supplement. The effectiveness of the supplement is driven mainly by leucine's ability to decrease fat storage and B6's ability to stimulate muscle fat oxidation.

Scientists from the University of California's Genome Research Institute demonstrated that the signaling pathway mTOR, which is activated by nutrient and hormonal signals, plays a role in alerting the brain to how much energy the body has available. These findings suggest that this signaling pathway serves as a checkpoint for picking up energy changes that could then be manipulated to adjust food intake. This pathway is also sensitive to BCAA, particularly leucine. When leucine was administered directly to the hypothalamus in the rats' brains, scientists observed reduced food intake. Though the findings are preliminary, these results make a convincing case that diets should integrate micronutrients and amino acids, which may be responsible for driving certain pathways in the brain that regulate appetite and body weight.

Through modulating protein synthesis, the BCAAs directly affect your body's response to food intake and the regulation of appetite and weight. When nutrients become available, the BCAAs initiate two signaling systems, which stimulate the hypothalamic region in the brain to decrease appetite and simultaneously rev up protein metabolism.

Simultaneously, the BCAAs help to regulate glucose levels, even in the absence of insulin, by accelerating the use of glucose by the liver. Through a combination of these functions, the BCAAs help your body facilitate energy metabolism by keeping weight and appetite in check. Branched chain amino acids help regulate protein synthesis and metabolism while also decreasing appetite and stabilizing glucose levels. They help decrease cravings, regulate blood sugar and ease the stress hormone response.

Why Amino Acid Levels Are Too Low

If amino acids are basic nutritional elements produced within our bodies or ingested through the food we eat, why do so many people lack the necessary amino acids to help regulate appetite? Several factors can contribute to an amino acid deficiency. Perhaps the main general cause in American culture today is that people do not eat enough protein. Vegetarians and those adolescents who subsist on a diet of pasta are at greatest risk.

Another contributing factor is poor digestion of protein. This is discussed in more detail in Chapter 10. Protein is broken down in the stomach, which secretes hydrochloric acid. This powerful acid converts a substance called pepsinogen into pepsin, an enzyme that reduces protein into smaller components, called polypeptides. Without enough hydrochloric acid, protein digestion is inefficient. Hydrochloric acid also helps with the absorption of vitamin B12 and certain minerals and triggers the satiety signal. Too little hydrochloric acid prevents absorption of these nutrients and weakens the signal to the brain that the belly is full.

A third factor is age. As we age, stomach acid levels decrease. They drop by almost 40% from the teens to the thirties and almost half again by the seventies. Consequently, our ability to digest protein diminishes with age.

Antacids can further deplete amino acid levels. Millions of people who experience stomach discomfort and develop indigestion from overeating treat themselves with antacids. Taking antacids actually makes the situation worse. People trying to medicate their discomfort may unwittingly exacerbate problems with protein digestion by reducing their already low levels of hydrochloric acid even further. As stomach acid in fact helps control appetite, decreasing levels can reinforce disordered patterns of eating.

Treatment with Amino Acids

Although eating a diet rich in protein is important, my first recommendation to those struggling with disordered eating is to try amino acid supplements. Hundreds of patients have reported that intense cravings for food subsided soon after they began taking amino acid supplements.

It is best to start with a free-form amino acid blend of all the essential amino acids. A free-form blend bypasses the digestion process and is easily absorbed by the body to be used in protein, neuropeptide and neurotransmitter synthesis. The blend of all the essential amino acids provides a foundation on which you can build a targeted treatment program.

In addition, I recommend a combination of 5-HTP and DL-phenylalanine. This combination increases serotonin, dopamine and CCK, providing a simple way to influence the complex pathways of neurotransmission and appetite. Often, these two amino acids along with the blend of free form amino acids will be sufficient to help you take back control over your appetite and get off the roller coaster.

Amino acids are easy to take and laboratory tests are not needed before you begin. Supplements are available in both pill and powder form. A woman should take a maximum of 10 grams of amino acid blend three times a day; a man can take 15 grams three times a day. To make sure the supplements are fully absorbed, take them at least thirty minutes before any meal or two hours after.

Although lab tests are not necessary before taking amino acids, personalized supplementation based on fasting amino acid testing is always preferable. It is always best to find a physician or other healthcare provider who is knowledgeable about potential side effects and drug interactions. If you are taking prescription antidepressant medications that contain monoamine oxidase (MAO) inhibitors, you should not use amino acid supplements.

Amino acid supplements are often the most important factor toward optimizing appetite control, decreasing bingeing and sugar cravings, improving mood and diminishing anxiety. Time and again, I have watched patients enjoy success with getting their eating patterns under control after they have begun taking amino acids.

All aspects of physiological and biochemical control of appetite involves amino acids. From a single amino acid to more complicated peptides, neurotransmitters and hormones, amino acids serve as foundations for the vast majority of the biochemistry behind appetite control. By optimizing amino acid levels, you will be able to synthesize both simple and complicated

proteins that are required to maintain hunger management and normalize eating behavior. The first steps to take immediately after optimizing digestion with digestive enzymes are:

1. Utilize free form amino acids that are easily absorbed by the body to provide all of the essential amino acids, such as tryptophan, to serve as precursors for important neurotransmitter synthesis.

2. Try targeted amino acid supplementation that incorporates 5-hydroxytryptophan (5-HTP) and DL-phenylalanine. This combination of single amino acids provide the most dramatic regulation of appetite by optimizing the synthesis of serotonin and peptides involved in appetite control.

3. For sugar cravings, try taking glutamine or glycine supplements. Many patients have found significant relief from adding these amino acids into their treatment.

Using amino acids is not a new medical breakthrough. The solution is logical, commonsense and easy. If a nutritional deficiency causes a problem, then supplementing the body with what it has been missing can solve it. Sometimes the most significant intervention for treatment of disordered eating is providing the body with adequate precursor amino acids. A major element of the New Hope model for restoring a healthy appetite is optimizing neurotransmitter and neuropeptide levels with amino acids. Sometimes the answer to binge eating is simple, and this is the only intervention needed.

New Hope Core Amino Acid Supplements

Supplement	Contains	Daily Dosage Instructions
Free-form essential amino acids	5-HTP, phenylalanine, tyrosine, glutamine, glycine, arginine, branched chain amino acids	10-15 grams/day (Approximately 2 teaspoons mixed with water or juice before meals)
Targeted amino acid precursors	5-HTP and dl-phenylalanine	5-HTP: 50-200 milligrams DL-plenylalanine: 300- 3,000 milligrams
Digestive enzymes with Betaine Hydrochloric Acid	Broad-spectrum plant-based digestive enzymes with Betaine Hydrochloric Acid	1-2 capsules with meals

Amino Acid Supplements for Sugar Cravings

Supplement	Contains	Daily Dosage Instructions
Glycine	Glycine	1-2 grams
Glutamine	Glutamine	500-1,000 milligrams three times a day

Amino Acid Supplements for Weight Management

Supplement	Contains	Daily Dosage Instructions
Taurine	Taurine	1-3 grams
Branched chain amino acids (BCAAs)	Leucine, isoleucine, valine	1-5 grams

Summary

Appetite is strongly influenced by three specific molecular structures in the body: peptides, hormones and neurotransmitters. When these regulator molecules are in balance, hunger cues are natural and appropriate, eating patterns are synchronized and appetite is generally under control. However, the body requires adequate amounts of raw material in the form of small organic compounds called amino acids to create these larger molecules at a steady rate. When there are insufficient amino acids present to meet demands, the production of peptides, hormones and neurotransmitters falters and appetite can quickly spiral out of control.

There are approximately 20 different types of amino acids that combine to create all of the functional proteins in the body. Some amino acids are manufactured by the body, while others, deemed essential amino acids, must be consumed through the diet. Each influences appetite and metabolism in a specific way—primarily through the modulation of neurotransmitter and hormone function. Tryptophan, for example, is the precursor to serotonin, while tyrosine helps to prevent stress-related depression by influencing dopamine, norepinephrine and epinephrine levels. Glutamate is involved in the production of GABA, one of the body's primary calming neurotransmitters. Other amino acids impact appetite via their roles in glucose metabolism such as: carnitine, which helps glucose reach the cells; glycine, which mobilizes stored glucose for energy; and glutamine, which replenishes glucose supplies to the brain. The branched chain amino acids work to regulate protein synthesis and metabolism, thus also decreasing appetite and stabilizing glucose levels.

When taken properly, amino acids can help to recalibrate the underlying biochemical imbalances that distort appetite and exacerbate destructive eating patterns. Working with a qualified healthcare practitioner to replenish amino acid levels can be an empowering step in regaining appetite control.

Key Points

- Low levels of the neurotransmitters serotonin, dopamine and norepinephrine can cause appetite disturbances and eating problems.

- All peptides, hormones and neurotransmitters are manufactured from amino acids, the organic compounds that combine to create proteins.

- There are approximately 20 different amino acids, distinguished between “essential” amino acids and “nonessential” amino acids. Our body is capable of making essential amino acids on its own, while the nonessential amino acids must be obtained through the diet.

- When amino acids are in short supply, neurotransmitter production decreases and hormone levels become imbalanced.

- Amino acid supplements provide the raw material needed to increase the production of neurotransmitters, peptides and hormones, which may calm appetite problems.

- Supplying the brain with sufficient tryptophan (in the form of 5-HTP) can help increase serotonin levels and regulate appetite, especially among those with a tendency to binge.

- Phenylalanine inhibits the appetite and decreases food intake by inducing a feeling of fullness.

- Tyrosine helps ward off stress-related depression as well as bingeing related to too little dopamine, norepinephrine or epinephrine.

- GABA, known for its calming and relaxing effects, is helpful for those who eat in response to stress, anxiety or depression. It also lowers the body’s need for insulin, helping to prevent blood sugar crashes that can lead to bingeing behavior.

- Glutamine helps replenish glucose supplies to the brain, stabilizing the mood and preventing sugar cravings and bingeing.

- Glycine helps keep blood sugar stable by mobilizing glycogen, stored carbohydrate that is released into the bloodstream as glucose. It helps improve energy and ward off sugar cravings, bingeing and hypoglycemia.

- Taurine provides a calm and stabilizing effect on the brain to help increase satiety.

- Branched chain amino acids help regulate protein synthesis and metabolism, while also decreasing appetite and stabilizing glucose levels.