CHAPTER 3

Why the Insulin Resistance Theory is Questionable

I have examined the insulin resistance theory in depth for years, and have concluded that it doesn't make biological sense. Proof of this is evident if we examine many related mechanisms of the body that should suffer or be altered if insulin resistance were true. Let's review these anomalies that demonstrate how insulin resistance cannot explain the cause of Type 2 diabetes.

1. No loss of the body's ability to regulate heat

If the millions of cells in the body were resistant to insulin, particularly in our muscle tissue, we would expect the body to have great difficulty regulating its consistent internal temperature, 98.6 degrees Fahrenheit. Let me explain why this would happen.

The body is like a home furnace that burns glucose to produce heat. Under normal conditions, the temperature of the inner core of the human body remains constant within ±1 degree Fahrenheit 24 hours a day. Even when the outside air temperature ranges from a low of 55 degrees Fahrenheit below zero to a high of 130 degrees Fahrenheit, the body still maintains an almost constant internal core body temperature. In contrast to our core temperature, our skin temperature can rise and fall with the temperature of the surroundings.

Where does the body get this internal heat? In babies, specialized fat cells containing "brown fat" generate heat mainly to warm major blood vessels that supply the brain with blood. Cells storing brown fat are different from regular fat cells by virtue of their ability to produce heat instead of ATP molecules in their mitochondria. The survival of rodents during exposure to cold temperature is a testament to the ability of their brown fat cells to keep them warm. Brown fat cells play a much smaller role in warming the human body, especially in adults who have reduced amounts of brown fat.

In adults, we get our heat from the many metabolic activities occurring inside each cell. As you learned, ATP, which is made from glucose molecules, is the ready source of energy in every living cell. Many calories of energy may be contained in each ATP molecule, but only a few are needed for the molecular reactions in the cell. The remainder of the energy created when ATP decomposes is distributed in the body in the form of heat, just as your entire kitchen heats up when you are cooking in the oven.

Even under the best of conditions, only 30 percent of the energy from food is used for metabolic functions of the body. The excess heat from each cell contributes to maintaining your body's core temperature. Highly active organs such as the liver, brain, heart and skeletal muscles produce most of the heat in the body. It's amazing that the core body temperature is kept within a very narrow range with contributions from trillions of tiny furnaces.

Given that about 40 percent of the body is skeletal muscle which consumes 80 to 90 percent of the glucose from your food, it is clear that muscle activity contributes a significant amount of the heat used to maintain the body temperature. But here's exactly the proof that insulin resistance is not a valid theory. If muscle cells supposedly cannot utilize glucose as fuel because of insulin resistance, then maintaining our body temperature would be significantly impaired. However, there is no evidence of impaired body temperature maintenance in individuals with Type 2 diabetes.

One might argue against this proof, claiming that perhaps other parts of the body compensate for impaired glucose-generated heat production in muscle cells. Perhaps other organs begin to function at a higher level to produce enough heat to compensate for the loss of heat from muscles resistant to insulin. But if this were true, we should see evidence of increased activity of the involved organs and systems contributing to the maintenance of body temperature.

But we don't see such evidence. No other body organ has been found to be extra active and no byproduct of activity from other organs has been detected in excess of normal in individuals with Type 2 diabetes. Increased metabolic activity leading to greater heat production in organs other than muscle has not been found.

In short, it does not seem that insulin resistance can explain why our muscles continue to function and even generate the heat our body needs to maintain its constant temperature, nor do we see other organs compensating for a lack of muscle-powered heat. Our muscles continue to derive energy even while glucose is not getting into them. (Keep this point in mind, as it is a key point in my alternative theory. Our muscles are deriving energy from something and don't need the glucose. We'll return to this point shortly.)

2. No loss of muscle strength

If insulin resistance prevented muscles from using glucose, we should see evidence of a weakening of muscle function, just as you would expect an automobile to function poorly if the engine's ability to burn gasoline was impaired.

A muscle consists of fibers that are made of protein filaments. When muscle fibers contract, one type of protein filament pulls itself over another, similar to a person climbing up a dangling rope using both arms. While some "arms" of the protein filament are gripping, others relax. The addition of ATP is essential for the "arms" to relax, so that they have the energy for the next grip. (The most extreme example of what happens when there is no ATP to make muscle fibers relax is "rigor mortis," the state of contracture that occurs after death.)

This suggests that if the main source of ATP is glucose metabolism, the absence of glucose due to insulin resistance should prevent muscle fibers from relaxing. However, diabetes does not prevent people from running, jumping, lifting heavy boxes, dancing, skiing, or walking. Type 2 diabetics are often aging seniors who are losing muscle mass, but not at rates faster than the general population of seniors. There is no evidence of progressive weakening of muscle power or deterioration of muscle function in individuals with decades long Type 2 diabetes, even if they required increasing doses of medications including insulin to regulate their blood sugar levels. In short, it seems unlikely that insulin resistance prevents muscles from obtaining energy, even if it is not facilitating the entry of glucose.

3. No loss of triglyceride production in the liver

Some medical scientists have suggested that the liver is the first organ to show resistance to insulin. Given that insulin normally *restricts* glucose production in the liver, a person with Type 2 diabetes with insulin resistance

should produce lots of glucose in the liver (since the insulin is not working to restrict it). The scientific evidence to support this claim is the fact that, in people with Type 2 diabetes who are fasting—and thus not consuming carbohydrates—we do see a rise of blood glucose proportionate to glucose production in the liver.

But let me counter this argument. When more carbohydrates are consumed than can be used for immediate energy, insulin normally promotes the conversion of excess glucose into fatty acids in the liver. These fatty acids are subsequently converted to triglycerides and transported in the blood to fat cells for storage. If the liver becomes resistant to insulin, however, triglyceride formation in the liver should be correspondingly reduced. Yet the level of circulating triglycerides is higher than normal when a Type 2 diabetic person exhibits an elevated glucose level in the blood. How does it happen that insulin resistance causes both high glucose production AND high triglyceride production, two mutually exclusive processes?

It could be argued that the finding of increased glucose production and high triglyceride formation in the liver at the same time occurs because *only part of the liver* is resistant to the action of insulin. But there are no observations to explain why different parts of the liver would react differently to the presence of insulin. There are also no observations explaining how this is sustained throughout the life of this condition in someone with Type 2 diabetes.

4. No finding of any agents that block insulin

With many diseases, an agent such as an antibody is sometimes found to block the utilization of molecules in cells. Given this pattern in the body, insulin resistance might be considered the result of such an agent blocking the attachment of insulin to its receptor on the cell surface. Yet no one has discovered or demonstrated an agent that blocks the binding of insulin with the insulin receptor on cells at the time Type 2 diabetes is diagnosed.

5. No proof that changes in cells cause a failure to recognize the presence of insulin

Some might suggest that resistance to insulin could occur because the cells that should respond to the presence of insulin outside them do not do so. Or, perhaps some event has occurred in the cell to negate its response to insulin, such as a change in the manufacture and movement of modules needed to transport glucose inside the cell.

However, here again there is no evidence of fluctuations in the number of insulin receptors or a lower level of function in the insulin-resistant organs corresponding to the fluctuating levels of insulin.

6. No other cells of the body appear to develop insulin resistance

Under the same principle of elevations of insulin and glucose levels in the blood, it can be argued that every organ in the body of a Type 2 diabetic should exhibit insulin resistance. But they don't. One might claim that every cell, as an independent living unit, has to have a mechanism to restrict the entry of nutrients it does not need. Without such a safeguard, the cells of insulin-sensitive organs would have to mobilize glucose transport modules that allow for the entry of glucose until glucose and insulin levels are normalized in the blood, regardless of their glucose usage or the glucose storage capabilities inside them. But this also does not happen.

In short, no one has proposed a theory that explains how cells other than those of skeletal muscle, the liver and fat tissue avoid the fate of becoming resistant to the action of insulin.

The Only Logical Conclusion: Insulin Resistance is Incorrect

All the above arguments point to gaping holes in the theory of insulin resistance as the cause of Type 2 diabetes. To date, there is absolutely no proof that insulin resistance accurately explains why the body's cells do not intake glucose the way they normally do. In addition to the six anomalies I raised above, many other questions need to be answered before insulin resistance can be accepted as the causative mechanism of Type 2 diabetes, including:

- Why would the body suddenly develop resistance to the action of one of its own hormones?
- Why do sensitive cells only target insulin as the hormone they are resistant to when there are other hormones they could also be resistant to?
- Is the biology behind such a development the same in all individuals who become diabetic, whether they are obese, thin, young or pregnant?

Furthermore, we have no information on whether the cause of resistance and the mechanism by which it occurs are the same in all affected cells—skeletal muscle, the liver and fat cells. In the absence of an obvious biological mechanism to explain how resistance occurs, it is scientifically unsound to claim that these three types of cells are the only organs in Type 2 diabetes afflicted with insulin resistance.

KEY POINTS

- The insulin theory of diabetes actually proposes two concepts: 1) that the pancreas stops producing enough insulin and eventually becomes worn out trying to produce more, and 2) certain cells of the body—the liver, muscle cells, and fat cells—become resistant to the presence of insulin.
- The first concept could be plausible, but why don't other organs of the body wear out? And why doesn't insufficient production happen to all or most people?
- The second concept might make sense, also, but there is no proof for how insulin resistance occurs or why it happens in just three body tissues. There is also no explanation for why the liver produces both high amounts of glucose and high amounts of triglycerides, two mutually exclusive processes.

CHAPTER 28

Three Reasons People Overeat

You probably love food. It's hard to resist a good meal. But until you began reading this book, you may not have thought much about food as a collection of molecules containing the nutrients your cells need to function. You of course know that food provides your body with energy and vitamins and minerals, but what has been missing in your understanding is the impact of what you eat at the micro-level, where food breaks down into single molecules of energy nutrients and essential nutrients. You probably also never thought about your brain as a regulatory system that actually monitors and tracks your nutrient intake—using your taste sensors, smell receptors, the sensations in your mouth, the hormones in your stomach and intestines, and the levels of glucose and nutrients in your blood as it flows through the brain.

If these sophisticated mechanisms have developed in humans, why do we overeat? Why doesn't the brain help us completely regulate our sensations of hunger and satisfaction such that we never gain weight, never consume too much food that floods our bloodstream with glucose, and never develop high blood sugar and diabetes?

I suggest there are three reasons why people override their brain's regulatory system and overeat:

1. Dopamine based: eating for the pure enjoyment of eating even when not hungry.
2. Fullness based: eating only when hungry, but continuing until feeling full.
3. Stress induced: eating to relieve stress and anxiety.

People who tend to overeat often do so for two or three of these reasons rather than just one. The commonality between these is that they all demonstrate that when we overeat, we override the brain's hunger and satisfaction signals.

Let's examine these three reasons to better understand them. In the next chapter, we will discuss how to overcome them.

Dopamine based: Eating for Enjoyment without Being Hungry

The factors that fuel the desire to eat when you are not hungry are likely complex. As an infant, toddler, and very young child, you probably did not overeat when you were not hungry. Most very young children tend to be completely in touch with their hunger and satisfaction signals. They only eat when hunger drives them to do so and then only as much as they can handle.

I suggest that non-hunger eating begins more or less as a temporary and occasional accident, done without recognizing its long-range significance. In most people, it occurs as incidental to other events or situations, such as a family picnic or holiday dinner, a chance meeting with a friend, or an unplanned spur-of-the-moment meal with someone. It is not a deliberate act of eating, but a random occurrence.

However, the more these eating events occur in one's early life, the more repetition reinforces the brain to make connections between eating and enjoyment. Whether you are hungry or not, if food is available and

appealing, you learn to feel it is okay to eat it. You may sense that it's not appropriate to be eating when you are not hungry, and even those who cared for you during your childhood might have told you not to do it. But little by little, you begin to rationalize that since food serves a good purpose, eating just a little bit without being hungry can't be that bad. The enjoyment of discovering new foods and the pleasure of eating them eventually overcomes your natural inclination to wait for the sensation of hunger.

Over the years, your mind develops ways to rationalize and minimize the unwanted consequences of this eating behavior. You may start to gain weight, but tell yourself, "It's just a few extra pounds and I can take it off easily." You may know that you are eating too much, but dismiss it by thinking, "I can stop doing this any time I want, but for now, I'm enjoying this food." This pattern of eating may even be strengthened by those around you who are doing it, too.

A repetitive act is reinforced when it is accompanied by strong feelings. In this case, it is the pleasure associated with food. You begin to establish a behavior of eating when stimulated by the sight, smell, or even just the thought of food rather than by your body's hunger signals, just because you like the feeling of enjoyment. The connection between food and enjoyment is stored in your memory and expresses itself without any conscious or deliberate effort. Smelling food cooking, walking into a colorful supermarket, passing by a restaurant—all these trigger in you a pleasurable feeling caused by the release of *dopamine*, a neurohormone, that prompts you to want food. You look forward to enjoying a variety of good quality, tasty foods.

Once you reach this stage, however, you may easily fall prey to craving foods that combine sugars, salts, and fats of different properties in optimum ratios to create items that intensify the feeling of pleasure you seek.

Once this rationale is established, even your awareness or the presence of adverse long-term consequences such as weight gain, high blood sugar, high blood cholesterol, or high blood pressure may not be sufficient deterrents to modify your response to food. This is because the brain has difficulty connecting behavior with long-term consequences. If the ill effects do not immediately follow the causal action, it is easy to rationalize a behavior. Your subconscious mind can't make value judgments, deciding whether what you're doing is good or bad. It simply remembers and accepts what you have been doing and facilitates the execution of the established behavior. The behavior continues, even when the consequences are damaging.

This pattern of behavior is not unlike other behaviors you might cultivate for pleasure, such as gambling, work, sex, or even accumulating wealth. Once you begin the activity, it becomes difficult to stop repeating it over and over.

Fullness based: Eating Only When You Are Hungry . . . but Overeating

If you are good at waiting for your hunger signals and not eating prematurely when your body needs nutrition, what would cause you to be unaware of the signals of satisfaction your body generates for you? There are likely several possible explanations for this behavior.

The first might be that you overeat in the sense that you simply consume too much of the wrong food. Your diet may emphasize grain-based carbohydrate, natural sugars, salt, and fat that provide your body with an excess of nutrients it cannot immediately use. While you may believe you are eating appropriate portions, the fact that your choice of foods is skewed means you are filling your body with glucose, fatty acids, and salt. The more you eat these foods, the harder it becomes to maintain your authentic weight and to prevent the onset of high blood sugar and possibly diabetes.

This type of overeating can also begin unconsciously. While hunger triggers the conscious decision to initiate eating, your subconscious mind is not controlled by rational thought and is easily swayed to follow eating patterns you established long ago. For example, if as a child or teen you repeatedly consumed fruit juice or soda in response to thirst, the subconscious mind can interpret the thirst sensation as a need for soda and not water. (Are you one of those people who drink soda all day long?) If you routinely had eggs and bacon for breakfast when you grew up, the brain could create a craving for these in the morning even though the body does not need nutrients from these items. In effect, you may be hungry when you eat, but you consume too much of the wrong nutrients out of habit.

The second reason you may overeat is similar to that of a person who enjoys food and has built up a behavior based around the pleasure of eating. You may wait for the hunger signal, but once it starts, your enjoyment takes over and you cannot stop yourself. However, instead of variety or quality, the quantity of food becomes the pleasure-generating factor for you. You have long stopped paying attention to the feeling of satisfaction during a meal. You wait for the stomach to stretch almost to the point of discomfort to stop eating.

Your uncontrolled enjoyment may also have started accidentally by overeating at family events, parties, business outings, and trips to new places where abundant (and sometimes free) foods are found. Repeated overeating at such events reinforces the feelings of pleasure you derive from getting full, and they become ingrained in your unconscious mind. The absence of immediate negative consequences following an excessive intake of food can lead to a behavior pattern in which you rationalize overeating with excuses such as, "I was really hungry" or "I just wanted to taste that new dish," or "I skipped lunch so it's okay if I eat a lot at this party." You might also be influenced to consume a lot of food by external factors such as dining with friends who overeat, going to an expensive restaurant where you want to partake of the luxury and get your money's worth, and many other situations.

Stress induced: Overeating in Response to Stress

Stress is any stimulus that alters the meaning or intensity of your feelings, actions, or communications. Signals that you interpret as harmful to your safety, security, or health are the ones that cause a stress response. The stimuli that cause stress are essentially the same for most people—perceived threats, illness, injury, or inconveniences. The intensity and duration of the stimuli needed to elicit the stress response varies for each person. One individual may be able to handle many difficult life events that another person would find highly stressful. It seems true that one's conditioning and training to cope with stress starting in early childhood and continuing to adulthood determines your sensitivity to stressful stimuli.

In general, people experience stress as two powerful feelings: fear or hurt. Fear can be imagined or real and based on known or unforeseen factors. Fear, by definition, is more emotional than rational. During the fear response, neurons located in the primitive core part of the brain are activated before the stimulus can be analyzed on the intellectual level to determine if it is real and deserves a thoughtful reaction. Fear rather forces you to determine what to do based on an incomplete analysis of partial information. Hurt can be physical or emotional. It can be based on a current event or a past experience.

The time of onset, degree, and duration of the stress response vary with each individual, based on hormones released in the body during the stress response. For instance, let's look at anger, a feeling of displeasure aroused by a real or imagined stress. If your body releases adrenaline at the slightest provocation, you're a person who

will get angry quickly and easily. If the amount of adrenaline released is large or if your sensitivity to it is high, the intensity of your anger will also be high. If you remain in the stressful environment or dwell on the stress in your mind, your body can continue releasing the hormone for a long period, setting the stage for prolonged anger. If you routinely expect a person or event to create displeasure for you, it may cause you to be angry each time you encounter that person or event.

How and why does stress cause people to overeat? The two are actually quite connected. As you recall from earlier discussion, adrenaline is released in the body in between meals to facilitate use of fatty acids as fuel. If you become stressed when you're hungry, or vice versa, more adrenaline is released. One of the reasons eating helps you feel better is because food in your digestive system helps slow the release of adrenaline. The experience of feeling calmer and more relaxed after eating sets up a behavior pattern that promotes eating when you feel stressed.

A second reason people eat when feeling stressed is that the body's stress response causes you to seek out some action to mitigate the stressor. You feel you have to do something to relieve the stress. For many people, the action of preparing and eating helps them stop thinking about the stressor or believe that they are managing it. Through the repetition of this behavior, eating often becomes an automatic process for stressed-out people to meet the challenges of their lives.

The irony about stress is that some people enjoy creating a sense of stress out of ordinary life events because they become habituated to the adrenaline in their body. They heighten events through thoughts that make them feel internally stressed, out of which they believe they become more energetic. In their mind, stress sharpens their focus and helps them perform at a higher level. They actually feel lethargic without some stress in their life. Some utilize stress in a creative way to accomplish their artistic objectives. Others may invent a stressful situation just to experience a thrill. For example, those who drive at high speeds or ride roller coasters do so for the pleasure they get from putting themselves in stressful situations.

Some "adrenaline junkies" use food or drink to counteract or complement their love of stress. They may drink coffee, soda, and sweetened beverages frequently during the day. In their jobs, they may drive themselves to keep working right through lunch time, scarfing down snacks and carbohydrate-rich foods and guzzling soda to hold them over until dinner time. In the evening, with their body depleted of energy, their brain is hungering for good nutrition so they finally eat a full meal. However, their lack of balance and control during the day often drives them to overeat as this becomes the only opportunity they have to enjoy their food— and so they overindulge in the pleasure of eating. This again becomes a common behavior pattern for stress junkies.

How Your Brain Reinforces the Pleasure of Eating

We need to recognize that the apparent innocuous "over-enjoyment" of food is a common theme among all three types who overeat. In all cases, we saw how random and accidental instances of overeating might initiate a seemingly innocent habit that you are initially able to find excuses for. But with increasing repetition, the rationale you give yourself for overeating becomes embedded in your subconscious mind. Little by little, overeating is transformed into a consistent behavior pattern of adulthood. It doesn't matter whether you overeat when you are hungry, not hungry, or under stress. Overeating becomes part of your conscious behavior. You believe you can consume as much as you want, even in the presence of side effects that you dismiss.

When the instinct to eat is repeatedly supplemented by a habitual inclination to overeat and eventually replaced by it, your brain has activated the area that generates a desire to eat while suppressing other areas

that usually warn you about the dangers of overeating. You have replaced your instinctive pattern of eating for nutrition because you now have a different priority—*deriving pleasure from eating.*

At the core of this behavior is the "pleasure mechanism" in the brain that controls the nutritional regulatory system. This mechanism utilizes two complementary sets of neurohormones. The first set that the brain releases to create satisfying feelings are *endorphins*, which are morphine-like neuropeptides released in the brain. These are the brain's natural painkillers that produce a sense of well-being and calm. This neurohormone may have originated as a reward when the body met basic necessities such as nutrients.

As mentioned above, the second neurohormone is *dopamine*, which produces the feeling of pleasure when you imagine a good meal. The dopamine system may have evolved as a way to feel rewarded by meeting the body's need at times of extreme deprivation of water, salt, glucose, and other nutrients. This feeling can be more intense than endorphin-based satisfaction because the situation was dire. For example, when feeling extremely thirsty, drinking a glass of water can be one of the most pleasurable feelings you have.

From a biological standpoint, the human body was not constructed to overeat on a consistent basis and gain excess weight to the point of causing high blood sugar and diabetes. As stated before, the body doesn't need to store more than a small amount of fat. The purpose of our digestive system and fat cells are to capture nutrients we might need on an immediate "just-in-time" basis. Similarly, the brain's neurohormone system of endorphins and dopamine was designed to produce feelings of satisfaction and pleasure when we consumed food that supplied our body with the nutrients it needed. The neurohormone system complemented our hunger and satisfaction signals.

What is happening to humans in much of the world is exposure to an endless variety of foods that activate our excitement and pleasure. It is biologically natural to feel a desire to eat these foods. But as we begin eating too much of the wrong foods that are mass produced in our industrial food complex—grain-based carbohydrates, natural sugars, fats, and salt—we reinforce behaviors that repeatedly trigger the pleasure system of the brain. We thus begin overeating regularly because it induces these pleasurable feelings and we are no longer content to feel the enjoyment that comes with eating enough to feel just satisfied.

Evidence of this abounds in Western societies where high blood sugar and diabetes are rapidly increasing. Restaurants continue to serve extremely large portions compared to the amount of food a normal human actually needs for nutrition in a single meal. Some restaurants even make an entire business out of offering people expansive 'all you can eat' specials, as if to challenge them to overeat until they are bloated and sick. Sugared drinks and food products packed with carbohydrates and salt are packaged and marketed in ways to make us associate them with happiness, sexuality, success, and good times. Even when people cook at home, they have trained themselves through habit to serve large portions and eat everything on their plate regardless of the signals they may receive from their mouth.

The occasional and random overeating that might have happened when we are young becomes a routine and acceptable lifestyle for most adults, driving an inevitable pandemic of high blood sugar and diabetes. I am not denying that food is enjoyable and creates pleasurable feelings in the brain. However, whether you overeat when you are hungry, not hungry, or stressed out, you lose control of your brain's two natural systems—the nutritional regulatory system and the pleasure system. This is unfortunate, because heeding these systems could prevent you from falling ill and possibly dying early.

People in Western societies are losing control of the natural human mechanisms to eat healthy and enjoy their food to powerful external forces that are motivated by profit—the food industry and marketers of food

products. Diabetes has existed as a rare human condition for thousands of years, a biological phenomenon based on bodily chemistry. However, with obesity in some countries now reaching 30 to 35 percent of the entire population and being seen in children as young as ten years old, and diabetes affecting an estimated one-third of the entire global population, it is clear that factors outside of normal human biological phenomena are driving epidemic levels of this disease. Nothing short of a revolutionary approach can reverse this epidemic.

KEY POINTS

- The three reasons why people override their brain's regulatory system and overeat include eating for pure enjoyment even when not hungry; eating only when hungry but overeating, and eating to relieve stress and anxiety.
- Non-hunger eating often begins as a temporary and occasional accident, but through repetition, the brain connects overeating and enjoyment.
- The "over-enjoyment" of food may seem innocuous at first, but through repetition, it becomes a habit and you replace your instinctive need to eat with *deriving pleasure from eating,* despite negative consequences for your body.