PART ONE

Prediabetes and Overweight

Two Sides of the Same Disease

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The Prediabetes Problem

If you have prediabetes or are overweight, you have an opportunity to turn your life around and improve your health. This opportunity won't last long, and the longer you wait, the more difficult it will be to regain your health. If you have already been diagnosed with the more serious diabetes mellitus and obesity, you can still take big steps to reduce your symptoms and the risk of developing serious complications.

The alternative is to continue with your present lifestyle and get sicker. Our sincere hope is that you choose to work with us and follow our advice to get better.

In this chapter we cover the basics about prediabetes and overweight but with an approach and a perspective that may be new to you.

What Do We Mean by Diabetes and Prediabetes?

Diabetes is characterized by two factors: abnormally high blood-sugar (glucose) levels, either before breakfast or after eating, and abnormally high levels of insulin (a hormone that normally helps your body to use blood sugar). In prediabetes, blood-sugar or insulin levels, or both, have begun to creep up.

Normally, blood sugar serves as one of your body's main fuels. Without it, you wouldn't have the energy to walk or think. But when blood-sugar levels are too high or too low, you cannot function at your best.

Insulin is also essential in normal health, but high levels lead to many health problems. In fact, elevated insulin usually precedes increases in blood sugar and can serve as a reliable early warning of diabetes risk. We'll explain more about blood sugar and insulin later in this chapter.

The Journey from Prediabetes to Diabetes

It helps to visualize diabetes as a continuum. Early in the disease process, your blood sugar may rise a little too much after you eat a lot of sugars or carbs, making you feel drowsy. At this stage you don't have any formal disease and blood-sugar tests would likely look normal, but we would describe you as being prediabetic. Your body is offering clues, if you pay attention, that you don't handle sugar and carbs very well.

If you ignore these clues, continue to eat whatever you want, and neglect your health in other ways, your sugar and carbohydrate intolerance will get worse. After a few years, your fasting blood sugar will creep up until you get a formal diagnosis of prediabetes. If you ignore this diagnosis, your symptoms will turn into type 2 diabetes, a far more serious disease. If you fail to properly treat type 2 diabetes, it may evolve into a truly horrible combination of type 2 and insulin-dependent type 1 diabetes.

This progression is inevitable if you continue to eat what you have been eating. The sooner you recognize what is happening and take steps to improve your health, the sooner you can take control of your health and your life.

Doctors use a variety of terms to describe prediabetes, with the differences usually reflecting the way they diagnose it. Sometimes this name game becomes confusing for patients. All of the following terms refer to prediabetes.

• Impaired fasting glucose

• Impaired glucose tolerance

QUICK TIP

What's the Difference between Blood Sugar and Glucose?

There's no difference at all, and both terms are used interchangeably. Glucose is a type of sugar that functions as blood sugar.

> QUICK TIP
>
> **Understanding Glucose Tolerance and Intolerance**
>
> People often talk about glucose tolerance and glucose intolerance, and it's important to understand what these terms mean. If you have been called glucose tolerant, your body can deal with large amounts of sugars and carbohydrates, at least for now. (That could change in the next few years.) If you have glucose intolerance or have been called glucose intolerant, you are actually prediabetic. The terms *glucose tolerant* and *intolerant* are a little misleading. The terms *sugar intolerant* and *carbohydrate intolerant*, or *sugar sensitive* and *carbohydrate sensitive*, may be more accurate.

- Hyperinsulinemia
- Insulin resistance
- Hypoglycemia
- Metabolic syndrome
- Syndrome X
- Metabolic Syndrome X
- Insulin resistance syndrome

If your doctor has used any of these terms to describe your health, you have prediabetes.

What Do We Mean by Overweight and Obesity?

Many people aren't always clear about what doctors and health experts mean when they talk about overweight and obesity. Part of the problem is that people frequently have distorted views of their own weight, so they think they weigh less than they do. For example, we've seen plenty of men who are physically strong but also terribly overweight.

Doctors use a variety of height-weight charts and body-fat or body mass indicators to determine whether patients are overweight. While none of these methods is perfectly accurate, they do help people assess their weight.

If you're above your ideal weight, odds are that you're overweight. If you have love handles, you're not cute—you're overweight. As a general rule, if you're roughly thirty or more pounds above your ideal weight, you're obese. If you're a hundred or more pounds over your ideal weight, you're morbidly obese.

How to Measure Your Body Mass Index

Using the body mass index (BMI) is one of the most common ways of calculating whether a person's weight is normal or not. You need to know

Determining Your Body Mass Index																	
BMI	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
Height in inches						Body weight in pounds											
58	91	96	100	105	110	115	119	124	129	134	138	143	148	153	158	162	167
59	94	99	104	109	114	119	124	128	133	138	143	148	153	158	163	168	173
60	97	102	107	112	118	123	128	133	138	143	148	153	158	163	168	174	179
61	100	106	111	116	122	127	132	137	143	148	153	158	164	169	174	180	185
62	104	109	115	120	126	131	136	142	147	153	158	164	169	175	180	186	191
63	107	113	118	124	130	135	141	146	152	158	163	169	175	180	186	191	197
64	110	116	122	128	134	140	145	151	157	163	169	174	180	186	192	197	204
65	114	120	126	132	138	144	150	156	162	168	174	180	186	192	198	204	210
66	118	124	130	136	142	148	155	161	167	173	179	186	192	198	204	210	216
67	121	127	134	140	146	153	159	166	172	178	185	191	198	204	211	217	223
68	125	131	138	144	151	158	164	171	177	184	190	197	203	210	216	223	230
69	128	135	142	149	155	162	169	176	182	189	196	203	209	216	223	230	236
70	132	139	146	153	160	167	174	181	188	195	202	209	216	222	229	236	243
71	136	143	150	157	165	172	179	186	193	200	208	215	222	229	236	243	250
72	140	147	154	162	169	177	184	191	199	206	213	221	228	235	242	250	258
73	144	151	159	166	174	182	189	197	204	212	219	227	235	242	250	257	265
74	148	155	163	171	179	186	194	202	210	218	225	233	241	249	256	264	272
75	152	160	168	176	184	192	200	208	216	224	232	240	248	256	264	272	279
76	156	164	172	180	189	197	205	213	221	230	238	246	254	263	271	279	287

The body mass index (BMI) is a fairly accurate way of determining whether you are overweight. Use your finger to find your height and then follow the line to the right to find your weight. Next, move your finger up to the top line (BMI). If your BMI is higher than 25, you are overweight. If your BMI is higher than 30, you are obese.

only your weight (using an accurate bathroom scale) and your height. BMI estimates are generally accurate, except for body builders or serious athletes, in which case muscle, not fat, accounts for the excess weight.

Your Body Proportions and Diabetes Risk

Although the BMI gives you a general idea of whether your weight is normal, we've found that body proportions often serve as a better guide to determining whether you might be prediabetic.

To explain, some people tend to gain weight in the buttocks, while others gain it around the belly. Belly fat is the better indicator of prediabetes and diabetes risk.

People with big rear ends tend to have a pear or pyramid shape, whereas those with a big belly have an apple or diamond shape. The diamond-apple shape points to prediabetes, diabetes, and what is sometimes called metabolic syndrome and Syndrome X. Belly fat results from two particular types of fat deposits. Subcutaneous fat is stored under the skin of the belly, and visceral fat is intertwined around organs in the midsection. Both subcutaneous and visceral fat secrete inflammation-causing substances that further harm the body.

Measuring Your Body Proportions and Belly Fat

How do you measure your belly fat? The simplest method is to stand naked in front of a mirror without sucking in your gut. If your belly sticks out from your chest (not counting your breasts, if you're a woman), you have too much belly fat.

Another way is to measure your waist, but don't use your belt size. Men tend to wear their belts below their waists, leading them to think they're thinner than they really are.

To accurately measure your waist, use a cloth tape measure. Place one end of the tape measure on top of your belly button, wrap it around your back, and match up the other end at your belly button. Don't suck in your belly as you take this measurement. If you're a man with a waist larger than forty inches or a woman with a waist larger than thirty-five inches, you have a high risk of developing prediabetes and diabetes, as well as heart disease.

For a more precise calculation, you can measure your waist-hip ratio. The bigger your waist, relative to your hips, the greater your risk of developing prediabetes, diabetes, and heart disease. Follow the previous instructions to measure your waist. Next, measure your hip circumference toward the top of your buttocks.

Now use a calculator to divide your waist measurement by your hip measurement. For example, if your waist is fifty-four inches and your hips are forty inches, your waist-hip ratio is 1.35. Here is what the different ratios mean:

- If your ratio is 0.95 (men) or 0.80 (women) or less, you have a low risk of developing prediabetes and diabetes and are not overweight.
- If your ratio is 0.96 to 1.0 (men) or 0.81 to 0.85 (women), you have a moderate risk.
- If your ratio is 1.1 (men) or 0.86 (women) or higher, you have a high risk.

Are You Prediabetic or Overweight? Take the Quiz

We would like you to take a few minutes to answer the questions on the following quizzes, which assess your risk of being prediabetic or overweight. The first two quizzes are for women, and the second two are for men. (Some questions are identical, but others differ.) Be honest in your answers. No one except you has to see them.

The Prediabetes Quiz for Women

My doctor has told me that either my blood sugar (glucose) or my insulin is high.	Y/N
I've been diagnosed with either carpal tunnel syndrome or Bell's palsy.	Y/N
I think my belly is too big.	Y/N

My waist is more than thirty-five inches (eighty-nine cm) around.   Y/N

I often skip breakfast, except for coffee.   Y/N

I often skip breakfast or just eat something starchy, like a bagel or a muffin.   Y/N

I often skip breakfast to lose weight.   Y/N

I get tired and sleepy after eating, especially after lunch.   Y/N

I often feel like taking a nap during the day or the early evening.   Y/N

I have trouble falling asleep at night.   Y/N

I have trouble getting up in the morning and must have some coffee or a soft drink to fully wake up.   Y/N

I often have food cravings, especially for something sweet, and have trouble resisting these foods.   Y/N

I snack a lot late at night.   Y/N

I often crave starchy foods, such as pasta, pizza, or bread.   Y/N

I have to add sugar to my coffee or tea, or it tastes too bitter.   Y/N

I drink one or two cans or bottles of some type of *non*diet soft drink each day.   Y/N

I usually have some sort of dessert or other sweet food at least once a day.   Y/N

I often feel stressed out.   Y/N

I seem to have a lot less energy than other people my age.   Y/N

I'm usually too tired to exercise, or I don't have enough time.   Y/N

I am usually very thirsty.   Y/N

I urinate a lot.   Y/N

I have mood swings one or more times each week, going from calm to irritable or from upbeat to depressed.   Y/N

I've been told that my blood pressure, cholesterol, or triglycerides are higher than they should be (without taking medications).   Y/N

Between the ages of forty-five and fifty-five, I was diagnosed   Y/N
   with low thyroid and also went through perimenopause.

A brother, a sister, or a parent was diagnosed with diabetes.   Y/N

Interpretation: If you answered "yes" to any of these questions, there's a good chance that you have, or are at risk of developing, prediabetes. If you answered "yes" to more than five of the questions, you have a very high risk of being prediabetic.

The Overweight and Obesity Quiz for Women

I know that I am overweight.   Y/N

I was told by my doctor that I should lose some weight.   Y/N

I carry my extra weight around my belly.   Y/N

I weigh more than I would like to.   Y/N

I've found that most diets don't work for very long.   Y/N

I wear larger clothing sizes than I'd like to.   Y/N

I think a lot of other people are way too thin.   Y/N

I think it's normal to gain weight as we get older.   Y/N

I have trouble getting in and out of my car.   Y/N

I like big cars because I have more room in them.   Y/N

I feel as though airline seats are not wide enough for me.   Y/N

I spend a lot of time thinking about what I'm going to eat   Y/N
   later.

I often continue to eat even after I feel full—it's hard to   Y/N
   stop eating.

I sometimes "pig out" at meals.   Y/N

I have regular food cravings, or I sometimes binge on   Y/N
   individual foods.

If I have to walk any kind of distance, I feel my heart   Y/N
   beating and feel out of breath.

Interpretation: If you answered "yes" to any of the first six questions, you have a weight problem and you know it. If you answered "no" to the

first six questions but did answer "yes" to two or more of the remaining questions, there's a good chance that you're overweight but may be in denial of it.

The Prediabetes Quiz for Men

My doctor has told me that either my blood sugar (glucose) or my insulin is high.	Y/N
I've been diagnosed with either carpal tunnel syndrome or Bell's palsy.	Y/N
I'm heavier than I should be around my belly.	Y/N
My waist is more than forty inches (101 cm) around.	Y/N
I often skip breakfast, except for coffee.	Y/N
I often skip breakfast or just eat something starchy, like a bagel or a muffin.	Y/N
I get tired and sleepy after eating, especially after lunch.	Y/N
I often need to take a nap during the day or the early evening.	Y/N
I have trouble falling asleep at night.	Y/N
I have trouble getting up in the morning and must have some coffee or a soft drink to fully wake up.	Y/N
I often have food cravings, especially for something sweet, and have trouble resisting these foods.	Y/N
I snack a lot late at night.	Y/N
I often crave starchy foods, such as pasta, pizza, or bread.	Y/N
I have to add sugar to my coffee or tea, or it tastes too bitter.	Y/N
I drink one or two cans or bottles of some type of *non*diet soft drink each day.	Y/N
I usually have some sort of dessert or other sweet food at least once a day.	Y/N
I often feel stressed out.	Y/N
I seem to have a lot less energy than other people my age.	Y/N
I'm usually too tired to exercise, or I don't have enough time.	Y/N

My interest in sex is not as great as it used to be, or I have trouble getting and maintaining an erection unless I take medication.	Y/N
I have mood swings one or more times each week, going from calm to irritable or from upbeat to depressed.	Y/N
I get angry a lot at family members, coworkers, and other drivers.	Y/N
I am usually very thirsty.	Y/N
I urinate a lot.	Y/N
I've been told that my blood pressure, cholesterol, or triglycerides are higher than they should be (without taking medications).	Y/N
A brother, a sister, or a parent was diagnosed with diabetes.	Y/N

Interpretation: If you answered "yes" to any of these questions, there's a good chance that you have, or are at risk of developing, prediabetes. If you answered "yes" to more than five of the questions, you have a very high risk of having prediabetes.

The Overweight and Obesity Quiz for Men

I know that I am overweight.	Y/N
I was told by my doctor that I should lose some weight.	Y/N
I have a little paunch, but it's not all that bad.	Y/N
People have told me that my love handles are cute.	Y/N
I have to admit that I've got a pretty good size beer belly.	Y/N
I weigh more than I did in my early twenties.	Y/N
I think it's normal to gain weight as we get older.	Y/N
I wear a larger belt size than I did ten years ago.	Y/N
I wear larger clothes (e.g., shirt size or pants waist size) than I did ten years ago.	Y/N
I have trouble finding shirts that fit or comfortably closing the top button on business shirts.	Y/N
I think thin guys tend to look weak or effeminate.	Y/N

I prefer driving large cars, such as an SUV or a full-size   Y/N
   pickup truck because I have more room in them.

I have trouble getting in and out of my car.   Y/N

I feel as though airline seats are not wide enough for me.   Y/N

If I have to walk any kind of distance, I feel my heart   Y/N
   beating and feel out of breath.

I often continue to eat even after I feel full—it's hard to   Y/N
   stop eating.

I sometimes "pig out" at meals.   Y/N

Interpretation: If you answered "yes" to any of the first six questions, you have a weight problem and you know it. If you answered "no" to the first six questions but did answer "yes" to two or more of the remaining questions, there's a good chance that you're overweight but may be in denial of it.

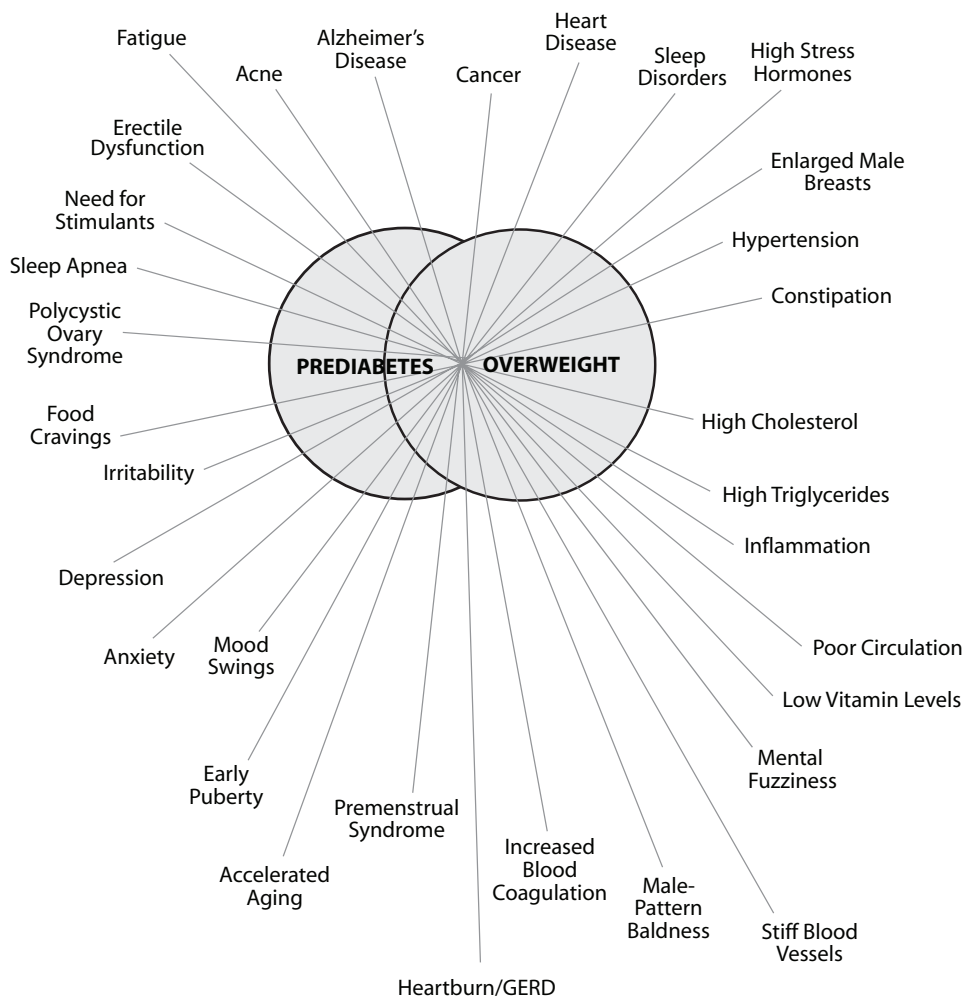## The Long-Term Consequences of Being Prediabetic and Overweight

Prediabetes, diabetes, and obesity are associated with an increased risk of developing many other health problems. You can lower your risk of suffering from these health problems by controlling your blood sugar and your weight.

Faster aging. Scientists regard diabetes as a type of accelerated aging. That's because normal age-related health problems occur earlier in life among people who have diabetes. For example, people with diabetes or prediabetes are more likely to develop heart disease or cancer at younger ages. If you want to live a long life, being prediabetic, diabetic, or overweight is not the way to do it.

People don't wake up one day to discover that they're suddenly diabetic. The progression from normal to prediabetic and then to diabetic typically occurs over many years. Furthermore, the slightest changes toward prediabetes are an ominous medical sign.

Heart disease. People with diabetes have four-times higher risk of incurring a heart attack compared with people who don't have diabetes.

Some of the Conditions Associated with Prediabetes, Diabetes, and Overweight

Fatigue
Acne
Alzheimer's Disease
Cancer
Heart Disease
Sleep Disorders
High Stress Hormones
Erectile Dysfunction
Need for Stimulants
Sleep Apnea
Polycystic Ovary Syndrome
Food Cravings
Irritability
Enlarged Male Breasts
Hypertension
Constipation

PREDIABETES   OVERWEIGHT

High Cholesterol
High Triglycerides
Inflammation
Depression
Anxiety
Mood Swings
Poor Circulation
Low Vitamin Levels
Mental Fuzziness
Early Puberty
Premenstrual Syndrome
Accelerated Aging
Increased Blood Coagulation
Male-Pattern Baldness
Stiff Blood Vessels
Heartburn/GERD

Prediabetes, diabetes, and overweight are associated with an increased risk of developing many other health problems. You can lower your risk by controlling your blood sugar and weight.

Here's another way of looking at your risk: let's say you work and socialize with sixteen people. If you're healthy, you have a one-in-sixteen chance of having a heart attack. If you're diabetic, your odds jump to one in four.

You don't have to be a full-blown diabetic to boost your risk of having a heart attack. Several studies have shown that modest elevations in blood sugar—within the normal range—can significantly increase your risk of suffering a heart attack. People with prediabetes or those who are overweight tend to have high levels of cholesterol, triglycerides, and inflammation—all are known risk factors for heart disease.

Elevated cholesterol. People who are prediabetic, diabetic, or overweight tend to have high levels of cholesterol, the "bad" low-density lipoprotein (LDL) cholesterol, and triglyceride levels, combined with low levels of the "good" high-density lipoprotein (HDL) cholesterol. This type of blood-fat profile is part of Syndrome X and is associated with an increased risk of developing heart disease. (For more information, see Jack's earlier book *Syndrome X*.)

High blood pressure. Hypertension is considered a leading risk factor for heart disease. Higher blood pressure leads to greater pounding of the blood vessels, kind of like strong waves crashing against a pier. This stress damages blood vessels. Research points to elevated insulin levels as the principal factor in hypertension.

Inflammation. Prediabetes, diabetes, and overweight boost the activity of the body's pro-inflammatory chemicals, such as interleukin-6 and C-reactive protein (CRP). Inflammation is now regarded as the underlying cause of heart disease. Basically, low-grade inflammation of the arteries leads to damage and sets the stage for cholesterol deposits. (For more information, see Jack's earlier book *The Inflammation Syndrome*.)

Low-grade infection. High blood-sugar levels interfere with the body's ability to fight bacterial infections. Doctors have known for more than a century that people with diabetes are especially susceptible to infections. In laboratory tests, high-sugar foods reduce the activity of white blood cells within minutes. Infections also promote inflammation.

Cancer. High insulin levels have been linked to breast, prostate, and colon cancers. Excess insulin seems to promote the growth of cancers. A study in the March 2007 issue of *Diabetes Care* reported that women with elevated blood-sugar levels were about 25 percent more likely to develop cancer. In addition, cancer patients often have symptoms of prediabetes.

Alzheimer's disease. There's strong evidence that prediabetes and

diabetes increase the risk of developing Alzheimer's disease. The mechanism may be related to elevated blood-sugar levels or insulin resistance in the brain. High levels of blood sugar also generate dangerous molecules called free radicals, which may damage both brain cells and blood vessels in the brain.

Poor concentration. One of the classic signs of diabetes is poor concentration, or feeling fuzzy headed. This appears to be related to abnormally high levels of blood sugar, which suppress orexins, a group of brain chemicals that keeps our minds sharp and alert.

Mood swings. Moods often follow blood-sugar levels. Most people feel contented after eating. When they get hungry, however, they can become grumpy, impatient, irritable, angry, mean, and aggressive. People with these changeable moods are often described as mercurial or Jekyll-and-Hyde types. (For more information, see Jack's earlier book *The Food-Mood Solution*.)

Kidney failure. High levels of blood sugar are toxic to the kidneys, organs that help your body to filter out toxins. People with diabetes are far more likely to suffer kidney failure, which is treated with surgery and regular dialysis treatments.

Eye diseases. High levels of blood sugar make blood platelet cells abnormally sticky, increasing the risk of blood clots. These clots are especially serious in the tiny blood vessels of the eyes, where they can lead to blindness. In addition, cataracts, glaucoma, and macular degeneration are strongly associated with glucose intolerance.

Nerve damage. People with diabetes have a very high risk of developing nerve damage, called neuropathy. This may lead to either pain or numbness. In the case of numbness, diabetics cannot feel foot injuries, which may become infected. A recent study found that people diagnosed with either carpal tunnel syndrome or Bell's palsy (characterized by weakened or paralyzed facial muscles) are often prediabetic and will be diagnosed with diabetes within ten years.

Sleep apnea. This condition entails a swelling of tissues in the back of the mouth, leading to episodes of choking and interrupted breathing

during sleep. Severe snoring is really a form of sleep apnea. Being over-weight strongly predisposes people toward sleep apnea.

Erectile dysfunction. The inability to maintain an erection is a common complication of prediabetes and more so with full-blown diabetes. Erectile dysfunction may be a sign of more serious circulatory problems.

Early puberty. Although scientists have not figured out exactly why, a high-sugar diet often leads to early puberty in boys and girls. Today, adolescents start puberty at least one year earlier than adolescents did a century ago. It is very likely that high blood-sugar and insulin levels increase the activity of testosterone and estrogen.

Amputation. Because of blood vessel disease and circulatory problems, people with diabetes have a high risk of developing gangrene, necessitating amputation of fingers, toes, or an entire foot or leg.

Surgical complications. A study published in the April 2006 *Archives of Surgery* reported that people with diabetes had twice the risk of post-operative infections, compared with patients who did not have glucose-tolerance problems. This makes surgery far more dangerous for people who are prediabetic and diabetic.

Blood Sugar and Insulin: Understanding the Deadly Duo

Now we'll explain a little more about blood sugar and insulin, the two substances that play central roles in prediabetes, diabetes, and over-weight.

What You Need to Know about Blood Sugar

Blood sugar, or glucose, is the principal fuel of the body and the brain. Your body makes glucose by breaking down other types of sugar (such as table sugar), carbohydrates (such as pasta), and protein (such as meat and fish). Fats can serve as an alternate fuel source for most organs.

In nature, sugars and starches are almost always intertwined with fiber, the indigestible part of plants. The fiber in most vegetables and fruits and some whole grains slows the digestion of starches and sugars, leading to a gradual increase in blood sugar. This slow rise in blood

sugar, followed by a moderate increase in insulin, is normal and healthy. Similarly, the digestion of protein results in very small increases in (and occasionally slight decreases) blood sugar. The more stable your blood sugar, the less likely you will experience hunger jags.

Pure sugars, however, such as sucrose and high-fructose corn syrups, are digested very quickly, leading to rapid increases in blood-sugar levels. Likewise, the starches in bread, pasta, pizza dough, muffins, bagels, and potatoes are also digested quickly. When blood-sugar levels shoot up, the body responds with a surge of insulin, which helps to lower blood-sugar levels. However, an insulin surge often reduces blood-sugar levels to *below* where they originally were, making people even hungrier. These extreme ups and downs in glucose and insulin are more likely to affect you than are more moderate changes in glucose and insulin levels.

When sharp blood-sugar swings occur day after day for many years, baseline (or fasting) blood-sugar levels gradually creep upward. The higher the blood sugar, the more likely it will start to *auto-oxidize* and generate hazardous molecules called free radicals. This auto-oxidation is a little like a chain reaction—one free radical can create another and another. The free radicals damage the body, speeding up the aging process and increasing your risk of developing heart disease and cancer. In fact, many of the complications of diabetes are related to high glucose levels and the free radicals they produce. (Antioxidants and certain vitamins, which we'll discuss in chapter 10, can neutralize free radicals.)

What You Need to Know about Insulin

Insulin is commonly regarded as the hormone that regulates blood-sugar levels, although it does far more than this. Biologically, it's one of the most ancient of all hormones.

In fact, insulin is an extremely potent anabolic hormone, meaning that it promotes the production of new tissue. It can stimulate the development of muscle, but high levels of insulin trigger a biological switch that turns off the production of muscle and switches on the production of fat, particularly around the belly. That's why insulin is considered the fat-storage hormone.

In addition, insulin helps convert blood sugar into triglycerides and then into body fat. Insulin also interferes with the breakdown of fat cells, so high insulin levels make it more difficult for you to lose weight.

Insulin resistance and high blood-sugar levels are the two trademarks of prediabetes and diabetes. But what exactly do we mean by insulin resistance? To explain, each time you eat a sugary or carbohydrate-rich food, your blood sugar surges. In response, your body releases insulin to help get rid of excess blood sugar.

The more your pancreas secretes insulin in an effort to control blood sugar, the less sensitive, or responsive, the rest of your body becomes to that insulin. Your body secretes still more insulin, and you become even less responsive to it. Insulin resistance develops when your body ignores what the insulin is trying to accomplish. Insulin levels continue to increase until your body's ability to make it wears out.

Although many of the complications of prediabetes and diabetes have been attributed to elevated blood sugar, high insulin levels actually seem to do far greater damage. Elevations in insulin precede increases in blood sugar by as much as fifteen years, leading to increases in belly fat, blood pressure, and blood fats. Sometimes doctors ask type 2 diabetic patients to inject themselves with insulin to control blood-sugar levels, but extra amounts of insulin boost their risk of developing heart disease and cancer.

Insulin also increases levels of cortisol, the body's principal stress hormone, and C-reactive protein, a promoter and a marker of inflammation. This relationship between insulin and CRP is significant for two reasons. One, inflammation aggravates many of the complications of diabetes, including kidney and eye disease. Two, inflammation is involved in every disease process, either causing or exacerbating symptoms and promoting the spread of the disease.

Three Must-Have Medical Tests

Three simple medical tests can clarify your risk of developing prediabetes, and several other tests may be helpful.

Fasting Glucose

Fasting glucose is part of nearly all conventional blood tests that patients undergo in the doctor's office and the hospital. It's based on the amount of glucose in a sample of blood taken in the morning, before you eat or drink anything except water.

If you've recently had blood tests, you can call your doctor's office to get a copy of your results. Your fasting blood sugar will be identified as "glucose." Our definitions of "better" and "best" glucose levels (see the following) are fairly strict compared with most doctors'.

Normal fasting glucose range: 65–99 mg/dl

Better fasting glucose range: 75–85 mg/dl

Best fasting glucose range: 80–82 mg/dl

Prediabetic fasting glucose range: 100–125 mg/dl

Diabetic fasting glucose range: 126 and above

There are two limitations to the fasting glucose test. First, the normal range (65–99 mg/dl) is far too wide. Minor increases within the norm can influence your long-term risk of developing diabetes and having a heart attack. One recent study found that young men with a fasting blood sugar of 87 mg/dl (well within the normal range) were far more likely to develop diabetes than were men whose fasting blood sugar was 81 mg/dl or less. Second, a normal fasting glucose test result can still miss a blood-sugar problem, but a fasting insulin test can usually ferret out less obvious blood-sugar problems.

Fasting Insulin

If your fasting glucose is between 65 and 99 mg/dl, your doctor may say your blood sugar is normal—but it may be a "false normal." Some people are very good at pumping out plenty of insulin, which will keep their glucose levels in the normal range. But high insulin, also known as hyperinsulinemia, is a smoking gun: it can increase your risk of developing prediabetes and diabetes by eight times!

As with fasting glucose, the normal range of fasting insulin—6 to 35 mcIU/ml—is too wide to be of any practical use. The higher your insulin, the harder your body is working to keep glucose levels down.

Identified early enough, elevated insulin is a red flag indicating prediabetes. Here are some better guidelines for interpreting your insulin levels.

Normal fasting insulin range: 6–35 mcIU/ml

Better fasting insulin range: Less than 10 mcIU/ml

Best fasting insulin range: Less than 7 mcIU/ml

Prediabetic fasting insulin range: More than 11 mcIU/ml

Dangerous fasting insulin range: More than 25 mcIU/ml

As a person's glucose tolerance decreases—that is, as he or she becomes more prediabetic and then diabetic—the body secretes more insulin to control glucose levels. More insulin becomes necessary to overcome the body's growing resistance to the normal activity of insulin. After several years, the insulin resistance becomes so pronounced that glucose levels start to climb. That's why people with type 2 diabetes commonly have elevated levels of both insulin and glucose.

Your doctor may hesitate to measure your insulin levels, and your insurer may be reluctant to pay for it. But getting the test is in your own best interest, so insist on it.

Your fasting insulin can also be combined with your fasting glucose to calculate your homeostasis assessment model (HOMA) score, which assesses your ability to make insulin and your degree of insulin resistance. (See page 40 for more on HOMA scores.)

> **A Point to Remember**
>
> A high fasting insulin level is a sign of prediabetes, even if your blood-sugar level appears normal.

Hemoglobin A$_{1c}$

This test, commonly abbreviated as HbA$_{1c}$ and called glycated hemoglobin, looks at how blood sugar has damaged proteins in your blood. In doing so, the test provides a snapshot of your average glucose levels over the previous six weeks. HbA$_{1c}$ levels are measured as a percentage, using the symbol %.

Like fasting glucose and insulin, this test is very simple and reveals what a single fasting glucose test might not. In a study of more than ten

thousand middle-age and elderly men and women, British researchers found that the risk of developing health problems increased when HbA_{1c} levels were above 5%, and the risk of having a heart attack increased by about 20 percent for each 1% rise in HbA_{1c} levels. In other words, a person with an HbA_{1c} of 6.0% was 20 percent more likely to have a heart attack compared with a person who had an HbA_{1c} of 5.0%. With an HbA_{1c} of 7.0%, a person was 42 percent more likely to suffer a heart attack.

Here is how you can interpret your HbA_{1c} test:

Normal HbA_{1c}: 4.5 to 5.7%

Best HbA_{1c}: Less than 5%

Prediabetic HbA_{1c}: 5.7 to 6.9%

Diabetic HbA_{1c}: 7% or higher

The HbA_{1c} test has certain advantages over a fasting glucose test. Sometimes, eating a lot of sugary foods the day before a fasting glucose test will throw off the results of the test. The HbA_{1c} provides your average blood sugar in recent weeks. An HbA_{1c} of 5.0% converts to 81 mg/dl average glucose, 5.2% to 87 mg/dl, 6.0% to 114 mg/dl, and 7.0% to 147 mg/dl.

Other Useful Medical Tests

Several additional tests may be helpful to you and your doctor, depending on your symptoms, medical history, and known risk factors for disease.

Triglycerides

Triglycerides are a type of blood fat and, like cholesterol, high levels are associated with an increased risk of developing heart disease. Elevated triglyceride levels usually reflect a diet that's high in refined sugar and carbohydrates. While levels above 150 mg/dl are generally considered only borderline high, they are strongly associated with prediabetes, especially when combined with overweight or acanthosis nigricans (a darkening of the skin on the neck, the groin, and the underarms). If

you have a normal blood-sugar level but elevated triglycerides, ask your doctor to run further tests, such as fasting insulin and HbA$_{1c}$.

Normal triglycerides: 150 mg/dl or less

Best triglycerides: 100 mg/dl or less

Borderline elevated triglycerides: 150–199 mg/dl

High triglycerides: 200–499 mg/dl

Very high triglycerides: 500 mg/dl or above

A combination of elevated triglycerides and high levels of low-density lipoprotein (LDL) cholesterol (above 150 mg/dl) is an especially strong indicator of developing diabetes and heart disease risk. You can lower your triglyceride levels by cutting back on sugar and refined carbs, and LDL levels can be reduced by eating fewer trans fats (found in partially hydrogenated vegetable oils) and saturated fats (found in fatty meats).

Elevated levels of total cholesterol and LDL cholesterol, along with low levels of the high-density lipoprotein (HDL) cholesterol, also point to diets that are rich in refined sugarlike carbohydrates. We've focused on triglyceride levels here for the sake of simplicity. As your eating habits improve, however, your LDL cholesterol level will likely decrease, and your HDL cholesterol level will likely increase—both positive changes.

Glucose-Tolerance Test

Your doctor might ask you to take a glucose tolerance test over two to five hours. In this test, you'll have a blood draw before drinking a glucose solution, followed by additional measurements each hour. The glucose solution is icky sweet, and getting blood drawn every hour isn't a lot of fun.

As an alternative, some doctors measure their patients' fasting glucose in the morning, ask them to go to a restaurant and eat their typical breakfast, and then have them return to the office for more blood-sugar tests. The mix of sugar, carbs, and fats will increase glucose levels, which are measured after one, two, or more hours.

An increase or decrease of more than 50 mg/dl of glucose within any one-hour period points to glucose intolerance and prediabetes. Diabetes

is diagnosed with a glucose level of 200 mg/dl or higher two hours after starting a glucose-tolerance test or eating breakfast.

HOMA

The HOMA (homeostasis assessment model) test is a calculation based on a patient's fasting glucose and fasting insulin levels. It determines the degree of insulin resistance (HOMA-IR) and the activity of pancreatic beta cells (%B), which manufacture insulin. You or your doctor can use a simple HOMA calculator to type in your fasting glucose and insulin levels. (The calculator can be found at www.dtu.ox.ac .uk/index.php.)

A normal HOMA-IR is 1.0, and a normal beta-cell function (%B) is 100 percent. This norm is based on a healthy person, of normal weight, thirty-five years of age or younger. A normal HOMA-IR and %B is worth targeting. Abnormal HOMA-IR levels are calculated based on variations from the norm.

A couple of examples convey the value of the HOMA calculation. A client of Jack's, Robert, had a fasting glucose of 85 mg/dl (normal) and a fasting insulin of 39 mcIU/ml (elevated). His HOMA-IR was calculated to be 4.7, pointing to severe insulin resistance and prediabetes. His %B was 320 percent, indicating very high beta-cell secretion of insulin to maintain normal glucose levels. His high level of insulin secretion will eventually wear out, leading to elevated glucose and diabetes.

A recent calculation of Jack's fasting glucose (82 mg/dl) and fasting insulin (4.9 mcIU/ml) found his HOMA-IR to be 0.6 and his %B to be 84. His below-normal HOMA-IR is exceptionally good (you could say better than normal), and his low %B indicates that he is not stressing his pancreas.

C-Reactive Protein

C-reactive protein (CRP) is both a marker and a promoter of inflammation. CRP levels can reach as much as 500 mg/dl in serious inflammatory diseases (such as rheumatoid arthritis) and trauma (life-threatening injuries).

In the late 1990s, Harvard Medical School researchers developed a more sensitive version of the test, called the high-sensitive C-reactive protein (hsCRP) test. This test identifies chronic low-grade inflammation that substantially increases the risk of developing heart disease and having a heart attack.

Elevated hsCRP levels are common in people who are overweight or have diabetes, and they point to low-grade inflammation. Other markers of inflammation, such as interleukin-6 and tumor necrosis factor alpha, are common in thin but flabby "preobese" people. People who eat a lot of sugary foods and refined carbohydrates also tend to have high levels of CRP.

Normal hsCRP: 0.11 mg/dl or less

Moderately elevated hsCRP: 0.12 to 0.19 mg/dl

High hsCRP: 0.20 to 1.50 mg/dl

Very high hsCRP: 1.51 to 3.7 mg/dl

Extremely high hsCRP: 3.8 mg/dl or higher

High levels of hsCRP can be reduced by losing weight, exercising, improving your glucose tolerance, eating more vegetables, using turmeric as a spice in your foods, taking vitamin E supplements, and reducing your consumption of sugary foods and refined carbs.

In this chapter, you've learned how to assess your likelihood of becoming prediabetic and overweight. By combining the quizzes and the information from medical tests, you and your physician will have a pretty clear grasp of your health. In the next chapter, we explain some of the dietary factors that set the stage for developing prediabetes and diabetes and becoming overweight.