1. Why and how did I get diabetes?

Diabetes occurs for a number of reasons, but the ultimate cause of the high blood sugar that characterizes the disorder is either **deficiency**of the hormone **insulin**or a combination of insulin deficiency and resistance of the body tissues to its actions. In response to food intake, insulin is released by specialized cells in the **pancreas**and is necessary for adequate amounts of **glucose**and other nutrients from food to be absorbed into certain tissues of the body. When insulin is lacking or the body resists its actions, the level of glucose in the blood becomes excessively high and diabetes is diagnosed. The difference in the balance between the two characterizes the two major forms of diabetes — type 1 and type 2 (see Question 2). Whatever the form of diabetes, its basis is to some extent hereditary and to some extent environmental. The hereditary contribution is more or less constant throughout recent human evolution. It is the environmental component that has changed markedly over the last 100 years, leading to the dramatic rise in the frequency of diabetes in almost all societies. You developed diabetes because either you are strongly predisposed due to hereditary reasons or because there are factors in your lifestyle and environment (such as gaining weight, getting insufficient exercise, taking certain medications) that increase the likelihood of diabetes or, as is usually the case, a combination of both. This is not all bad, because the environment and lifestyle can often be changed, with dramatic improvement in the severity of the diabetes.

1. What is the difference between type 1 and type 2 diabetes?

**Type 1 diabetes**is entirely due to an almost complete deficiency of insulin. The deficiency is the result of the**immune system**erroneously attacking and destroying the insulin-producing cells in the pancreas. For the proper functioning of our bodies, it is necessary for insulin to be present at all times in the bloodstream and tissues, not only after we have eaten. Insulin is essential to maintain the structure of our tissues and prevent them from being broken down in an uncontrolled manner. Without any insulin present, our tissues literally melt away into simple compounds that leave our bodies when we urinate. Accordingly, people with type 1 diabetes have high levels of sugar and breakdown products of fat and protein in the bloodstream and urine and develop the typical symptoms described in Question 4.

**Type**2 **diabetes**is due to a combination of our body tissues becoming resistant to the action of insulin (for the reasons described previously in Question 1) and the inability of the pancreas to make enough extra insulin to overcome it. Although this latter component of the problem is often viewed as a failure of the pancreas, it is not true in the strictest sense. While it is common for the insulin-producing capability of the pancreas to decline throughout later adult life, it was nevertheless sufficient throughout most of human evolution to prevent us from developing diabetes. It is only in recent times, when our lifestyle and environment have caused many of us to become very insulin resistant, that the insulin-producing capacity is unable to compensate. In the true sense, it fails because we impose an excessive load upon it. This is true, even for those of us who have a hereditary predisposition to becoming insulin resistant.

1. What is the difference between diabetes mellitus and diabetes insipidus?

The word diabetes is an interesting one. Its origin is in the Greek language where it is derived from the word for a siphon or, more simply, a pipe or hose. This word was used to describe the disorder in ancient times (and diabetes was recognized in great antiquity) because those suffering from it produced such plentiful amounts of urine that they were reminiscent of a water pipe. The reason for the plentiful amounts of urine lies in the fact that when the sugar glucose reaches excessively high levels in our bloodstream, it is filtered into the kidney and enters the urine in large quantities. Due to its chemical and physical properties, when large amounts of glucose are filtered by our kidneys into the urine, it cannot be fully reabsorbed and retains a large amount of water with it, thus creating very large volumes of urine. The second part of the name,**mellitus,**is derived from the word meaning sweet, as in mellifluous music. Mellitus was added when it was discovered that the urine in a person with diabetes and very high blood sugar is sweet.

**Diabetes insipidus**is a disorder with an entirely different basis, but its sufferers share the siphon-like quality of very frequent and very high volume urination. Diabetes insipidus is due to failure of production or action of another vital hormone, known as **arginine vasopressin**(AVP), also called **antidiuretic hormone**(ADH), that is responsible for maintaining the normal volume and concentration of our urine. When AVP is deficient (usually due to damage or disease of the hypothalamus or pituitary gland) or fails to work (usually due to disease of or damage to the kidney), we are unable to concentrate our urine and it becomes excessively dilute. As such, it appears pale, almost colorless and watery — in a word insipid, hence *insipidus.* It is not sweet, as it has negligible amounts of sugar in it.

***Diabetes mellitus***

*A condition characterized by inadequate production of insulin or resistance of the body's tissues toits actions, which results In excessive levels of glucose In the blood.*

***Diabetes Insipidus***

*Increased urine production caused by Inadequate secretion of vasopressin by the pituitary gland or by resistance of the kidney to Its actions.*

***Arginine vasopressin (AVP)***

*A hormone that Is responsible for maintaining the normal volume and concentration of our urine. Also called antidiuretic hormone (ADH).*

1. What are the symptoms of diabetes?

The typical symptoms of diabetes occur as a result of the high levels of glucose in the bloodstream and its passage into the urine and other tissues. These are frequent urination and thirst. Thirst arises as a result of the dehydration caused by the frequent urination. Dehydration and loss of nutrient calories in the urine lead to weight loss and hunger. Passage of glucose into the tissues of the eye can cause fluctuating degrees of blurred vision.

***Antidiuretic hormone (ADH)***

*A hormone that is responsible for maintaining the normal volume and concentration of our urine. Also called arginine vasopressin (AVP).*

*One of every four people believed to have diabetes is unaware of it and is undiagnosed.*

***Neuropathy***

*Nerve damage.*

***Prediabetes***

*A condition in which abnormalities in plasma glucose levels lie in-between normal and standard accepted definitions of diabetes. "Borderline diabetes," "impaired fasting glucose," and "impaired glucose tolerance" are other terms used to describe types of this condition.*

***Retinopathy***

*Eye damage.*

***Nephropathy***

*Kidney damage.*

When these symptoms are prolonged and severe, as is typical with type 1 diabetes, serious changes occur in our blood chemistry due to the deficiency of insulin. Those changes, coupled with dehydration, result in dizziness, weakness, drowsiness, and ultimately coma, which if untreated can lead to death. Both type 1 and type 2 diabetes, when severe and inadequately treated, can be associated with coma and death. Although coma is less common in type 2 diabetes, it is more common for it to result in death, as people with type 2 diabetes tend to be older and to have more medical problems. Two other important points are worth noting. The first is that diabetes may not cause any symptoms. In fact, one of every four people believed to have diabetes is unaware of it and is undiagnosed. However, as diabetes of even moderate severity can lead to complications and shorten lifespan, it is important to make the diagnosis, even in people without symptoms. The second point is that the majority of people with diabetes may not have any symptoms from the elevated blood sugar, but it can still present with symptoms from its complications. Thus, people may be diagnosed with diabetes after presenting with symptoms of nerve damage**(neuropathy** — see Question 32) or a heart attack or stroke (see Question 35). In fact, one of every three people admitted with a sudden heart event is found to have diabetes or **prediabetes**(see Question 9) of which he or she or the doctor was unaware. Neuropathy is present in two of every five patients with type 2 diabetes at the time of diagnosis, while eye damage **(retinopathy** — see Question 33) is present in one of every five and kidney damage**(nephropathy** — see Question 34) is present in one in ten, indicating that the diabetes was ongoing for many months or even years before diagnosis.

1. Can diabetes be cured?

In general, we do nor consider that diabetes can be cured once it has been diagnosed. People with type 2 diabetes can reverse the detectable abnormalities of diabetes by lifestyle adjustment without the use of medications (discussed in Question 28). However, the tendency to manifest high blood sugar again is always present if the patient is under significant metabolic stress, such as that caused by medications, severe illness, injury, regaining lost weight, cessation of exercise, aging, etc. Therefore we consider that diabetes can be under excellent control or in **remission,**but we do not usually use the word cured. Even people with type 1 diabetes who have undergone successful pancreas or islet transplantation and no longer require insulin therapy cannot be considered cured. There is a significant possibility that their diabetes will one day come back for a variety of reasons, including rejection of the transplant or a renewed attack on the transplanted**islet tissue**by the patient's immune system.

Perhaps the closest we have been able to come in the search for a true cure for diabetes is the effect of**bariatric surgery**("weight loss surgery"), which either involves procedures to restrict the entry of food into the stomach or procedures to bypass the stomach and upper intestine, thus reducing food absorption. Procedures of the bypass type have shown prolonged remission of diabetes in up to 80% of cases for as long as 10 years. Remission for 10 years or more is approaching a definition of a true cure, and in the future this and other medications or procedures that provide a long-term reversal of obesity may come to be generally accepted as "curing" type 2 diabetes.

***Remission***

*A temporary or permanent decrease of manifestations of a disease.*

***Islet tissue***

*Groups of cells found within the pancreas that produce and release insulin, glucagons, and other substances.*

***Bariatric surgery***

*Weight loss surgery.*

1. Does diabetes affect all racial groups equally?

No, there are significant differences in the hereditary tendency to acquire diabetes**.**In general Caucasians (non-Hispanic whites) have a lower tendency to develop type 2 diabetes than other ethnic groups. The situation with regard to type 1 diabetes is the opposite, with the highest prevalence currently being in the regions in and near Finland, Sardinia, and Kuwait. Lifestyle does not appear to be more important than the hereditary tendency in determining the chance of a person to develop type 1 diabetes. However, in the case of type 2 diabetes it is an important factor. Thus, certain ethnic groups may have a very high tendency to develop type 2 diabetes under one set of environmental circumstances, but they may have a very low tendency under different environmental conditions. A case in point is the Pima tribe of Native Americans living in Arizona. Half of the Pima have type 2 diabetes, while their genetically related cousins living in the Chiapas region of Mexico pursuing a nonurban lifestyle have a low frequency of the disorder. The two most common and most important factors contributing to a high prevalence of type 2 diabetes in groups at high hereditary risk are weight gain and lack of physical exercise.

1. Are my brothers and sisters and my children at risk of diabetes?

If you have type 1 diabetes, your first-degree relatives (i.e. mother, father, brother, sister, and your children) are about ten times more likely than the general population to get type 1 diabetes. The frequency of type 1 diabetes in the general population is about half a percent (i.e., one in two hundred), so the risk in your first-degree relatives is about 10 X 1/2, or 5%. Fortunately, this is not particularly high. Also, it is related to age. About 90% of cases of type 1 diabetes occur before age 35. Therefore, the parents of a person with type 1 diabetes are at considerably less, and ever decreasing, risk compared to his or her siblings and children. The risk of getting type 1 diabetes for an identical twin of a person with type 1 diabetes is 30-50%, indicating that environmental factors are very important, even though they are not well understood. In the case of type 2 diabetes, the risk is considerably higher. On average, one out of three of the children of an individual with type 2 diabetes will develop the disease. Two out of three of the children will develop diabetes when both parents have the disease. The risk of getting type 2 diabetes for an identical twin of a person with type 2 diabetes is 75-90%, indicating that genetic (hereditary) factors are very important.

1. Can a person have both type 1 and type 2 diabetes at the same time?

Generally speaking, we do not diagnose both disorders in the same individual. If people have type 1 diabetes, they are completely lacking effective circulating insulin. By definition, this is not the case in people with type 2 diabetes, so having the one disorder effectively rules out the other. However, people with type 1 diabetes may be prone to the same metabolic problems as those with type 2 diabetes. In other words, if people with type 1 diabetes gain weight, become sedentary, or are members of an ethnic group at high risk for type 2 diabetes, they may become insulin resistant and their diabetes will be more difficult to control. Higher doses of insulin will be required and they may develop the metabolic problems that tend to be associated with type 2 diabetes, such as cholesterol and related blood fat abnormalities, as well as high blood pressure. These will add to their risk of cardiovascular disease. Some people with apparent type 2 diabetes appear to have a partial form of type 1 diabetes, which has stopped short of complete destruction of their insulin-producing cells in the pancreas. This is known as LADA or *latent autoimmune diabetes of the adult.* They tend to require insulin treatment earlier in the course of their diabetes, but are not considered to have both diseases.

1. Is there such a thing as borderline diabetes? What is it?

The term **borderline diabetes**has now been replaced by the *term prediabetes.* Both terms indicate that a person has abnormalities in his or her plasma glucose levels that fall short of standard accepted definitions for frank diabetes. **Table 1**shows the normal ranges for both **fasting**plasma glucose and for plasma glucose after a glucose load by mouth. The reason that a standardized 75 gram (a little under 3 ounces) glucose load is used is to allow a direct comparison between different individuals under the same conditions. The table also shows the glucose levels above which diabetes is diagnosed. The range between the upper end of normal and diabetes itself is the prediabetic range. For lasting glucose, the range is 100 to 125 mg/dl and for glucose values 2 hours after a standard 75 gram glucose drink by mouth, it is 140 to 199 mg/dl. The former is termed *impaired fasting glucose,* or IFG, and the latter is termed *impaired glucose tolerance*, or IGT. When either is present, an individual is described as having prediabetes. There are at least two reasons why it is important to identify prediabetes. One reason is that people with prediabetes have a known increased risk of progression to frank type 2 diabetes and, second, prediabetes, especially of the IGT type, is associated with a significantly higher risk of cardiovascular disease and death. Therefore, knowledge that one has prediabetes necessitates regular follow-up and also permits early intervention to prevent progression to frank diabetes.

1. Why do some women get diabetes when they are pregnant? Is this dangerous for them or their baby?

Pregnancy is a situation in which insulin resistance (see Question 2) is a normal feature. This is because it is beneficial for the nutrients absorbed from a pregnant woman's meals to be channeled first to the growing- fetus. The development of maternal insulin resistance in the second half of pregnancy assures that this will occur. At least part of the reason for the development of maternal insulin resistance is that the placenta produces substances that lead to insulin resistance and as the placenta grows, the insulin resistance increases. This is called physiologic (i.e., normal) insulin resistance. Indeed, a healthy pregnant woman may be more insulin resistant than the average patient with type 2 diabetes! However, the vast majority (>95%) of otherwise healthy pregnant women do not get diabetes in this situation because the pancreas is able to make enough insulin to overcome the insulin resistance and keep the glucose levels normal. A small minority of women cannot do so and their glucose levels rise. These women tend to be the same women who are destined to get type 2 diabetes later in life. The risk of developing type 2 diabetes is much higher in a woman who has had diabetes detected in pregnancy **(gestational diabetes mellitus**or GDM). GDM provides a unique opportunity to follow the natural history of type 2 diabetes in the years prior to its onset in women, since most GDM goes away very rapidly, often within hours, after the baby is delivered and reappears in later life as tvpe 2 diabetes. If untreated, GDM can cause harm to both mother and baby, especially at or soon after delivery. Fortunately, outcomes of GDM are generally excellent in most developed countries.

1. How does my weight affect my risk of type 2 diabetes?

Weight and risk of type 2 diabetes are clearly linked. **Figure 3**shows the risk of development of type 2 diabetes, as it relates to body weight. For clinical purposes, weight is related to height by a formula known as **body mass index**or BMI. In our society, a BMI of 18 to almost 25 is considered to be healthy and from 25 to almost 30 is considered overweight. From 30 to 35 is considered to be obese and from 35 to 40 is severely obese. A BMI that is greater than 40 is considered morbidly obese, indicating that a person with this degree of obesity is at very serious risk of both immediate and long-term health problems. To calculate your own BMI, divide your weight in pounds by the square of your height in inches (i.e., your height multiplied by itself) and then multiply the answer by 703. For example, if you are 5 feet 8 inches (68 inches) tall and weigh 148 pounds, your BMI will be 148 divided by 68 × 68, i.e., 148/4624 = 0.032 and then multiplied by 705, i.e., your BMI is 22.6. Congratulate yourself, as your weight is in the healthy range! Figure 3 shows the risk for development of type 2 diabetes according to weight for both men and women. The risk of having type 2 diabetes increases as weight increases, even within the normal range, especially for women. Severe and morbid obesity are associated with an almost 100 times greater chance of diabetes in women and almost 50 times for men. The reason for this is principally because the likelihood of having insulin resistance, a major causative factor for type 2 diabetes (see Question 2), increases as weight rises. Very physically active individuals who are overweight or obese by usual standards may be at little increased risk due to the protective effect of exercise

1. Does regular exercise help to prevent type 2 diabetes?

Yes, regular exercise of at least moderate intensity provides some protection against the onset of type 2 diabetes. Exercise improves insulin resistance and thereby makes insulin more effective at removing glucose from the blood. In patients with prediabetes (see Question 9), exercise can prevent the progression of elevated glucose values toward the frankly diabetic range, or even restore them to normal. Exercise also consumes **calories**from those stored in the exercising muscle as starch **(glycogen)**and the need to replenish these stores draws glucose out of the bloodstream and thereby reduces the circulating levels. Exercise also helps to maintain a healthy body weight and avoid the weight gain that can lead to diabetes (see Question 11), although it is not as certain that exercise is as helpful in promoting weight reduction. Weight reduction is much more dependent on restriction of food intake. However, exercise is clearly important in maintaining weight loss. Finally it is worth noting that exercise has beneficial effects on the other risk factors that combine with diabetes to cause vascular disease. For example, exercise increases the good (or HDL) cholesterol and improves levels of other blood fats, while lowering- blood pressure and enhancing cardiovascular (i.e., heart and blood vessel) conditioning.

*Regular exercise of at least moderate intensity provides some protection against the onset of type 2 diabetes.*

***Calorie***

*A unit used to express heat or energy value of food.*

***Glycogen***

*Starch, which comprises sugars linked together in a storage pattern.*

***HDL***

*High-density lipoprotein; "good cholesterol."*

1. Are there any medications I can take to help prevent diabetes?

Yes, there are a number of medications that will help to reduce the likelihood of a person developing type 2 diabetes, but not type 1 diabetes. None are labeled by the Food and Drug Administration for this indication. Our use of them is mainly confined to choosing a drug that will tend to slow progression to type 2 diabetes when the drug is needed for another condition. For example, when a patient at risk for diabetes needs treatment for high blood pressure, one would consider using a drug that has been shown to slow progression to diabetes in those at high risk, as opposed to one that might actually accelerate it. Early use of drugs that are approved to treat type 2 diabetes in people at high risk of development of type 2 diabetes (mainly those with prediabetes — for definition see Question 9) has also been shown to prevent or delay the onset of the disease. Examples of this use are also shown in Table 2. Whether this represents prevention of diabetes or pretreatment of diabetes is not conclusively known. To be considered true prevention, the drug needs to modify the course and progression of the underlying factors leading to the disease and not merely lower the blood sugar. This means the rate at which those at risk progress to diabetes should be reduced in a sustained manner. It should be emphasized that one must be very cautious in advocating the use of oral antidiabetic drugs in this manner. The FDA and other authoritative bodies have not evaluated the ratio of risk to benefit sufficiently to recommend their use in prediabetes.

1. Is there a particular type of diet that will reduce my chance of type 2 diabetes?

The most important aspect of any diet to prevent type 2 diabetes is its calorie (i.e., energy) content. If calorie intake exceeds calorie usage, then the excess calories will, in the absence of other modifying factors, be directed toward the body's energy storage compartment, which is, of course, the fat tissue. Therefore, a diet that matches calorie consumption with output is the key to prevention of overweight and obesity and therefore diabetes. If one is already overweight, then the diet should provide fewer calories than are required, so that energy will be drawn from the body fat stores and gradual weight loss will occur. Even modest weight loss can be very beneficial. The benefits can be shown very early, almost as soon as calorie intake drops below that required to maintain body weight and before significant weight loss actually occurs. The consumption side of this balance is, of course, food intake. The output side that we can control is exercise. Neither can operate successfully to regulate weight independent of the other. Very calorie- dense foods, such as those with a high fat content (e.g., cheese, ice cream, fried foods, and processed meats) are common components of diets that lead to weight gain, obesity, and ultimately diabetes. Although sugar itself does not cause diabetes, foods with a high content of refined sugar, such as sodas and candies, are also more likely to be associated with weight gain and diabetes than those with natural sugars. Natural sugars tend to be associated with **fiber,**which delays and limits their absorption. Thus, portion for portion, more sugar is consumed in foods high in refined sugar. The question of whether a specific diet composition can prevent diabetes, independent of its actual energy content, is not entirely known. Studies have shown that diets high in grain and fiber tend to be associated with a lower frequency of diabetes in the population. This may be related to the more gradual breakdown and absorption of the components of the meal, especially the**carbohydrates,**as discussed previously.

*The most important aspect of any diet to prevent type 2 diabetes is its calorie (i.e., energy) content.*

***Fiber***

*The structural part of plants and plant products that consists of carbohydrates that are wholly or partially indigestible.*

***Carbohydrates***

*Substances composed of long chains of oxygen, hydrogen, and carbon molecules. Carbohydrates in food (for example, sugar and starch) provide energy for the body and, if present in excess, are stored as fat.*

Since, in all parts of the world, the explosive rise in diabetes is clearly linked to weight gain (with some population groups being more susceptible than others) rather than to a specific type of diet, the dietary focus should remain on eating a healthy diet that provides the recommended amounts of important nutrients, in quantities necessary to maintain a healthy weight (see Question 11) and prevent undesirable weight gain.

1. Does stress affect my risk of getting diabetes?

he perception of stress differs greatly among individuals. What one person may perceive as stressful, another may not. For this reason, stress is quite hard to measure in real-life situations. Artificial measures of accepted stress, such as electric shocks or deprivation of sleep, are very hard to apply to day-to-day life. However, people who report that they are more stressed, regardless of the actual nature of the stress itself, are more likely to suffer from diabetes. Furthermore, it has recently become apparent that measurable physical and psychological stress, such as that caused by sleep deprivation and social stress, is more likely to be associated with the presence of diabetes. This may in part explain the difference in the frequency of diabetes found in people of similar genetic background and measurable physical characteristics (body weight, amount of exercise, etc.) in different regions and societies. Exactly how perceived stress, whether physical, social, or psychological, leads to diabetes is not yet understood.

1. What other factors increase my risk of getting diabetes?

Besides excess weight, hereditary risk, and lack of exercise, another factor that can increase the risk of developing diabetes is the use of certain medications. Among these medications, the type associated most strongly with increased risk are the steroids (also called glucocorticoids), whose members include prednisone, methylprednisolone, hydrocortisone, and dexamethasone. The steroids belong to a class of naturally occurring stress hormones known as **counter- regulatory hormones,**which prepare the body to combat stress. They tend to raise blood sugar. Other stress hormones include the so-called *catecholamines* such as epinephrine (adrenaline) and norepinephrine (noradrenaline), which also raise the blood sugar. Synthetic versions of these compounds, which include some drugs used in weight loss medications, cold and allergy medications, asthma medications, and stimulants, can also cause a rise in blood sugar. Certain types of diuretic pills ("water pills") such as thiazides can also occasionally raise blood sugar, although these pills are commonly and appropriately used in people with diabetes. A certain type of cholesterol-modifying drug known as niacin can raise the blood sugar, sometimes quite markedly. The long- acting ("extended release") version of niacin is less likely to do this. Certain types of medications used to treat psychiatric conditions (the atypical antipsychotics) can lead to a higher frequency of diabetes, although this appears to be largely due to their tendency to cause weight gain. Certain classes of antiviral drugs, especially those used for the treatment of HIV/AIDS, can lead to diabetes.

*Among those medications*, *the type associated most strongly with increased risk are the steroids (also called glucocorticoids).*

***Counterregulatory hormones***

*Naturally occurring hormones that prepare the body to combat stress.*

*Certain classes of antiviral drugs, especially those used for the treatment of HIV/AIDS, can lead to diabetes.*

In the case of all these drugs, the prescribing physician needs to consider the potential benefit of the drug in question to the patient and weigh this against the known risks, including the risk of developing diabetes. In many cases, the potential benefit of using these drugs, which may be life-saving, is believed to outweigh the risks and the blood sugar should be monitored and treated appropriately if diabetes occurs. Once the drug in question is discontinued, the diabetes usually goes away and treatment can be discontinued.

1. Is there anything I can do to reduce my childrens risk of getting diabetes?

There is presently little that can reliably be done to reduce a person's risk of type 1 diabetes, as discussed in Question 19. However, type 2 diabetes has undergone a dramatic increase in children and adolescents in recent years, and it is clear that this is driven, in the most part, by childhood and adolescent overweight and obesity as well as lack of regular exercise. Therefore, establishment of a healthy pattern of eating in childhood, without excess calorie intake, and encouragement of regular exercise can be the most effective means of preventing the development of diabetes. It is important not only to provide children with these elements, but to ensure that they understand how to make healthy choices for themselves and that they realize the lifelong benefits that maintenance of healthy body weight and regular exercise can bring. In this way, they are more likely to establish and attach importance to a healthy lifestyle in adulthood and thus reduce their likelihood of developing diabetes lifelong.

1. Are there any natural herbs, minerals, or other remedies that prevent diabetes?

While it would be premature to answer *yes* to this question, it does appear that certain compounds can favorably impact the blood sugar and may have the potential to delay or prevent diabetes. Those for whom there is at least some evidence include uncooked walnuts, gymnema sylvestre (also known as *gurmar booti* or *gurmar),* green tea, and certain compounds of chromium, zinc, and vanadium. While it is not known how most of these compounds work, the metallic compounds may work by facilitating the body's mechanisms

*Establishment of a healthy pattern of eating in childhood, without excess calorie intake, and encouragement of regular exercise can be the most effective means of preventing the development of diabetes.*

***Immunization***

The process of inducing immunity, usually through inoculation or vaccination.

for releasing insulin, or responding to insulin. Overall, the effect of most of these items is quite mild, and they may influence the blood sugar by a few points. However, occasional individuals have a fairly dramatic response. In addition, there is a known association between low levels of vitamin D and diabetes. It is possible that this may not result from the lack of vitamin D itself, but from other factors somehow related to low vitamin D levels. Replenishment of vitamin D has not been shown to prevent diabetes long term and it is too early to draw conclusions about this.

1. Can type 1 diabetes also be prevented?

At the present time, we do not think that type 1 diabetes can effectively be prevented. Part of the problem is that we do not know the exact environmental triggers), although there is provocative evidence for a number of factors, such as early exposure to cow's milk, certain viral strains, and lack of stimulation of the immune system at an early age by natural exposure to infective agents. The evidence is insufficient to make specific recommendations for avoidance of, or immunization against, specific potential triggering agents.

20. Several members of my close family have diabetes. Will attempts at prevention still work for me?

your success in preventing- diabetes depends upon a combination of how successful you are at attaining the necessary goals and how susceptible your family is. Inherited susceptibility can range from modest to very high. The risk also depends very much on whether both sides of a person's family have a hereditary pattern of diabetes. If both the mother and the father's sides have a high frequency of diabetes, then their offspring will have a marked tendency to develop type 2 diabetes. The general degree of risk is described in Question 7. In spite of the importance of heredity, it is clear than environment and lifestyle play a major role. This is clearly the case because hereditary tendencies to disease change little over the course of a few generations, while environment and lifestyle can change very rapidly. The recent explosive rise in the frequency of type 2 diabetes in most regions of the world clearly implicates the latter as the most important factor. The most readily identifiable lifestyle factors that precipitate type 2 diabetes are weight gain and lack of exercise. Greater than 90% of type 2 diabetes in our society results from one, or usually both, of these factors. Depending on the severity of your inherited risk, a greater or lesser degree of adherence to a lifestyle that avoids overweight or obesity and engages you in regular exercise will effectively prevent you from developing type 2 diabetes.

*If both the mother and the fathers sides have a high frequency of diabetes, then their offspring will have a marked tendency to develop type 2 diabetes.*

21. What are the most common symptoms of diabetes?

The common and early symptoms of diabetes result from the effect of the high blood sugar entering the urine and drawing fluid from the body's tissues along with it. This leads to excess urine production with frequent urination. The loss of body fluid leads to thirst, in order to replace the fluid loss. As long as the person with diabetes is able to keep pace with his or her thirst by regular fluid intake, he or she will remain relatively well. However, without free access to fluid, which can occur for a variety of reasons, one will become dehydrated, which leads to dizziness upon standing upright drowsiness, confusion, and ultimately fainting and unconsciousness. Due to the wasting of calories as glucose in the urine, patients will complain of hunger and will usually lose weight if high blood sugar is very marked. However, it is important to note that only a minority of people with diabetes will experience these symptoms. Frequently, the degree of high blood sugar is more moderate, with little sugar entering the urine and causing no immediate symptoms. However, diabetes of even modest severity can cause considerable harm and lead to serious chronic complications. Therefore, it is important to detect diabetes that is **asymptomatic**(i.e., without symptoms), which is the reason that screening programs to detect diabetes in those at highest risk have been developed. If asymptomatic diabetes is not discovered for a sufficiently long period (many months or years), patients may actually present with long-term complications of the previously unrecognized diabetes, such as heart attack, stroke, heart failure, neuropathy (nerve damage), nephropathy (kidney damage), or retinopathy (eye damage). These are discussed in Questions 32 to 35.

22. How does my doctor confirm the diagnosis of diabetes?

our doctor will perform one of the standard measurements for the diagnosis of diabetes approved by the accepted authoritative body in whichever part of the world you live. In the United States, this is generally set by the American Diabetes Association (ADA) and is accepted by most practitioners, insurers, and health providers as valid. The most current ADA criteria for the diagnosis of diabetes are shown in Table 1 (see Question 9). Your doctor may or may not ask you to fast prior to measuring the blood glucose or he or she may perform a standard 2-hour test known as the oral glucose tolerance test. Unless they are clearly and indisputably abnormal, or accompanied by typical symptoms of diabetes (discussed in Question 4), the results should be confirmed on a different day, since the diagnosis of diabetes carries many implications and necessitates lifelong monitoring and treatment. Very soon, the test that measures the average blood glucose over the past 3 months (the Hemoglobin Alc or HbAlc test) is also likely to become a standard test for detection and diagnosis of diabetes.

Different diagnostic procedures are used for pregnant women, most of whom should be screened for the presence of diabetes of pregnancy ("gestational diabetes") during the 24th to 28th week of pregnancy or earlier if they are at high risk or had diabetes in a previous pregnancy. This involves an initial 1-hour screening test for which fasting is not required. If the screening test is positive, it is followed by a more detailed 3-hour test for which prior fasting is necessary.

*Although many people with diabetes confidently state that they can reliably detect both their high and low blood sugars without actual measurement, studies have shown that these beliefs are not usually accurate.*

***Hypoglycemia***

*An abnormally low level of glucose in the blood; symptoms include shakiness, sweatiness, hunger, abdominal discomfort, palpitations, and confusion.*

***Hyperglycemia***

*An abnormally high level of glucose in the blood; secondary symptoms include frequent urination and thirst.*

23. Can I "feel" my high and low blood sugars reliably?

Although many people with diabetes confidently state that they can reliably detect both their high and low blood sugars without actual measurement, studies have shown that these beliefs are not usually accurate. It is generally easier to be aware of **hypoglycemia**("low sugars") than high blood sugars. This is because the margin of safety between blood sugars in the lower part of the normal range and dangerously low blood sugars is quite narrow — only about 25 mg/dl — and the body has a vigorous and rapid response system, designed to ensure that a source of energy is rapidly found and consumed. Nevertheless, especially after longstanding diabetes or a period of very tight glucose control, symptoms of low blood sugar are often not detected by patients. If they are detected, they are perceived with insufficient time to take preventive action. Typical early symptoms of hypoglycemia are shakiness, sweatiness, hunger, abdominal discomfort, palpitations (i.e., a fluttering sensation in the chest), and headache. When blood sugar is very low, confusion and disorientation often occur together with sometimes bizarre behavior, but these features are generally noted by others rather than the affected person him- or herself. In the case of **hyperglycemia,**people with diabetes are usually quite unaware of the presence or severity of high sugars until secondary symptoms such as frequent urination and thirst occur. For the great majority of people, the only sure way to detect high blood sugar is to perform regular glucose monitoring.

24. My doctor says I have hypoglycemia. Isn't that the opposite of diabetes?

Yes, hypoglycemia (low blood sugar) is the opposite of the hyperglycemia (high blood sugar) that characterizes diabetes. Certain treatments for diabetes and several conditions unrelated to diabetes can cause hypoglycemia. The most common form of hypoglycemia occurs in otherwise healthy young individuals, more commonly in women than men, and is quite benign, although it can be associated with distressing symptoms. Fortunately, it is usually treatable by adjustment of the composition and timing of meals. Sometimes, hypoglycemia can be caused by serious conditions and your doctor will be able to determine whether you are one of the small percentage of people who needs further investigation and specialist referral.

It is important to note that hypoglycemia can be an early feature of diabetes. This type of hypoglycemia occurs in people with prediabetes (see Question 9) who are resistant to the action of insulin and yet are still capable of mounting a vigorous insulin release from the pancreas to overcome it. In the later stages of absorption of calories from a meal, the insulin levels may remain high as the blood glucose level is falling quite rapidly. This may lead to a temporary but sometimes distressing period of low blood sugar that usually occurs about 3 to 5 hours after a meal. It tends to resolve if the prediabetes progresses to frank diabetes, but in some people, it may persist for some years. It is also often treatable by dietary adjustment or other means.

25. Could I have had diabetes for a long time and not known it?

Yes, indeed, you could have had diabetes for a considerable period of time, months or even years, and been unaware of it. However, it is unlikely that you could have had severe diabetes with very high blood sugars for a long time without having to seek medical attention, as you would have experienced complications. However, milder degrees of diabetes are often without obvious symptoms, although in retrospect patients will realize that all was not well when they start to feel the benefits of treatment. Studies have shown that, on average, type 2 diabetes has been present for several years by the time it is diagnosed. It is important that asymptomatic diabetes is detected and treated, because it can lead to serious health consequences, which may be irreversible when detected. About one of every three people has detectable neuropathy (nerve damage) at the time of diagnosis, indicating that longstanding diabetes has been present. Less commonly, eye damage (retinopathy) and/or kidney damage (nephropathy) are discovered at the time of diagnosis. These are serious consequences of diabetes and are the leading causes of blindness and kidney failure in working age adults in the United States, as well as much of the industrialized world. As serious, or even more serious than this, is the potential for undetected and untreated diabetes to lead to heart attacks, strokes, heart failure, or amputations. Indeed, almost 4 of every 10 patients admitted to hospital with a sudden serious cardiac event will be found to have previously unsuspected and undiagnosed diabetes or prediabetes. It is now clear that prediabetes is almost as serious a risk factor for such cardiac events and death from them as full-blown diabetes.

*It is important that asymptomatic diabetes is detected and treated, because it can lead to serious health consequences, which may be irreversible when detected.*

26. I have a strong family history of diabetes. How often should I be checked for it?

The frequency with which you should be checked for diabetes depends upon your degree of risk, your age, and lifestyle factors. Even if you have a strong family history of type 1 diabetes, your risk of developing it is still only about 5% and is much lower after the age of 35.

Furthermore, type 1 diabetes usually presents with obvious symptoms, such as those described in Question 21, and is unlikely to be missed. Since there is presently little that can be done to prevent type 1 diabetes, screening is usually not performed. If you have a strong family history of type 2 diabetes, the frequency with which you should be screened also depends on age and lifestyle factors. If you are young (younger than 30), physically active, and lean, then you are not at high risk and regular screening is not necessary. As you get older, especially if you get more sedentary and gain weight, as most of us do, then regular screening is advisable. Since screening for diabetes with a fasting or random blood glucose measurement is rapid and inexpensive, there is no reason not to perform it at least annually in individuals at high risk and every 2 to 3 years in those at lesser, but still significant, risk. In general, all pregnant women should be screened for gestational diabetes between 24 and 28 weeks of pregnancy. Some authorities exclude younger (younger than 25 years old) women, who are otherwise at low risk, from the need for screening.

27. I had diabetes during my last pregnancy. Am I at risk of diabetes in the future?

Yes, you are at high risk both of having type 2 diabetes in the future and of having diabetes again with your next pregnancy. The reason for this is that women destined to get type 2 diabetes in middle age or beyond tend to be the same women who will develop diabetes in pregnancy. Therefore, the presence of diabetes in pregnancy is an indicator of future risk for type 2 diabetes. Because type 2 diabetes is a disorder of aging, the diabetes in pregnancy tends to be more severe and requires more intensive treatment with each successive pregnancy, unless steps are taken between pregnancies to reverse one or more risk factors, such as excess weight or lack of exercise.

*If you are young (younger than 30), physically active, and lean, then you are not at high risk and regular screening is not necessary. As you get older, especially if you get more sedentary and gain weight, as most of us do, then regular screening is advisable.*

28. Can diabetes sometimes be temporary and go away again?

Yes, this can and does occur, in the case of both types of diabetes. However, in the case of type 1 diabetes, the disappearance is very predictably temporary and the diabetes will almost inevitably return within months or a year or two. The reasons for it are complex and relate to the fact that type 1 diabetes is often diagnosed under conditions of physical stress. When the diabetes is treated and the stress to the body has resolved, there may be sufficient remaining insulin-producing capability in the pancreas to keep the blood sugar normal under most circumstances. Eventually, however, the pancreas fails and permanent diabetes supervenes.

In the case of type 2 diabetes, although the hereditary factors causing it cannot be reversed, the environmental and lifestyle factors can be changed. The latter are the cause of the explosive rise in the number of people affected with diabetes in recent years. Questions 1,11, 12, 16, and 20 discuss some of these causative factors. Although we do not generally refer to type 2 diabetes as being cured once it has been diagnosed (see Question 5), it can certainly go into remission (cease to be an active medical problem) for long periods, depending on how successfully the causative factors are addressed. Because excess weight and sedentary lifestyle are the two most important and serious causative factors, weight reduction and adherence to an exercise program can often put type 2 diabetes into remission for as long as they are maintained. Sometimes, all medications, even insulin, can be stopped and all measures of diabetes, including blood glucose and hemoglobin A1c (HbA1c — the measure of your blood sugar control averaged over 3 months), will completely normalize. Other associated conditions, such as high blood pressure and cholesterol abnormalities, will also improve greatly. The possibility of stopping all medications is more likely to occur earlier in the course of diabetes and before long-term complications have developed. Unfortunately, many of us in modern society are unable to sustain weight reduction and exercise for long periods and the failure rate is high.

29. What can happen if my diabetes is not properly treated and controlled?

Uncontrolled diabetes, which generally refers to glucose levels that are higher rather than lower than the target range, can lead to immediate short-term and longer- term consequences. The short-term consequences result from the very high blood glucose itself, which is described in Question 4. If severe enough or untreated for long enough, markedly high blood glucose levels can result in coma and ultimately death, due to the severe abnormalities of blood chemistry that occur. It is important to note that only a very small minority of patients with either form of diabetes will die in this way. Therefore, although immediate **decompensation**of diabetes is a serious and life-threatening condition, with a high death rate if detected and treated too late, the majority of people with diabetes should be more concerned about the damaging effects of diabetes that are not well controlled, yet not sufficiently poorly controlled to focus their attention.

***Decompensation***

*A serious deterioration in a medical condition.*

The longer-term consequences of less than adequate diabetes control are the result of damage to the small (micro) and larger (macro) vessels of the circulation. The most common manifestations are diabetic eye disease (retinopathy), which is the leading cause of blindness in working-age adults in the United States; diabetic kidney disease (nephropathy), which is the leading cause of severe kidney failure necessitating dialysis or transplantation in working-age adults in the United States; and nerve damage (neuropathy), which is present in about 1 out of 3 people with diabetes at the time of diagnosis and in over 7 out of 10 by the time diabetes has been present for 10 years. Both retinopathy and nephropathy can be entirely without symptoms until they reach an advanced and irreversible stage, leading to blindness and the need for kidney dialysis or transplant. Diabetic neuropathy can cause very troublesome symptoms and lead to loss of sensation, mainly in the feet, which places the patient at high risk of trauma, infection, and amputations of the legs and feet.

Disease of the large blood vessels leads to a high rate of heart attack, stroke, heart failure, and amputation of the (usually lower) limbs. About two of every three patients with diabetes will die as a result of large vessel disease. Fortunately, studies have shown that good control of diabetes can prevent or delay the progression of many of these serious problems, but other contributing factors, such as blood pressure and cholesterol, must also be given careful attention.

However, we are only achieving target levels of diabetes control in about half of all people with diabetes in America today.

30. Does diabetes put me at risk of any other diseases or illnesses?

Aside from the direct consequences of high blood sugar itself, which are discussed in Question 29, people with diabetes are at risk of suffering from other associated diseases. In the case of type 1 diabetes, the diseases either result from the high blood sugar or from the root cause of the diabetes, which is a predisposition to destroy the hormone-producing tissues (called**autoimmunity).**Thus, a person with type 1 diabetes is more likely to suffer from adrenal gland damage (Addison's disease), thyroid gland damage (Graves' or, much more commonly, Hashimoto's disease), and several other disorders. Fortunately, except in the case of thyroid disease, which affects about one in three people with type 1 diabetes, the likelihood of developing one of these other disorders is not high, but can be so in certain families. Most people with type 1 diabetes are screened annually for thyroid disease. In the case of type 2 diabetes, the other diseases appear to be independent, but related. In other words, they and the diabetes arise from a common soil in the affected person's metabolic makeup. These related diseases include cholesterol and other blood fat abnormalities **(dyslipidemia),**high blood pressure **(hypertension),**and gout. The first two are commonly seen in people with type 2 diabetes, while the third is less so.

***Autoimmunity***

*A predisposition to produce autoantibodies.*

***Dyslipidemia***

*Cholesterol and other blood fat abnormalities.*

***Hypertension***

*High blood pressure.*

31. What is diabetic coma?

32. What is diabetic neuropathy?

33. What is diabetic retinopathy?

34. What is diabetic nephropathy?

35. Why is the risk of blood vessel diseases increased so much in diabetes?

36. Can my diabetes affect my sex life? If so, how and what can I do about it?

37. I feel as if my memory has gotten worse since I developed diabetes. Could I be right?

38. I hear a lot about footwear and foot care for diabetes. Why is this so important?

PART FIVE. Treatments for Diabetes

39. Is diet and exercise management alone really effective for diabetes?

40. What should I eat and what should I avoid? Please be specific!

41. What are the best and safest pills for diabetes?

42. Who should take pills and who should take insulin?

43. My doctor says that I need to start insulin. If I do, will I ever get off it?

44. I take several types of pills for my diabetes. How can I reduce the expense?

45. Why is it so important for people with diabetes to control their blood pressure and cholesterol as well?

46. What is the difference between basal insulin and bolus insulin?

47. I am afraid that my diabetes treatment will cause me to gain weight. How can I prevent this?

48. I am afraid that I might forget I have taken my insulin and take it twice, or mistakenly take my long-acting dose for my short-acting and vice versa. What should I do if this happens?

49. I am on insulin for my diabetes and I am overweight. If I lose weight, will I be able to stop the insulin shots?

50. Do any traditional or nonprescription remedies for diabetes really help control blood sugar? If so, which ones do you recommend?