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ABSTRACT

This brochure addresses the problem of gestational diabetes and answers the most frequently asked questions about the disease. It begins by defining gestational diabetes and discussing its cause, then addresses such topics as: (1) how gestational diabetes differs from other types of diabetes; (2) who is at risk for developing gestational diabetes and how it is detected; (3) how gestational diabetes affects pregnancy and whether it will hurt the baby; (4) what can be done to reduce problems associated with gestational diabetes; and (5) how to monitor blood glucose levels. Other topics concerning the disease involve health of the baby, labor and delivery, weight gain during pregnancy, breast-feeding, insulin, diet, and exercise. Figures in the brochure show how the pancreas produces insulin, how high maternal glucose affects the fetus, the distribution of weight gain during pregnancy, and the six food groups. Seven tables show values for a three-hour glucose tolerance test for gestational diabetes, a prenatal weight gain grid, prepregnancy weight limits, protein equivalents, a daily food guide, caffeine comparisons, and calorie comparisons. Also included are a sample menu for 2,000 calories, a glossary of terms, and forms for self-monitoring of blood glucose and food and exercise. (SH)

Understanding Gestational Diabetes

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A Practical Guide to a Healthy Pregnancy

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES

Public Health Service • National Institutes of Health

National Institute of Child Health and Human Development

Understanding Gestational Diabetes

A Practical Guide to a Healthy Pregnancy

Approximately 3 to 5 percent of all pregnant women in the United States are diagnosed as having gestational diabetes. These women and their families have many questions about this disorder. Some of the most frequently asked questions are: What is gestational diabetes and how did I get it? How does it differ from other kinds of diabetes? Will it hurt my baby? Will my baby have diabetes? What can I do to control gestational diabetes? Will I need a special diet? Will gestational diabetes change the way or the time my baby is delivered? Will I have diabetes in the future?

This brochure will address these and many other questions about diet, exercise, measurement of blood sugar levels, and general medical and obstetric care of women with gestational diabetes. It must be emphasized that these are general guidelines and only your health care professional(s) can tailor a program specific to your needs. You should feel free to discuss any concerns you have with your doctor or other health care provider, as no one knows more about you and the condition of your pregnancy.

What is gestational diabetes and what causes it?

Diabetes (actual name is diabetes mellitus) of any kind is a disorder that prevents the body from using food properly. Normally, the body gets its major source of energy from glucose, a simple sugar that comes from foods high in simple carbohydrates (e.g., table sugar or other sweeteners such as honey, molasses, jams, and jellies, soft drinks, and cookies), or from the breakdown of complex carbohydrates such as starches (e.g., bread, potatoes, and pasta). After sugars and starches are digested in the stomach, they enter the blood stream in the form of glucose* (figure 1). The glucose in the blood stream becomes a potential source of energy for the entire body, similar to the way in which gasoline in a service station pump is a potential source of energy for your car. But, just as someone must pump the gas into the car, the

*For the purpose of this brochure the words sugar and glucose are used synonymously.

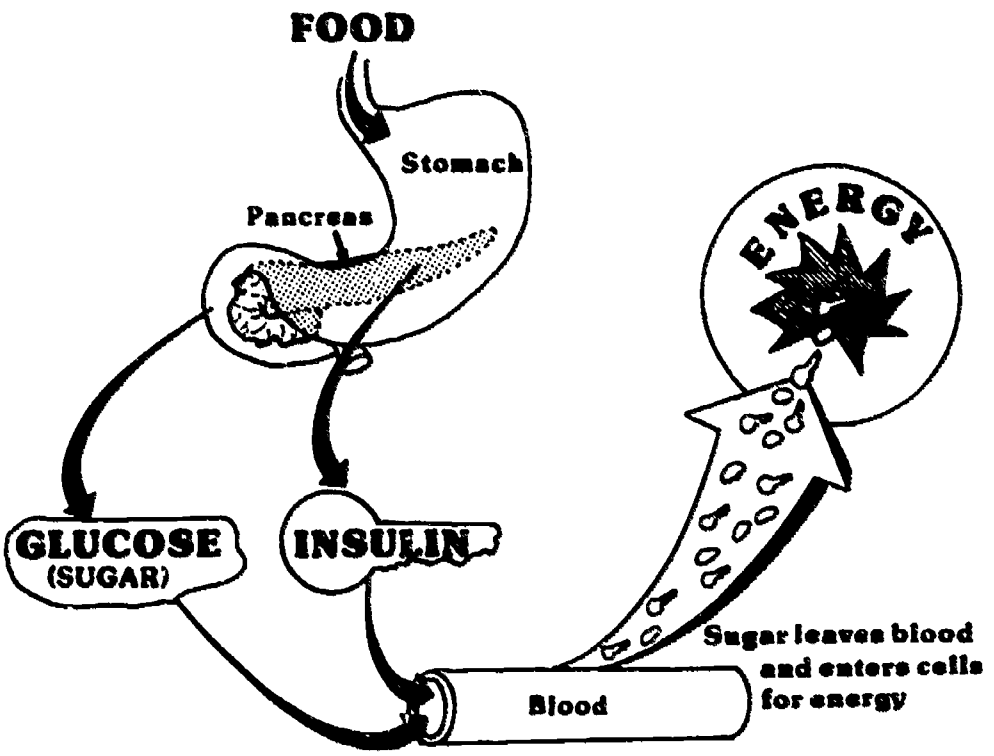


FIGURE 1

Insulin: The Key to Turning Food into Energy

body requires some assistance to get glucose from the blood stream to the muscles and other tissues of the body. In the body, that assistance comes from a hormone called insulin. Insulin is manufactured by the pancreas, a gland that lies behind the stomach. Without insulin, glucose cannot get into the cells of the body where it is used as fuel. Instead, glucose accumulates in the blood to high levels and is excreted or "spilled" into the urine through the kidneys.

When the pancreas of a child or young adult produces little or no insulin we call this condition juvenile-onset diabetes or Type I diabetes (insulin-dependent). This is not the type of diabetes you have. Unlike women with Type I diabetes, women with gestational diabetes have plenty of insulin. In fact, they usually have more insulin in their blood than women who are not pregnant. However, the effect of their insulin is partially blocked by a variety of other hormones made in the placenta, a condition often called insulin resistance.

The placenta performs the task of supplying the growing fetus with nutrients and water from the mother's circulation. It also produces a variety of hormones vital to the preservation of the pregnancy.

Ironically, several of these hormones such as estrogen, cortisol and human placental lactogen (HPL) have a blocking effect on insulin, a "contra-insulin" effect. This contra-insulin effect usually begins about midway (20 to 24 weeks) through pregnancy. The larger the placenta grows, the more these hormones are produced, and the greater the insulin resistance becomes. In most women the pancreas is able to make additional insulin to overcome the insulin resistance. When the pancreas makes all the insulin it can and there still isn't enough to overcome the effect of the placenta's hormones, gestational diabetes results. If we could somehow remove all the placenta's hormones from the mother's blood, the condition would be remedied. This, in fact, usually happens following delivery.

How does gestational diabetes differ from other types of diabetes?

There are several different types of diabetes. Gestational diabetes begins during pregnancy and disappears following delivery. Another type is referred to as juvenile-onset diabetes (in children) or Type I (in young adults). These individuals usually develop their disease before age 20. People with Type I diabetes must take insulin by injection every day. Approximately 10 percent of all people with diabetes have Type I (also called insulin-dependent diabetes).

Type II diabetes or noninsulin-dependent diabetes (formerly called adult-onset diabetes) is also characterized by high blood sugar levels, but these patients are often obese and usually lack the classic symptoms (fatigue, thirst, frequent urination, and sudden weight loss) associated with Type I diabetes. Many of these individuals can control their blood sugar levels by following a careful diet and exercise program, by losing excess weight, or by taking oral medication. Some, but not all, need insulin. People with Type II diabetes account for roughly 90 percent of all diabetics.

Who is at risk for developing gestational diabetes and how is it detected?

Any woman might develop gestational diabetes during pregnancy. Some of the factors associated with women who have an increased risk are obesity; a family history of diabetes; having given birth previously

to a very large infant, a stillbirth, or a child with a birth defect; or having too much amniotic fluid (polyhydramnios). Also, women who are older than 25 are at greater risk than younger individuals. Although a history of sugar in the urine is often included in the list of risk factors, this is not a reliable indicator of who will develop diabetes during pregnancy. Some pregnant women with perfectly normal blood sugar levels will occasionally have sugar detected in their urine.

The Council on Diabetes in Pregnancy of the American Diabetes Association strongly recommends that all pregnant women be screened for gestational diabetes. Several methods of screening exist. The most common is the 50-gram glucose screening test. No special preparation is necessary for this test, and there is no need to fast before the test. The test is performed by giving 50 grams of a glucose drink and then measuring the blood sugar level 1-hour later. A woman with a blood sugar level of less than 140 milligrams per deciliter (mg/dl) at 1-hour is presumed not to have gestational diabetes and requires no further testing. If the blood sugar level is greater than 140 mg/dl the test is considered abnormal or "positive." Not all women with a positive screening test have diabetes. Consequently, a 3-hour glucose tolerance test must be performed to establish the diagnosis of gestational diabetes.

If your physician determines that you should take the complete 3-hour glucose tolerance test, you will be asked to follow some special instructions in preparation for the test. For 3 days before the test, eat a diet that contains at least 150 grams of carbohydrates each day. This can be accomplished by including one cup of pasta, two servings of fruit, four slices of bread, and three glasses of milk every day. For 10 to 14 hours before the test you should not eat and not drink anything but water. The test is usually done in the morning in your physician's office or in a laboratory. First, a blood sample will be drawn to measure your fasting blood sugar level. Then you will be asked to drink a full bottle of a glucose drink (100 grams). This glucose drink is extremely sweet and occasionally makes some people feel nauseated. Finally, blood samples will be drawn every hour for 3 hours after the glucose drink has been consumed. The normal values for this test are shown in table 1.

TABLE 1. 3-Hour Glucose Tolerance Test for Gestational Diabetes

	Diagnostic Criteria Blood Glucose Level	**Normal Mean Values*** Blood Glucose Level
Fasting	105 mg/dl	80 mg/dl
1 hour	190 mg/dl	120 mg/dl
2 hour	165 mg/dl	105 mg/dl
3 hour	145 mg/dl	90 mg/dl

From 752 Unselected Pregnancies

If two or more of your blood sugar levels are higher than the diagnostic criteria, you have gestational diabetes. This testing is usually performed at the end of the second trimester or the beginning of the third trimester (between the 24th and 28th weeks of pregnancy) when insulin resistance usually begins. If you had gestational diabetes in a previous pregnancy or there is some reason why your physician is unusually concerned about your risk of developing gestational diabetes, you may be asked to take the 50-gram glucose screening test as early as the first trimester (before the 13th week). Remember, merely having sugar in your urine or even having an abnormal blood sugar on the 50-gram glucose screening test does not necessarily mean you have gestational diabetes. The 3-hour glucose tolerance test must be abnormal before the diagnosis is made.

How does gestational diabetes affect pregnancy and will it hurt my baby?

The complications of gestational diabetes are manageable and preventable. The key to prevention is careful control of blood sugar levels just as soon as the diagnosis of gestational diabetes is made.

You should be reassured that there are certain things gestational diabetes does not usually cause. Unlike Type I diabetes, gestational diabetes generally does not cause birth defects. For the most part, birth defects originate sometime during the first trimester (before the 13th week) of pregnancy. The insulin resistance from the contra-insulin hormones produced by the placenta does not usually occur until

*O'Sullivan, J. B. Establishing Criteria for Gestational Diabetes. *Diabetes Care* 3: 437-439. 1980.

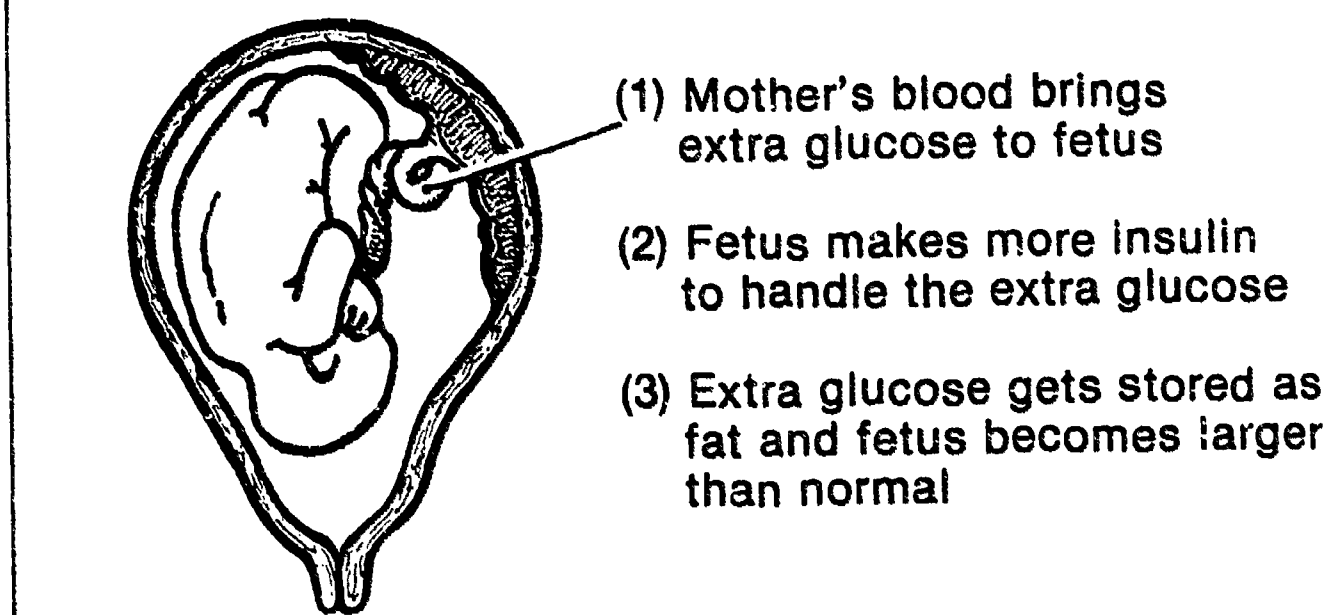


FIGURE 2

The Role of High Maternal Glucose in Fetal Macrosomia

approximately the 24th week. Therefore, women with gestational diabetes generally have normal blood sugar levels during the critical first trimester.

One of the major problems a woman with gestational diabetes faces is a condition the baby may develop called "macrosomia." Macrosomia means "large body" and refers to a baby that is considerably larger than normal. All of the nutrients the fetus receives come directly from the mother's blood (figure 2). If the maternal blood has too much glucose, the pancreas of the fetus senses the high glucose levels and produces more insulin in an attempt to use the glucose. The fetus converts the extra glucose to fat. Even when the mother has gestational diabetes, the fetus is able to produce all the insulin it needs. The combination of high blood glucose levels from the mother and high insulin levels in the fetus results in large deposits of fat which causes the fetus to grow excessively large, a condition known as macrosomia. Occasionally, the baby grows too large to be delivered through the vagina and a cesarean delivery becomes necessary. The obstetrician can often determine if

the fetus is macrosomic by doing a physical examination. However, in many cases a special test called an ultrasound is used to measure the size of the fetus. This and other special tests will be discussed later.

In addition to macrosomia, gestational diabetes increases the risk of hypoglycemia (low blood sugar) in the baby immediately after delivery. This problem occurs if the mother's blood sugar levels have been consistently high causing the fetus to have a high level of insulin in its circulation. After delivery the baby continues to have a high insulin level, but it no longer has the high level of sugar from its mother, resulting in the newborn's blood sugar level becoming very low. Your baby's blood sugar level will be checked in the newborn nursery and if the level is too low, it may be necessary to give the baby glucose intravenously. Infants of mothers with gestational diabetes are also vulnerable to several other chemical imbalances such as low serum calcium and low serum magnesium levels.

All of these are manageable and preventable problems. The key to prevention is careful control of blood sugar levels in the mother just as soon as the diagnosis of gestational diabetes is made. By maintaining normal blood sugar levels, it is less likely that a fetus will develop macrosomia, hypoglycemia, or other chemical abnormalities.

What can be done to reduce problems associated with gestational diabetes?

In addition to your obstetrician, there are other health professionals who specialize in the management of diabetes during pregnancy including internists or diabetologists, registered dietitians, qualified nutritionists, and diabetes educators. Your doctor may recommend that you see one or more of these specialists during your pregnancy. In addition, a neonatologist (a doctor who specializes in the care of newborn infants) should also be called in to manage any complications the baby might develop after delivery.

One of the essential components in the care of a woman with gestational diabetes is a diet specifically tailored to provide adequate nutrition to meet the needs of the mother and the growing fetus. At the same time the diet has to be planned in such a way as to keep blood glucose levels in the normal range (60 to 120 mg/dl). Specific details about diet during pregnancy are discussed later.

An obstetrician, diabetes educator, or other health care practitioner can teach you how to measure your own blood glucose levels at home to see if levels remain in an acceptable range on the prescribed diet. The ability of patients to determine their own blood sugar levels with easy-to-use equipment represents a major milestone in the management of diabetes, especially during pregnancy. The technique called "self blood glucose monitoring" (discussed in detail later) allows you to check your blood sugar levels at home or at work without costly and time-consuming visits to your doctor. The values of your blood sugar levels also determine if you need to begin insulin therapy sometime during pregnancy. Short of frequent trips to a laboratory, this is the only way to see if blood glucose levels remain under good control.

What is self blood glucose monitoring?

Once you are diagnosed as having gestational diabetes, you and your health care providers will want to know more about your day-to-day blood sugar levels. It is important to know how your exercise habits and eating patterns affect your blood sugars. Also, as your pregnancy progresses, the placenta will release more of the hormones that work against insulin. Testing your blood sugar level at important times during the day will help determine if proper diet and weight gain have kept blood sugar levels normal or if extra insulin is needed to help keep the fetus protected.

Self blood glucose monitoring is done by using a special device to obtain a drop of your blood and test it for your blood sugar level. Your doctor or other health care provider will explain the procedure to you. Make sure that you are shown how to do the testing before attempting it on your own. Some items you may use to monitor your blood sugar levels are:

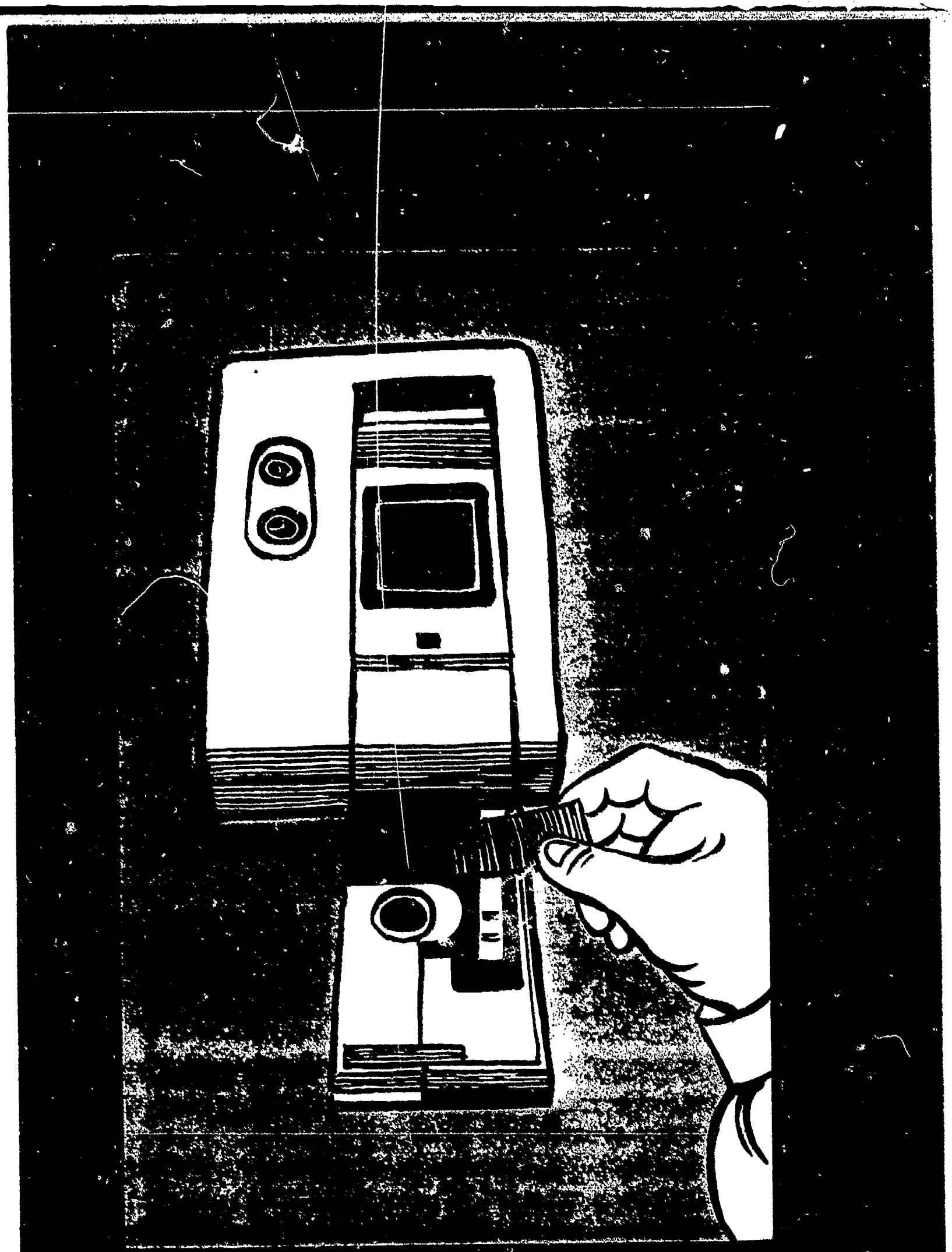
Lancet—a disposable, sharp needle-like sticker for pricking the finger to obtain a drop of blood.

Lancet device—a spring-loaded finger sticking device.

Test strip—a chemically treated strip to which a drop of blood is applied.

Color chart—a chart used to compare against the color on the test strip for blood sugar level.

Glucose meter—a device which "reads" the test strip and gives you a digital number value.



Glucose Meter

Your health care provider can advise you where to obtain the self-monitoring equipment in your area. You may want to inquire if any places rent or loan glucose meters, since it is likely you won't be needing it after your baby is born.

How often and when should I test?

You may need to test your blood several times a day. Generally, these times are fasting (first thing in the morning before you eat) and 2 hours after each meal. Occasionally, you may be asked to test more frequently during the day or at night. As each person is an individual, your health care provider can advise the schedule best for you.

How should I record my test results?

Most manufacturers of glucose testing products provide a record diary, although some health care providers may have their own version. A Self Blood Glucose Monitoring Diary is included at the end of this book.

You should record any test result immediately because it's easy to forget what the reading was during the course of a busy day. You should always have this diary with you when you visit your doctor or other health care provider or when you contact them by phone. These results are very important in making decisions about your health care.

Are there any other tests I should know about?

In addition to blood testing, you may be asked to check your urine for ketones. Ketones are by-products of the breakdown of fat and may be found in the blood and urine as a result of inadequate insulin or from inadequate calories in your diet. Although it is not known whether or not small amounts of ketones can harm the fetus, when large amounts of ketones are present they are accompanied by a blood condition, acidosis, which is known to harm the fetus. To be on the safe side, you should watch for them in your urine and report any positive results to your doctor.

How do I test for ketones?

To test the urine for ketones, you can use a test strip similar to the one used for testing your blood. This test strip has a special chemically treated pad to detect ketones in the urine. Testing is done by passing the test strip through the stream of urine or dipping the strip in and out of urine in a container. As your pregnancy progresses, you might find it easier to use the container method. All test strips are disposable and can be used only once. This applies to blood sugar test strips also. You cannot use your blood sugar test strips for urine testing, and you cannot use your urine ketone test strips for blood sugar testing.

When do I test for ketones?

Overnight is the longest fasting period, so you should test your urine first thing in the morning every day and any time your blood sugar level goes over 240 mg/dl on the blood glucose test. It is also important to test if you become ill and are eating less food than normal. Your health care provider can advise what's best for you.

Is it ever necessary to take insulin?

Yes, despite careful attention to diet some women's blood sugars do not stay within an acceptable range. A pregnant woman free of gestational diabetes rarely has a blood glucose level that exceeds 100 mg/dl in the morning before breakfast (fasting) or 2 hours after a meal. The optimum goal for a gestational diabetic is blood sugar levels that are the same as those of a woman without diabetes.

There is no absolute blood sugar level that necessitates beginning insulin injections. However, many physicians begin insulin if the fasting sugar exceeds 105 mg/dl or if the level 2 hours after a meal exceeds 120 mg/dl on two separate occasions. Blood sugar levels measured by you at home will help your doctor know when it is necessary to begin insulin. The ability to perform self blood glucose monitoring has made it possible to begin insulin therapy at the earliest sign of high sugar levels, thereby preventing the fetus from being exposed to high levels of glucose from the mother's blood.

Will my baby be healthy?

The ultimate concern of any expectant mother is, "Will my baby be all right?" There is an array of simple, safe tests used to assess the condition of the fetus before birth and these can be particularly valuable during a pregnancy complicated by gestational diabetes. Tests that may be given during your pregnancy include:

Ultrasound. Ultrasound uses short pulses of high-frequency, low-intensity sound waves to create images. Unlike x rays, there is no radiation exposure to the fetus. First used during World War II to detect enemy submarines below the surface of the water, ultrasound has since been used safely in obstetrics. Occasionally, the date of your last menstrual period is not sufficient to determine a due date. Ultrasound can provide an accurate gestational age and due date that may be very important if it is necessary to induce labor early or perform a cesarean delivery. Ultrasound can also be used to determine the position of the placenta if it is necessary to perform an amniocentesis (another test discussed later).

Fetal movement records. Recording fetal movement is a test you can do by yourself to help determine the condition of the baby. Fetal activity is generally a reassuring sign of well-being. Women are often asked to count fetal movements regularly during the last trimester of pregnancy. You may be asked to set aside specific times to lie down on your back or side and count the number of times the baby moves or kicks. Three or more movements in a 2-hour period is considered normal. Contact your obstetrician if you feel fewer than three movements to determine if other tests are needed.

Fetal monitoring. Modern instruments make it possible to monitor the baby's heart rate before delivery. Currently, there are two types of fetal monitors—internal and external. The internal monitor consists of a small wire electrode attached directly to the scalp of the fetus after the membranes have ruptured. The external monitor uses transducers secured to the mother's abdomen by an elastic belt. One transducer records the baby's heart rate by a sensitive microphone called a doppler. The other transducer measures the firmness of the abdomen during a contraction of the uterus. It is a crude measure of the strength and frequency of contractions. Fetal monitoring is the basis for the non-stress test and the oxytocin challenge test described below.

Non-stress test. The "non-stress" test refers to the fact that no medication is given to the mother to cause movement of the fetus or contraction of the uterus. It is often used to confirm the well-being of the fetus based on the principle that a healthy fetus will demonstrate an acceleration in its heart rate following movement. Fetal activity may be spontaneous or induced by external manipulation such as rubbing the mother's abdomen or making a loud noise above the abdomen with a special device. When movement of the fetus is noted, a recording of the fetal heart rate is made. If the heart rate goes up, the test is normal. If the heart rate does not accelerate, the fetus may merely be "sleeping"; if, after stimulation, the fetus still does not react, it may be necessary to perform a "stress test" (oxytocin challenge test).

Stress test (oxytocin challenge test). Labor represents a stress to the fetus. Every time the uterus contracts, the fetus is momentarily deprived of its usual blood supply and oxygen. This is not a problem for most babies. However, some babies are not healthy enough to handle the stress and demonstrate an abnormal heart rate pattern. This test is often done if the non-stress test is abnormal. It involves giving the hormone oxytocin (secreted by every mother when normal labor begins) to the mother to stimulate uterine contractions. The contractions are a challenge to the baby, similar to the challenge of normal labor. If the baby's heart rate slows down rather than speeds up after a contraction, the baby may be in jeopardy. The stress test is considered more accurate than the non-stress test. Nevertheless, it is not 100 percent fool-proof and your obstetrician may want to repeat it on another occasion to ensure its accuracy. Most women describe this test as mildly uncomfortable but not painful.

Amniocentesis. Amniocentesis is a method of removing a small amount of fluid from the amniotic sac for analysis. Either the fluid itself or the cells shed by the fetus into the fluid can be studied. In mid-pregnancy the cells in amniotic fluid can be analyzed for genetic abnormalities such as Down syndrome. Many women over the age of 35 have amniocentesis for just this reason. Another important use for amniocentesis late in pregnancy is to study the fluid itself to determine if the lungs of the fetus are mature and able to withstand early delivery. This information can be very important in deciding the best time for a woman with Type I diabetes to deliver. It is not done as frequently to women with gestational diabetes.

Amniocentesis can be performed in an obstetrician's office or on an outpatient basis in a hospital. For genetic testing, amniocentesis is usually performed around the 16th week when the placenta and fetus can be located easily with ultrasound and a needle can be inserted safely into the amniotic sac. The overall complication rate for amniocentesis is less than 1 percent. The risk is even lower during the third trimester when the amniotic sac is larger and easily identifiable.

Does gestational diabetes affect labor and delivery?

Most women with gestational diabetes can complete pregnancy and begin labor naturally. Any pregnant woman has a slight chance (about 5 percent) of developing preeclampsia (toxemia), a sudden onset of high blood pressure associated with protein in the urine, occurring late in pregnancy. If preeclampsia develops, your obstetrician may recommend an early delivery. When an early delivery is anticipated, an amniocentesis is usually performed to assess the maturity of the baby's lungs.

Gestational diabetes, by itself, is not an indication to perform a cesarean delivery, but sometimes there are other reasons your doctor may elect to do a cesarean. For example, the baby may be too large (macrosomic) to deliver vaginally, or the baby may be in distress and unable to withstand vaginal delivery. You should discuss the various possibilities for delivery with your obstetrician so there are no surprises.

Careful control of blood sugar levels remains important even during labor. If a mother's blood sugar level becomes elevated during labor, the baby's blood sugar level will also become elevated. High blood sugars in the mother produce high insulin levels in the baby. Immediately after delivery high insulin levels in the baby can drive its blood sugar level very low since it will no longer have the high sugar concentration from its mother's blood.

Women whose gestational diabetes does not require that they take insulin during their pregnancy, will not need to take insulin during their labor or delivery. On the other hand, a woman who does require insulin during pregnancy may be given insulin by injection on the

morning labor begins, or in some instances, it may be given intravenously throughout labor. For most women with gestational diabetes there is no need for insulin after the baby is born and blood sugar level returns to normal immediately. The reason for this sudden return to normal lies in the fact that when the placenta is removed the hormones it was producing (which caused the insulin resistance) are also removed. Thus, the mother's insulin is permitted to work normally without resistance. Your doctor may want to check your blood sugar level the next morning, but it will most likely be normal.

Should I expect my baby to have any problems?

One of the most frequently asked questions is, "Will my baby have diabetes?" Almost universally the answer is no. However, the baby is at risk for developing Type II diabetes later in life, and of having other problems related to gestational diabetes, such as hypoglycemia (low blood sugar) mentioned earlier. If your blood sugars were not elevated during the 24 hours before delivery, there is a good chance that hypoglycemia will not be a problem for your baby. Nevertheless, a neonatologist (a doctor who specializes in the care of newborn infants) or other doctor should check your baby's blood sugar level and give extra glucose if necessary.

Another problem that may develop in the infant of a mother with gestational diabetes is jaundice. Jaundice occurs when extra red blood cells in the baby's circulation are destroyed, releasing a substance called bilirubin. Bilirubin is a pigment that causes a yellow discoloration of the skin (jaundice). A minor degree of jaundice is common in many newborns. However, the presence of large amounts of bilirubin in the baby's system can be harmful and requires placing the baby under special lights which help get rid of the pigment. In extreme cases, blood transfusions may be necessary.

Will I develop diabetes in the future?

For most women gestational diabetes disappears immediately after delivery. However, you should have your blood sugars checked after your baby is born to make sure your levels have returned to normal. Women who had gestational diabetes during one pregnancy are at greater risk of developing it in a subsequent pregnancy. It is important

that you have appropriate screening tests for gestational diabetes during future pregnancies as early as the first trimester.

Pregnancy is a kind of "stress test" that often predicts future diabetic problems. In one large study more than one-half of all women who had gestational diabetes developed overt Type II diabetes within 15 years of pregnancy. Because of the risk of developing Type II diabetes in the future, you should have your blood sugar level checked when you see your doctor for your routine check-ups. There is a good chance you will be able to reduce the risk of developing diabetes later in life by maintaining an ideal body weight and exercising regularly.

Why is a special diet recommended?

A nutritionally balanced diet is always essential to maintaining a healthy mother and successful pregnancy. The foods you choose become the nutrient building blocks for the growth of the fetus. For a woman with gestational diabetes, proper diet alone often keeps blood sugar levels in the normal range and is generally the first step to follow before resorting to insulin injections. Careful attention should be paid to the total calories eaten daily, to avoid foods which increase blood sugar levels, and to emphasize the use of foods which help the body maintain a normal blood sugar. A registered dietitian is the best person to help you with meal planning to meet your individual needs. Your physician can help you find a dietitian if this service is not a part of his or her office or clinic. Your local chapter of the American Dietetic Association or the American Diabetes Association can also help you locate a registered dietitian.

How much weight should I gain?

Of all questions asked by pregnant women, this is the most common. The answer is particularly important for women with gestational diabetes. The weight that you gain is a rough indication of how much nutrition is available to the fetus for growth. An inadequate weight gain may result in a small baby who lacks protective calorie reserves at birth. This baby may have more illness during the first year of life. An excessive weight gain during pregnancy, however, has an insulin-resistant effect, just like the hormones produced by the placenta, and will make your blood sugar level higher.

TABLE 2. Prenatal Weight Gain Grid

Adapted from Judith E. Brown. *Nutrition for Your Pregnancy.* University of Minnesota Press, 1983.

The "optimal" weight to gain depends on the weight that you are before becoming pregnant (table 2). Your pre-pregnancy weight is also a rough indication of how well-nourished you are before becoming pregnant. If you are at a desirable weight for your body size before you become pregnant, a weight gain of 24 to 27 pounds is recommended. If you are approximately 20 pounds or more above your desirable weight before pregnancy, a weight gain of 24 pounds is recommended. Many overweight women, however, have healthy babies and gain only 20 pounds. If you become pregnant when you are underweight, you need

TABLE 3. Pre-Pregnancy Weight

Pre-pregnancy weight for height. Use this chart to determine if your pre-pregnancy weight is normal, underweight, or overweight.

Height without Shoes	Underweight If You Weighed This or Less	Normal Weight Range*	Overweight If You Weighed This or More
4'10"	88	89-108	109
4'11"	91	92-112	113
5'	94	95-115	116
5'1"	99	100-121	122
5'2"	104	105-127	128
5'3"	108	109-132	133
5'4"	113	114-138	139
5'5"	118	119-144	145
5'6"	123	124-150	151
5'7"	127	128-155	156
5'8"	132	133-161	162
5'9"	137	138-167	168
5'10"	142	143-173	174
5'11"	146	147-178	179
6'	151	152-184	185

*Normal weight for "thin-boned" women will be closer to the lower end of this range. For "big-boned" women, it will be closer to the higher end.

Reprinted with permission from: Judith E. Brown. *Nutrition for Your Pregnancy.* University of Minnesota Press, 1983.

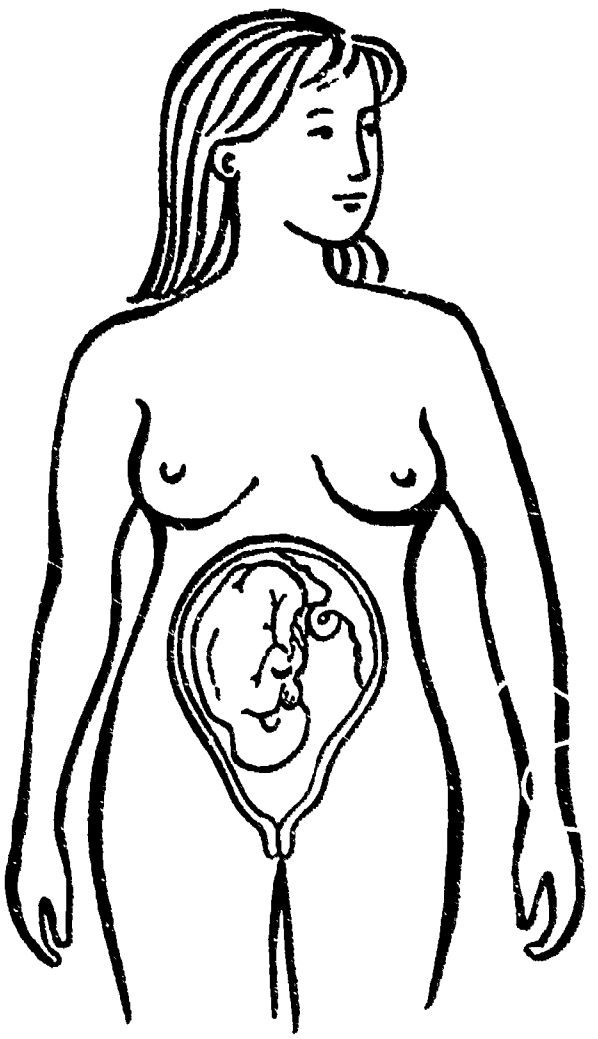
to gain more weight during the pregnancy to give your baby the extra nutrition he or she needs for the first year. You should gain 28 to 36 pounds, depending on how underweight you are before becoming pregnant. Table 3 shows whether your pre-pregnancy weight is considered underweight, normal weight, or overweight. Your nutrition advisor or health care provider can recommend an appropriate weight gain. How your weight gain is distributed is illustrated in figure 3.

Total recommended weight gain is often not as helpful as a weekly rate of gain. Most women gain 3 to 5 pounds during the first trimester (first 3 months) of pregnancy. During the second and third trimesters, a good rate of weight gain is about three-quarters of a pound to one

pound per week. Gaining too much weight (2 or more pounds per week) results in putting on too much body fat. This extra body fat produces an insulin-resistant effect which requires the body to produce more insulin to keep blood sugar levels normal. An inability to produce more insulin, as in gestational diabetes, causes your blood sugar levels to rise above acceptable levels. If weight gain has been excessive, often limiting weight gain to approximately three-quarters of a pound per week (3 pounds per month) can return blood sugar levels to normal. Fetal growth and development depend on proper nourishment and will be placed at risk by drastically reducing calories. However, you can limit weight gain by cutting back on excessive calories and by eating a nutritionally-sound diet that meets your needs and the needs of your baby. Remember that dieting and severely cutting back on weight gain may increase the risk of delivering prematurely. If blood sugar levels continue to go up and you are not gaining excessive weight or eating improperly, the safest therapy for the well-being of the fetus is insulin.

Occasionally, your weight may go up rapidly in the last trimester (after 28 weeks) and you may notice an increase in water retention, such as swelling in the feet, fingers, and face. If there is any question as to whether the rapid weight gain is due to eating too many calories or too much water retention, keeping records of how much food you eat and your exercise patterns at this time will be very helpful. A Food and Exercise Record Sheet is included at the end of this book. By examining your Food and Exercise Record Sheet, your nutrition advisor can help you determine which is causing the rapid weight gain. In addition, by examining your legs and body for signs of fluid retention, your physician can help you to determine the cause of your weight gain. If your weight gain is due to water retention, cutting back drastically on calories may actually cause more fluid retention. Bed rest and resting on your side will help you to lose the build-up of fluid. Limit your intake of salt (sodium chloride) and very salty foods, as they tend to contribute to water retention.

Marked fluid retention when combined with an increase in blood pressure and possibly protein in the urine are the symptoms of preeclampsia. This is a disorder of pregnancy that can be harmful to both the mother and baby. Inform your obstetrician of any rapid weight gain, especially if you are eating moderately and gaining more



WEIGHT IN POUNDS	
7.5-8.5	FETUS
7.5	STORES OF FAT & PROTEIN
4.0	BLOOD
2.7	TISSUE FLUIDS
2.0	UTERUS
1.8	AMNIOTIC FLUID
1.5	PLACENTA & UMBILICAL CORD
1.0	BREASTS
28-29.0 POUNDS	

FIGURE 3

Distribution of Weight Gain During Pregnancy

than 2 pounds per week. Should you develop preeclampsia, be especially careful to eat a well-balanced diet with adequate calories.

After being diagnosed as having gestational diabetes, many women notice a slower weight gain as they start cutting the various sources of sugar out of their diet. This seems to be harmless and lasts only 1 or 2 weeks. It may be that sweets were contributing a substantial amount of calories to the diet.

How should I eat during my pregnancy?

As with any pregnancy, it is important to eat the proper foods to meet the nutritional needs of the mother and fetus. An additional goal for women with gestational diabetes is to maintain a proper diet to keep blood sugars as normal as possible.

TABLE 4. Protein Equivalents

Food	Grams of Protein
1 cup 2% milk	8
1 cup plain nonfat yogurt	8
1 ounce American processed cheese	7
1 ounce low-fat cheese	7
1 tbsp. peanut butter	7
1/4 cup cottage cheese	7
1/2 cup cooked dried beans	7
1 slice whole wheat bread	3
1/2 cup flaked cereal, bran or corn	3

The daily need for calories increases by 300 calories during the second and third trimesters of pregnancy. If non-pregnant calorie intake was 1800 calories per day and weight gain was maintained, a calorie intake of 2100 calories per day is usual from 14 weeks until delivery. This is the equivalent of an additional 8 ounce glass of 2% milk and one-half of a sandwich (1 slice of bread, approximately 1 ounce of meat, and 1 teaspoon of margarine, mayonnaise, etc.) per day. The need for protein also increases during pregnancy. Make sure your diet includes foods high in protein, but not high in fat (table 4). Most vitamins and minerals are also needed in larger amounts during pregnancy. This can be attained by increasing dairy products, especially those low in fat, and making sure you include whole grain cereals and breads, as well as fruits and vegetables in your diet each day. To make sure you get enough folate (a B vitamin critical during pregnancy) and iron, your obstetrician will probably recommend a prenatal vitamin. Prenatal vitamins do not replace a good diet; they merely help you to get the nutrients you need. To absorb the most iron from your prenatal vitamin, take it at night before going to bed, or in the morning on an empty stomach.

The Daily Food Guide (table 5) serves as a guideline for food sources that provide important vitamins and minerals, as well as carbohydrates, protein, and fiber during pregnancy. The recommended minimal servings per day appear in parentheses after each food group listed. This guide emphasizes foods that are low in fat and in sugar (discussed later).

TABLE 5. Daily Food Guide *(Each item equals one serving)*

Milk and Milk Products *(4 Servings Per Day)*	1 cup milk, skim or low-fat 1/3 cup powdered non-fat milk 1 cup reconstituted powdered non-fat milk 1½ oz. low-fat cheese* (no more than 6 grams of fat per ounce) 1 cup low-fat yogurt**	(high protein calcium, vitamin D)
Meat, Poultry, Fish, and Meat Substitutes *(5-6 Servings Per Day)*	1 oz. cooked poultry, fish, or lean meat (beef, lamb, pork) 1 tbsp. peanut butter 1 egg 1/4 cup low-fat cottage cheese 1/2 cup cooked dried beans or lentils	(high protein, B vitamins, iron)
Breads, Cereals, and Other Starches *(5-6 Servings Per Day)*	1 slice whole grain bread 5 crackers 1 muffin, biscuit, pancake, or waffle 3/4 cup dry cereal, unsweetened 1/2 cup pasta (macaroni, spaghetti), rice, mashed potatoes, or cooked cereal 1/3 cup sweet potatoes or yams 1/2 cup cooked dried beans or lentils 1/2 bagel, 1/2 english muffin, or 1/2 flour tortilla 1 small baked potato 2 taco shells	(high complex carbohydrates) (emphasize whole grains, or use fortified or enriched) (a good source of protein, B-vitamins, fiber and minerals)

Fruit *(2 servings per day)*	1/2 cup fresh fruit. 1/2 banana, or 1 medium-sized fruit (apple, orange) 1/2 cup, orange, grapefruit, or other juice fortified with vitamin C 1/2 medium-sized grapefruit 1 cup strawberries 1/2 cup fresh apricots, nectarines, purple plums, cantaloup, or 4 halves dried apricots (vitamin A source)	(fresh fruit provides fiber) (include one vitamin C source daily)
Vegetables*** *(2 servings per day)*	1/2 cup cooked or 1 cup raw: broccoli, spinach, carrots, (vitamin A source) 1/3 cup mixed vegetables	(include good vitamin A sources at least every other day)
Fats	1 tsp. butter or margarine 1 tsp. oil or .nayonnaise 1 tbsp. regular salad dressing 2 tbsp. low-calorie salad dressing 1/4 cup nuts or seeds	

*1 oz. low-fat cheese can also be used as 1 serving from the Meat, Poultry, Fish, and Meat Substitutes group if sufficient calcium is already being provided from 4 servings.

**This refers to plain yogurt. Commercially fruited yogurt contains a lot of added sugar.

***Starchy vegetables such as corn, peas, and potatoes are included in Breads, Cereals, and Other Starches list.

The food guide is divided into six groups: milk and milk products; meat, poultry, fish, and meat substitutes; breads, cereals, and other starches; fruits; vegetables; and fats. Each group provides its own combination of vitamins, minerals, and other nutrients which play an important part in nutrition during pregnancy (figure 4). Omitting the foods from one group will leave your diet inadequate in other nutrients. Plan your meals using a variety of foods within each food group, in the amounts recommended, and you'll be most likely to get all the vitamins, minerals, and other nutrients the fetus needs for growth and development.

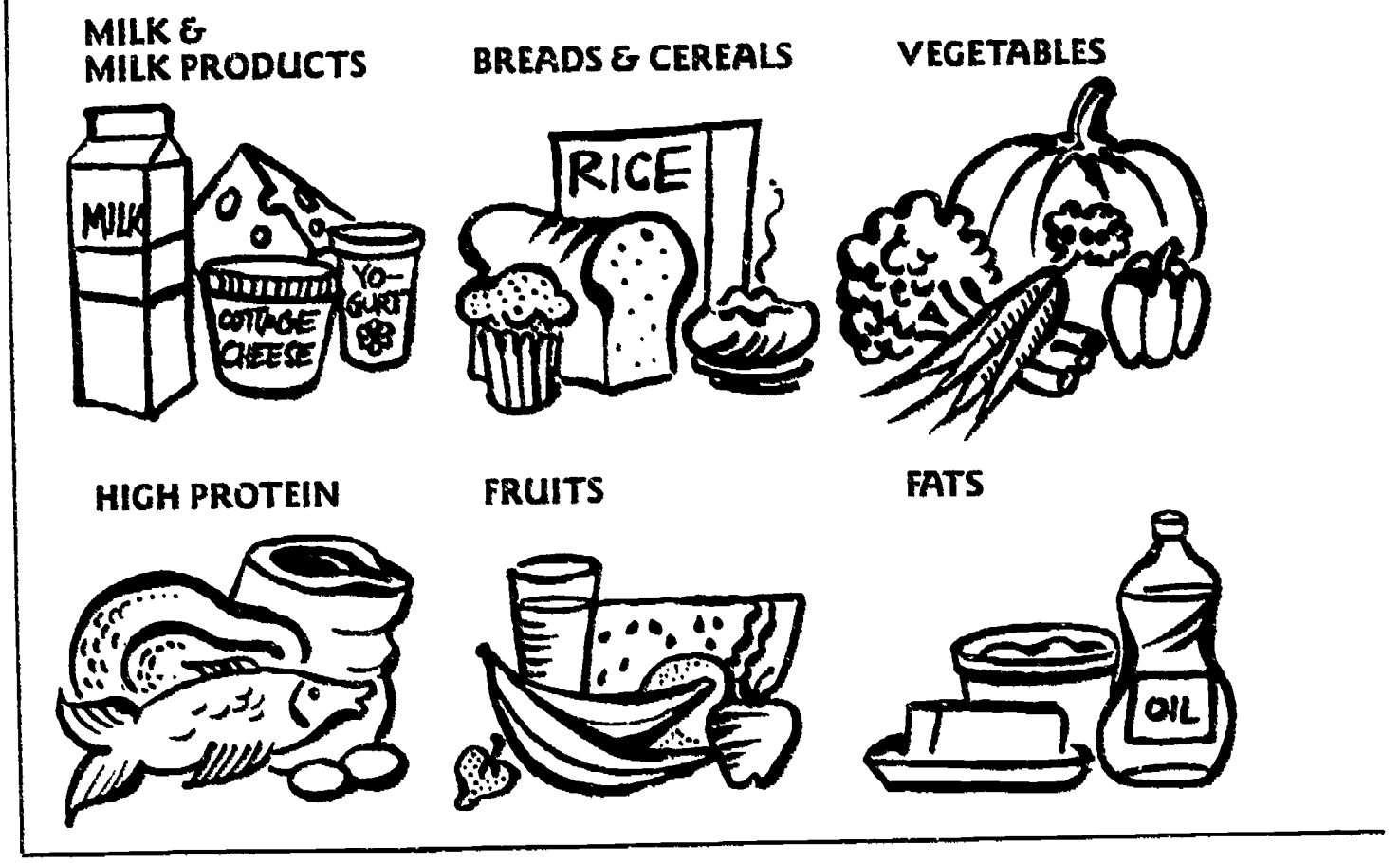


FIGURE 4

The Six Food Groups

Other Nutritional and Non-Nutritional Considerations:

Alcohol. There is no known safe level of alcohol to allow during pregnancy. Daily heavy alcohol intake causes severe defects in development of the body and brain of the fetus, called Fetal Alcohol Syndrome. Even moderate drinking is associated with delayed fetal growth, spontaneous abortions, and lowered birth weight in babies. The Surgeon General's office warns: "Women who are pregnant or even considering pregnancy should avoid alcohol completely and should be aware of the alcohol content of food and drugs."

Salt. Salt restriction is no longer routinely advised during pregnancy. Recent research shows that during pregnancy the body needs salt to help provide the proper fluid balance. Your health care provider may recommend that you use salt in moderation.

Caffeine Studies conflict on the potential danger of caffeine to the fetus. Caffeine is found primarily in coffee, tea, and some sodas (table 6). Moderation is recommended. Talk to your doctor or other health professional about the maximum amount of caffeine recommended.

TABLE 6. Caffeine Comparisons

Food	Serving	Amount of Caffeine
Regular coffee	8 oz.	80-200 mg.
Instant coffee	8 oz.	60-100 mg.
Decaffeinated coffee	8 oz.	3-5 mg.
Tea	8 oz.	60-65 mg.
Carbonated drinks, e.g., colas	12 oz.	30-65 mg.
Hot chocolate	8 oz.	13 mg.

Megavitamins. Megavitamins are defined as 10 times the Recommended Dietary Allowance* of vitamins and minerals and are not recommended for pregnant women. Although it is possible to get all of the necessary nutrients from food alone, your doctor may prescribe some prenatal vitamins and minerals. If taken regularly, along with a balanced diet, you will be getting all the vitamins and minerals needed during your pregnancy.

Smoking. Research has shown without question that smoking during pregnancy increases the risk of fetal death and preterm delivery, impairs fetal growth, and can lead to low birth weight. It is best to stop smoking entirely and permanently, or at the very least, to cut back drastically on the number of cigarettes you smoke.

What foods patterns help keep blood sugar levels normal?

The following outlines food patterns which help to keep blood sugar levels within an acceptable range.

Avoid sugar and foods high in sugar. Most women with gestational diabetes, just like those without diabetes, have a desire for something sweet in their diet. In pregnant women, sugar is rapidly absorbed into the blood and requires a larger release of insulin to maintain normal blood sugar levels. Without the larger release of insulin, blood sugar levels will increase excessively when you eat sugar-containing foods.

There are many forms of sugar such as table sugar, honey, brown sugar, corn syrup, maple syrup, turbinado sugar, high fructose corn

*Dietary allowances established by the National Academy of Sciences-National Research Council.

syrup, and molasses. Generally, food that ends in "ose" is a sugar (e.g., sucrose, dextrose, and glucose).

Foods that usually contain high amounts of sugar include pies, cakes, cookies, ice cream, candy, soft drinks, fruit drinks, fruit packed in syrup, commercially fruited yogurt, jams, jelly, doughnuts, and sweet rolls. Many of these foods are high in fat as well.

Be sure to check the list of ingredients on food products. Ingredients are listed in order of amount. If an ingredient is first on the list, it is present in the highest amount. If some type of sugar is listed first, second, or third on the list of ingredients, the product should be avoided. If sugar is further down, fourth, fifth, or sixth, it probably will not cause your blood sugar levels to go up excessively.

Fruit juices should only be taken with a meal and limited to 6 ounces. Tomato juice is a good choice because it is low in sugar. Six ounces of most other juice (apple, grapefruit, orange) with no sugar added still contain approximately 4 to 5 teaspoons of sugar. However, these do not contain much of the fiber of a piece of fruit which normally would act to slow the absorption of sugar into the blood. If you drink juice frequently to quench your thirst during the day, a high blood sugar level may result. Use only whole fruit for snacks.

To help with the occasional sweet tooth that we all have, artificial sweeteners may be used in foods. Aspartame has been extensively tested for safety. Use during pregnancy has been approved by the Food and Drug Administration and by the American Medical Association's Review Board. However, aspartame has not been tested for long-term safety and has not been on the market very long. It may be best to avoid its use until more tests have been done.

Saccharin is not advised during pregnancy. Likewise, use of mannitol, xylitol, sorbitol, or other artificial sweeteners is not recommended until further research is done.

Fructose is a special type of sugar that is slowly absorbed into the system. A small amount of fructose can be used if your blood sugar levels are within normal range. However, fructose still has 4 calories per gram, as much as table sugar. High fructose corn syrup is part fructose and part corn syrup, making it very similar to table sugar in composition. It will raise blood sugar levels and should definitely be avoided.

Emphasize the use of complex carbohydrates. These include vegetables, cereal, grains, beans, peas, and other starchy foods. A well-balanced diet with plenty of fiber provided by

vegetables, dried beans, cereals, and other starchy foods decreases the amount of insulin your body needs to keep blood sugars within a normal range. Anything that decreases the need for insulin is beneficial. The American Diabetes Association recommends that at least one-half of your calories come from complex carbohydrates. Starchy foods include pasta, rice, grains, cereals, crackers, bread, potatoes, dried beans, peas, and legumes. Also, contrary to popular belief, carbohydrates are not highly fattening when eaten in moderate amounts and without the rich sauces and toppings often added.

Emphasize foods high in dietary fiber. Fiber is the edible portion of foods of plant origin that is not digested (e.g., skins, membranes, seeds, bran). Foods with a high fiber content include whole grain cereals and breads, fruits, vegetables, and legumes (dried peas and beans). Fiber aids digestion and helps prevent constipation. The fiber found in fruits, vegetables, and legumes also helps keep your blood sugar level from becoming too high without requiring extra insulin.

Keep your diet low in fat. Some fat is needed to help with the absorption of certain vitamins and to provide the essential fatty acids necessary for fetal growth. A diet which is high in fat causes the insulin to react in a less efficient manner, necessitating more insulin to keep blood sugar levels within normal range. Foods high in saturated fats such as fatty meats, butter, bacon, cream (light, coffee, sour cream, etc.), and whole milk cheeses are likely to be high in total fat. Most foods with saturated fat are also high in cholesterol because they are fats from animal origin. However, foods such as crackers made with coconut, palm, or palm kernel oil can be high in saturated fats as well. Read labels carefully. Unsaturated fats are found in foods such as fish, margarine and vegetable oils. Keep your use of salad dressings to a minimum and whenever possible use those prepared with olive oil. To help keep the diet lower in fat, avoid adding extra fats such as rich sauces and creamy desserts, and bake or broil foods instead of frying them. Replacing fatty foods with those high in complex carbohydrates is also helpful.

Include a bedtime snack that is a good source of protein and complex carbohydrates. Women with gestational diabetes have a tendency toward lower than normal blood sugar levels during the night. This causes the body to increase its utilization of fats as a fuel source. As fat is used, ketones (discussed later) are produced as a by-product of the breakdown of fats, and in large amounts, may be

harmful to the fetus. This can be prevented by having a bedtime snack that provides protein and complex carbohydrates such as starchy foods. Starch will stabilize your blood sugar level in the early night, while protein acts as a long-acting stabilizer. Examples of a bedtime snack are:

1 oz. American-processed cheese + 5 crackers

1/2 chicken sandwich on whole wheat bread

3 cups unbuttered popcorn + 1/4 cup nuts

If you need to take insulin, a bedtime snack is critical and you should not omit it. When taken by injection, insulin acts to lower blood sugar level, even during the night when meals are not eaten. A bedtime snack is protective against low blood sugars while sleeping or upon arising. If a bedtime snack causes heartburn, sleep with your head raised on pillows, and be careful that you are not eating too large a bedtime snack.

How do I plan meals?

A registered dietitian or qualified nutritionist can help you plan a meal pattern that is right for you. Most women with gestational diabetes need three meals and a bedtime snack each day. It is unwise for anyone who is pregnant to go long periods of time (greater than 5 hours) without eating, as this will produce ketones. Extra snacks are necessary if your schedule results in a long time between meals. Blood sugars will be easier to keep in the normal range if meal times and amounts (total calories) are evenly spaced. It's more likely that a higher blood sugar will result if the majority of calories are eaten at dinner, than if they are distributed more evenly throughout the day. If insulin injections prove necessary, the time at which meals are eaten and the amounts eaten should be approximately the same from day to day. Do not skip meals and snacks, as this often results in hypoglycemia (low blood sugar), which may be harmful to the fetus and makes you feel irritable, shaky, or may result in a headache.

Sample Menu—2000 Calories

This diet is planned for women whose normal non-pregnant weight should be 130-135 lbs. For women who weigh less than 130 before pregnancy, the diet should contain fewer calories. Women who are overweight are at higher risk for gestational diabetes. Your health care provider can discuss this and help you make necessary changes.

BREAKFAST

1/2 grapefruit
3/4 cup oatmeal, cooked
1 tsp. raisins
1 cup 2% milk
1 whole wheat English muffin
1 tsp. margarine

LUNCH

Salad with:
- 1 cup romaine lettuce
- 1/2 cup kidney beans, cooked
- 1/2 fresh tomato

1 oz. part skim mozzarella cheese
2 tbsp. low-calorie Italian dressing
1 bran muffin
1/2 cup cantaloupe chunks

AFTERNOON SNACK

2 rice cakes
6 oz. low-fat yogurt, plain
1/2 cup blueberries

DINNER

3/4 cup vegetable soup with
- 1/4 cup cooked barley

3 oz. chicken, without skin
1 baked potato
1/2 cup cooked broccoli
1 piece whole wheat bread
1 tbsp. margarine
1 fresh peach

BEDTIME SNACK

1 apple
2 cups popcorn, plain
1/4 cup peanuts

What can be done to slow weight gain during pregnancy?

Gaining too much weight during pregnancy will make blood sugar levels higher than normal for women with gestational diabetes. Yet, for many pregnant women it is very difficult to gain weight slowly and still get all of the recommended nutrients. Luckily, fat, which is high in calories (9 calories per gram), is needed in only small amounts during pregnancy. Carbohydrates and protein, in contrast to fat, provide only 4 calories per gram. To cut calories without depriving the fetus of any necessary nutritional factors, it is best to avoid fats and fatty foods.

✔ Avoid high-fat meats. Choose lean cuts of beef, pork, and lamb. Emphasize more fish and poultry (without the skin).

✔ Avoid frying meat, fish, or poultry in added oil, shortening, or lard. Bake, broil, or roast instead.

✔ Avoid foods fried in oil such as chips, french fries, and doughnuts. Substitute pretzels, unbuttered popcorn, or breadsticks instead.

✔ Avoid using cream sauces and butter sauces, as well as salt pork for seasoning on vegetables. Season with herbs instead.

✔ Avoid using the fat drippings from meat or poultry for gravy. Use broth or bouillon instead and thicken with cornstarch.

✔ Avoid using mayonnaise or oil for salads. Use vinegar, lemon juice, or low-calorie salad dressings instead.

To help reduce calories choose low-fat dairy products. During pregnancy you need 1200 mg calcium daily to build the fetal skeleton without drawing from maternal calcium stores. Table 7 points out foods in which the calcium content is almost the same, yet the calories are not due to the difference in fat content.

The difference between 600 calories and 340 calories is only 260 calories and may seem insignificant. Yet, if your diet is cut by 260 calories daily for 1 week, your weight gain slows down by approximately 1/2 pound per week. In other words, instead of gaining 1½ pounds per week you will only gain 1 pound per week.

If cheese is a part of your daily diet, use low-fat cheeses such as low-fat cottage cheese, Neufchatel, mozzarella, farmers, and pot cheese. Avoid using cream cheese, as it has little protein and most of its calories come from fat.

Even though pregnancy can be a very hectic time, with little time for meal preparation, eat less and less often at "fast food" restaurants. Studies have shown that some foods from fast food restaurants average 40 to 60 percent of their calories from fat, and are quite high in calories.* For example, chicken and fish that are coated with batter and deep-fried in fat may contain more fat and calories than a hamburger or roast beef sandwich.

Fast Food Facts: Nutritive and Exchange Values for Fast Food Restaurants. Marion J. Franz. International Diabetes Center. Minneapolis, Minnesota. 1987. 54 pp.

TABLE 7. Calorie Comparisons

Food	Calories
4-8 oz. glasses whole milk	600
4-8 oz. glasses 2% milk	480
4-8 oz. glasses skim milk	340
2-8 oz. glasses whole milk plus 3 oz. American processed cheese	600
2-8 oz. glasses 2% milk plus 3 oz. American processed cheese	540
2-8 oz. glasses skim milk plus 3 oz. American processed cheese	470

Go lightly when using butter and margarine. Adding only an extra three pats of butter or margarine (same calories) daily could add an extra pound of weight gain next month. It may be better to emphasize the use of foods rich in complex carbohydrates that don't use butter, margarine, or cream sauce to make them palatable. Many people find rice, noodles, and spaghetti tasty without a lot of butter. Use a variety of spices and herbs (such as curry, garlic, and parsley) to flavor rice and tomato sauce to flavor pasta without additional fats.

It is also a good idea to eat small amounts frequently, thereby keeping the edge off your appetite. This will assist your "self-control" in avoiding large portions of food that you should not have. Avoid skipping meals or trying to cut back drastically on breakfast or lunch. It will leave you too hungry for the next meal to exercise any control. Your doctor or dietitian can help you determine how you can cut extra calories.

You may find it helpful to keep food records of what you eat, as most of us tend to forget or not realize the extent of our snacking. Recording everything you eat or drink tends to be a sobering and instructive experience. A Food and Exercise Record Sheet is included at the end of this book.

Be careful to maintain a weight gain of at least 1/2 pound per week, over several weeks, if you are in the second trimester (14 weeks or more of gestation). Cutting back more than this may increase the risk of having a low-birth-weight infant.

Is breast-feeding recommended?

Breast-feeding is strongly encouraged. For most women this represents the easiest way back to pre-pregnancy weight after delivery. The body draws on the calories stored during the first part of pregnancy to use in milk production. Approximately 800 calories per day are used during the first 3 months of milk production, and even more during the next 3 months. By 6 weeks after delivery, women who breast-feed usually have lost 4 pounds more than women who bottle-feed. This can be a very important factor, as it is strongly recommended that women with gestational diabetes return to their desirable body weight 4 to 5 months postpartum. As previously mentioned, maintaining a weight appropriate for your height and frame may reduce the risk of developing diabetes later in life.

In addition, breast-feeding has many advantages for your baby. Protection from infection and allergies are transferred to the baby through breast milk. This milk is also easier to digest than formula, and its minerals are better absorbed than those in formula.

Should I exercise?

A daily exercise program is an important part of a healthy pregnancy. Daily exercise helps you feel better and reduces stress. In addition, being physically fit protects against back pain, and maintains muscle tone, strength, and endurance. For women with gestational diabetes, exercise is especially important.

✔ Regular exercise increases the efficiency or potency of your body's own insulin. This may allow you to keep your blood sugar levels in the normal range while using less insulin.

✔ Moderate exercise also helps blunt your appetite, helping you to keep your weight gain down to normal levels. Maintaining the correct weight gain is very important in preventing high blood sugar levels.

Talk with your doctor about what exercise program is right for you. Your doctor can advise you about limitations, warning signs, and any special considerations. Generally, you can continue any exercise program or sport you participated in prior to pregnancy. Use caution, however, and avoid sports or exercises where you might fall, or that involve jolting. Pre-pregnancy bicycling, jogging, and cross-country skiing are good exercises to continue during pregnancy. If you plan to

start an exercise program during pregnancy, talk to your doctor before beginning and start slowly. Vigorous walking is good for women who need to start exercising and have not been active before pregnancy.

Exercising frequently, 4 to 5 days per week, is necessary to get the "blood sugar lowering" advantages of an exercise program. Don't omit a warm-up period of 5 to 10 minutes and a cool-down period of 5 to 10 minutes. Always stop exercising if you feel pain, dizziness, shortness of breath, faintness, palpitations, back or pelvic pain, or experience vaginal bleeding. Also, avoid vigorous exercise in hot, humid weather or if you have a fever. It is important to prevent dehydration during exercise, especially during pregnancy. The American College of Obstetricians and Gynecologists (ACOG) recommends drinking fluids prior to and after exercise, and if necessary, during the activity to prevent dehydration.

An ACOG report* issued in 1985, warned that target heart rates for pregnant and postpartum women should be set approximately 25 to 30 percent lower than rates for non-pregnant women. It may be that exercising too vigorously will direct blood flow away from the uterus and fetus. ACOG recommends that pregnant women measure their heart rate during activity and that maternal heart rate not exceed 140 beats per minute.

If you need to be on insulin during your pregnancy, take a few precautions. Because both insulin and exercise lower blood sugar levels, the combination can result in hypoglycemia or low blood sugar. You need to be aware that this is a potential problem, and you should be familiar with the symptoms of hypoglycemia (confusion, extreme hunger, blurry vision, shakiness, sweating). When exercising, take along sugar in the form of hard, sugar-sweetened candies just in case your blood sugar becomes too low. When on insulin, you should always carry some form of sugar for potential episodes of hypoglycemia.

It may be necessary for you to eat small snacks between meals if the exercise results in low blood sugar levels.

✔ One serving of fruit will keep blood sugars normal for most short-term activities (approximately 30 minutes).

✔ One serving of fruit plus a serving of starch will be enough for activities that last longer (60 minutes or more).

*Home Exercise Program: Exercise During Pregnancy and the Postnatal Period. American College of Obstetricians and Gynecologists. May 1985. 6 pp.

If you exercise right after a meal, eat the snack after the exercise. If the exercise is 2 hours or more after a meal, eat the snack before the exercise.

What happens if diet and exercise fail to control my blood sugars?

If your blood sugars tend to go over the acceptable levels (105 mg/dl or below for fasting, 120 mg/dl or below 2 hours after a meal) you may need to take insulin injections. Insulin is a protein and would be digested like any other protein in food if it were given orally. The needles used to inject insulin are extremely fine, so there is little discomfort. If insulin injections are necessary, you will be taught how to fill the syringe and how to do the injections yourself.

Your physician will calculate the amount of insulin needed to keep blood sugar levels within the normal range. It is very likely that the amount or dosage of insulin needed to keep your levels of blood sugar normal will increase as your pregnancy advances. This does not mean your gestational diabetes is getting worse. As any healthy pregnancy progresses, the placenta will grow and produce progressively higher levels of contra-insulin hormones. As a result you will likely need to inject more insulin to overcome their effect. Some women may even require two injections each day. This does not imply anything about the severity of the problem or the outcome of the pregnancy. The goal is to maintain normal blood sugar levels with whatever dosage of insulin is needed.

Can my blood sugar level go too low, and if so, what do I do?

Occasionally, your blood sugar level may get too low if you are taking insulin. This can happen if you delay a meal or exercise more than usual, especially at the time your insulin is working at its peak. This low blood sugar is called "hypoglycemia" or an "insulin reaction." This is a medical emergency and should be promptly treated, never ignored.

The symptoms of insulin reaction vary from sweating, shakiness, or dizziness to feeling faint, disoriented, or a tingling sensation. Remember, if you take insulin injections, you need to keep some form

of sugar-sweetened candy in your purse, at home, at work, and in your car. In case of an episode of hypoglycemia, you will be prepared to treat it immediately. Be sure to eat something more substantial afterward. Also, report any insulin reactions or high blood sugar levels to your doctor right away in case an adjustment in your treatment needs to be made.

As you can see from reading this booklet, extra care, work, and commitment on the part of you and your spouse or partner are required to provide the special medical care necessary. Don't worry if you occasionally go off your diet or miss a planned exercise program. Your doctor and other health care professionals will work along with you to make sure you receive the specialized care that has resulted in dramatically improved pregnancy outcome.

An ounce of prevention is worth a pound of cure! Eat as directed. Exercise as directed. Monitor as directed. Do these things and you are doing your part toward a happy, healthy pregnancy.

Glossary

Carbohydates—A type of food, usually from plants versus animals. Carbohydrates include simple carbohydrates (sugar, fruit) and complex carbohydrates (vegetables, starches). One of three nutrients that supply calories to the body. (See fat and protein.)

Diabetes mellitus—A disorder that prevents the body from converting digested food into the energy needed for daily activities.

Fat—One of three nutrients that supply calories to the body. Included are vegetable oil, lard, margarine, butter, shortening, mayonnaise, and salad dressing. (See carbohydrates and protein.)

Gestational diabetes—A form of diabetes which begins during pregnancy and usually disappears following delivery.

Glucose tolerance test—A blood test used to make the diagnosis of diabetes, including gestational diabetes. After drinking a liquid containing 100 grams of glucose, blood is drawn every hour for 3 hours. Two or more abnormally elevated blood sugar levels indicate gestational diabetes.

Health care providers—Health care professionals who specialize in the management of certain conditions. In the case of gestational diabetes, the health care providers may include an obstetrician, an internist, a diabetologist, a registered dietitian, a qualified nutritionist, a diabetes educator, and a neonatologist.

Hormone—A chemical substance produced within the body which has a "regulatory" effect on the activity of a certain tissue in the body. Estrogen, cortisol, and human placental lactogen are hormones produced by the placenta which cause changes in the mother's body to prepare her for the pregnancy and birth. These hormones also have a contra-insulin effect.

Hypoglycemia—A condition where the blood sugar is lower than normal. This is a dangerous condition and should be avoided or treated rapidly.

Insulin—A hormone manufactured by the pancreas. Insulin helps glucose leave the blood and enter the muscles and other tissues of the body.

Insulin-resistance—A partial blocking of the effect of insulin. This interference can be caused by hormones produced by the placenta or by excessive weight gain.

Ketone—A break-down product of fat that accumulates in the blood as a result of inadequate insulin or inadequate calorie intake.

Legumes—Beans, peas, and lentils which supply fiber and nutrients and are high in vegetable protein.

Macrosomia—A term meaning "large body." This refers to a baby that is considerably larger than normal. This condition occurs when the mother's blood sugar levels have been higher than normal during the pregnancy. This is a preventable complication of gestational diabetes.

Nutrients—Proteins, carbohydrates, fats, vitamins, and minerals. These are provided by food and are necessary for growth and the maintenance of life.

Pancreas—A long gland that lies behind the stomach. The pancreas manufactures insulin and digestive enzymes.

Placenta—A special tissue that joins the mother and fetus. It provides hormones necessary for a successful pregnancy, and supplies the fetus with water and nutrients (food) from the mother's blood.

Protein—A substance found in many parts of the body that helps the body to resist disease. Protein often, but not always, comes from animal products. High protein foods include meat, poultry, fish, eggs, hard cheese, cottage cheese, yogurt, and milk. Non-animal sources of protein are nuts and seeds, peanut butter, legumes, whole grains, and tofu. One of three nutrients that supply calories to the body. (See carbohydrates and fat.)

Recommended Dietary Allowances—Recommendations for daily intake of specific nutrients for groups of healthy individuals. There is a specific recommendation for pregnant and for lactating women. These recommendations are set by the Food and Nutrition Board of the National Research Council of the National Academy of Science.

Self (or home) blood glucose monitoring—A process by which blood sugars can be determined at home by pricking the finger, putting a drop of blood on a chemically treated test strip, and comparing the color changes to a chart.

Trimester—A period of 3 months. Pregnancy is divided into three trimesters. The first trimester is 0-13 weeks gestation. The second trimester is 14-26 weeks gestation. The third trimester is 27 weeks gestation until birth.

Self Blood Glucose Monitoring Diary

DATE	Before eating **am**	2 hr. after **breakfast**	2 hr. after **lunch**	2 hr. after **dinner**	Amount of **insulin**	NOTES

Food and Exercise Record Sheet

The following chart is intended to help you and your health care providers keep track of your food and exercise habits and enable you to plan a regimen tailored to your particular needs.

1) Write down everything you eat or drink.

2) Write down items added to foods (e.g., sugar, butter).

3) Write down how your food was prepared (e.g., broiled, fried, baked).

4) Write down the amount you eat in household measures (e.g., 1/2 cup or 2 tbsp.).

5) Write down any exercising you have done, type of exercise, and time spent.

DAY	TIME	FOOD AND TYPE OF PREPARATION	AMOUNT	EXERCISE