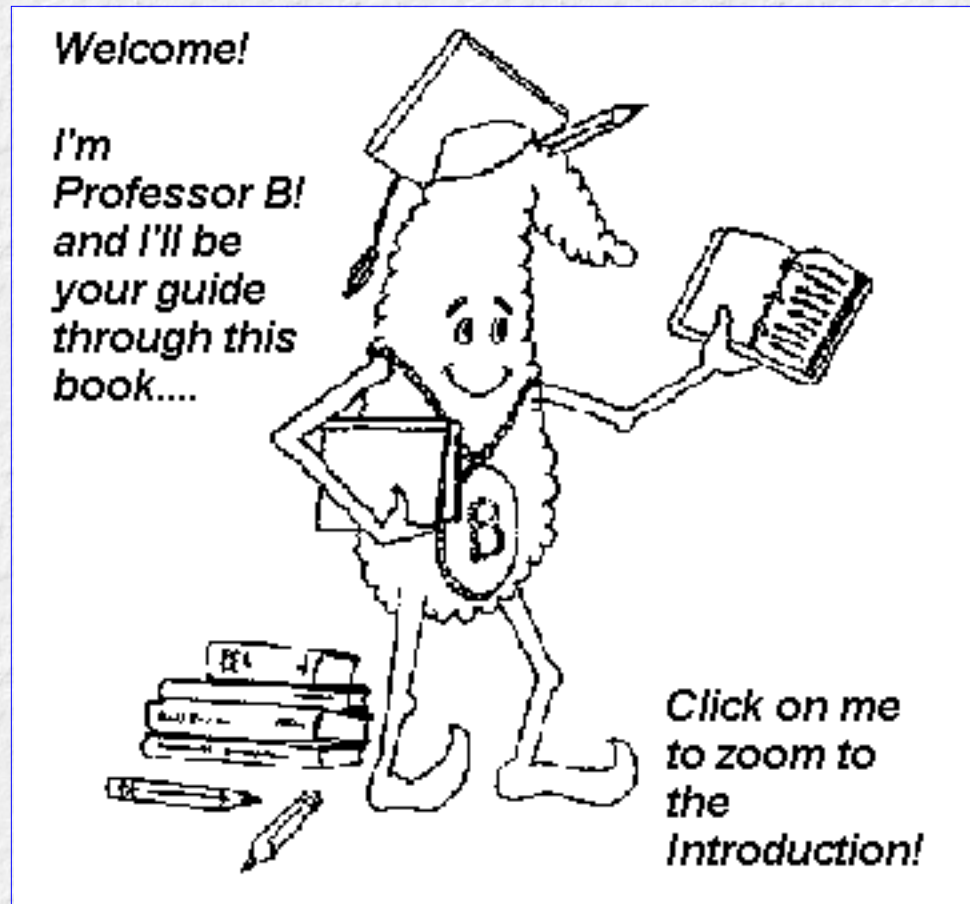


THE HEALING HANDBOOK for PERSONS WITH DIABETES

Table of Contents

- [Title Page](#)
- [Introduction](#)
- [Chapter 1: What is Diabetes?](#)
- [Chapter 2: Coping with Diabetes](#)
- [Chapter 3: Insulin Dependent Diabetes Mellitus](#)
- [Chapter 4: Non-Insulin Dependent Diabetes Mellitus \(NIDDM\)](#)
- [Chapter 5: Monitoring](#)
- [Chapter 6: Diet](#)
- [Chapter 7: Exercise](#)
- [Chapter 8: Insulin](#)
- [Chapter 9: Oral Medications](#)
- [Chapter 10: Sick Day Management](#)
- [Chapter 11: Skin and Foot Care](#)
- [Chapter 12: Complications](#)
- [Chapter 13: Diabetes and the Family](#)
- [Chapter 14: Traveling](#)
- [Chapter 15: Research](#)
- [Additional Online Information for Persons with Diabetes](#)
- [Glossary](#)



This page was last revised on January 1, 1998.

[[Title Page](#) | [Introduction](#)]

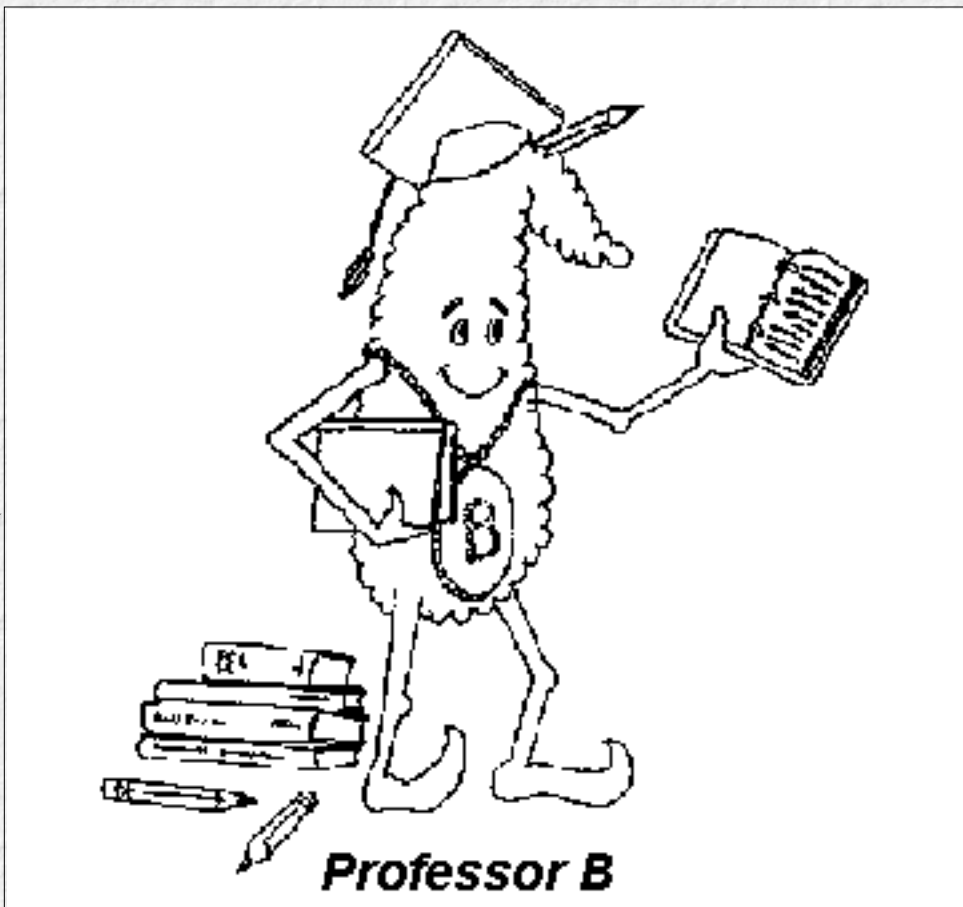
The Healing Handbook *for* Persons with Diabetes

[[Table of contents](#) | [Chapter 1](#)]

Introduction

- You have diabetes. You also have lots of questions.
- Why me?
- Can I still lead a normal life?
- How will I take care of myself?
- [Table of contents](#)

It's time to begin learning about diabetes and how you can live with it. You're going back to school. This time you won't be studying math, science, history, or Latin, though you will learn something about each of these as they relate to diabetes. You'll be studying diabetes-what causes it, how you can adapt your life style to it, and how to care for yourself, now that you have it. And you'll be studying life, your life with diabetes.



This handbook is your basic text. It holds the answers to many of your questions, and it's filled with advice to help you manage your diabetes and still do almost everything you did before. Well-meaning people may offer stories, opinions, and advice that could be confusing. Get the facts from your health care-providers and **Professor B**. Professor B is your instructor for this course. He's shaped like the pancreas, and he wears the letter B to remind you about the beta cells in the pancreas, where insulin is produced in people who do not have diabetes. In people with diabetes, the beta cells either malfunction, or they are destroyed.

Here's a sample of what you'll find in this handbook:


- [Chapter 1 \(What is Diabetes?\)](#) contains diabetes definitions, causes, and history, as well as an overview of insulin, the pancreas, and kidney functioning.
- [Chapter 2 \(Coping with Diabetes\)](#) offers practical advice for accepting your diabetes emotionally and living with it day to day. Plus Your Guide to Better Diabetes Care.
- [Chapter 3 \(Insulin Dependent Diabetes Mellitus\)](#) is a description of Type I diabetes. If you've been diagnosed with this types of diabetes, you'll want to pay special attention to this chapter.
- [Chapter 4 \(Non-insulin Dependent Diabetes Mellitus\)](#) is a description of Type II diabetes. If you've been diagnosed with this type of diabetes, you'll want to pay special attention to this chapter.
- [Chapter 5 \(Monitoring\)](#) explains how you can keep track of your blood sugar level to help control

your diabetes. It's important that you read this chapter no matter which kind of diabetes you have.

- [Chapter 6 \(Diet\)](#) contains information everyone with diabetes needs on a vital component of diabetes control. You'll learn how you can plan meals at home or when dining at a restaurant or a friend's home.
- [Chapter 7 \(Exercise\)](#) contains advice on exercise programs for people with diabetes. Whether you have Type I or Type II diabetes, exercise can help keep you healthy.
- [Chapter 8 \(Insulin\)](#) teaches you about types of insulin, how to buy and store insulin, how to inject insulin, and how to avoid and treat insulin reactions. If you're not injecting insulin, you can skip this chapter.
- [Chapter 9 \(Oral Medications\)](#) contains information for people who take oral diabetes pills. If you do not take oral diabetes pills, you can skip this chapter.
- [Chapter 10 \(Sick Day Management\)](#) is a guide to diabetes control during illness. Read this chapter carefully so that you know how to cope with illness before you get sick.
- [Chapter 11 \(Skin and Foot Care\)](#) lists easy things you can do to avoid some of the most common problems people with diabetes experience.
- [Chapter 12 \(Complications\)](#) describes complications associated with diabetes and offers advice on how you can avoid them.
- [Chapter 13 \(Diabetes and the Family\)](#) presents information and advice for families coping with diabetes. Part I of this chapter explains the special concerns of pregnant women with diabetes. Part II offers advice to parents of children with diabetes.
- [Chapter 14 \(Traveling\)](#) offers tips that help ensure safe, healthy trips for people with diabetes.
- [Chapter 15 \(Research\)](#) highlights current research activities into the causes and prevention of and potential treatments for diabetes.
- The [Glossary](#) defines many of the medical terms that persons with diabetes need to know.

The chapters are constructed to help you learn about your diabetes now, and also to make information available when you need it. Some of the chapters end with a series of questions and answers that may help clear up confusion about information in the chapter. Several chapters lists products for people with diabetes or refer to other publications on diabetes. Your health-care provider can advise you on products and help you locate publications. Finally, there is a glossary of diabetes-related terms at the end of the handbook. The glossary is a useful resource while you are learning about diabetes.

Read this handbook carefully. Take notes if it helps you learn. Be sure to write down questions that come up as you are reading, and go over them with your diabetes educator. The more you know about your diabetes, the better control you will achieve. Better control means good health and a long life.

 Remember that the care of diabetes is a team effort involving you, your physician, and the diabetes education staff where you receive your medical care. This handbook cannot-and was not meant to-replace this team effort.

This handbook embodies the approach of the diabetes care team at the University of Massachusetts Medical Center. Different diabetes care teams may approach some aspects of diabetes care in ways

that differ from those in this handbook. While most teams are in close agreement regarding the GENERAL PRINCIPLES of diabetes care, they may differ in the DETAILS. There can be more than one "right" way to approach a specific issue in diabetes management.

Always remain in touch with your diabetes care team, and bring any questions you may have about the materials in this handbook to their attention!

Copyright 1995, 1996, 1997, 1998 Ruth E. Lundstrom, R.N., John P. Mordes, M.D., Aldo A. Rossini, M.D. All rights reserved.

Feedback: [Dr. Aldo Rossini](#)

This page was last revised on January 1, 1998.

[[Table of Contents](#) | [Chapter 1](#)]

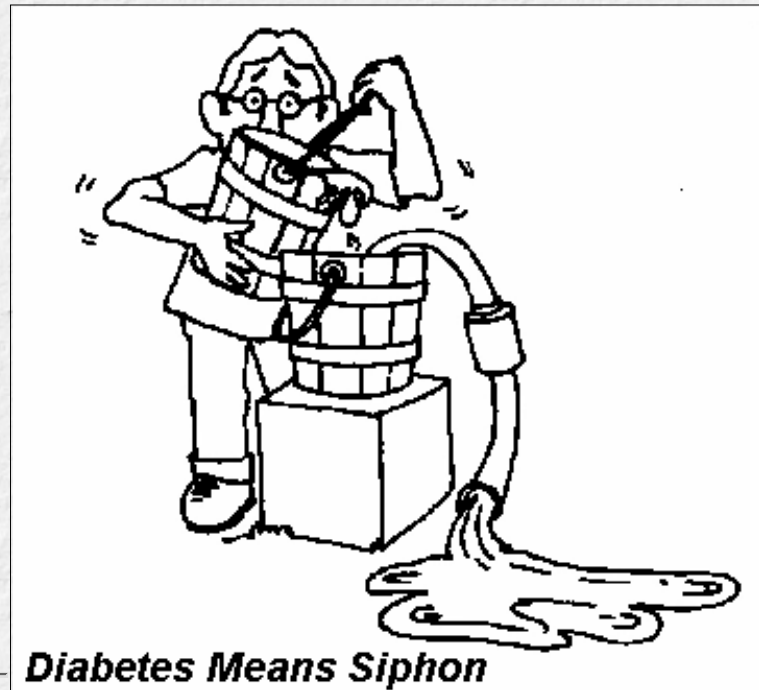
The Healing Handbook *for* Persons with Diabetes

[[Table of contents](#) | [Introduction](#) | [Next chapter](#)]

Chapter 1

What is Diabetes?

- [Origins](#)
- [The Role of Insulin](#)
- [The Pancreas, Islets of Langerhans, and Beta Cells](#)
- [Where Does Blood Sugar Come From?](#)
- [Diabetes Symptoms](#)
- [The Kidney Dam](#)
- [Types of Diabetes](#)
- [Causes of Diabetes](#)
- [Other Factors Can Cause Or Trigger Diabetes](#)
- [Controlling Diabetes](#)
- [More Information:](#) The American Diabetes Association and the Juvenile Diabetes Foundation

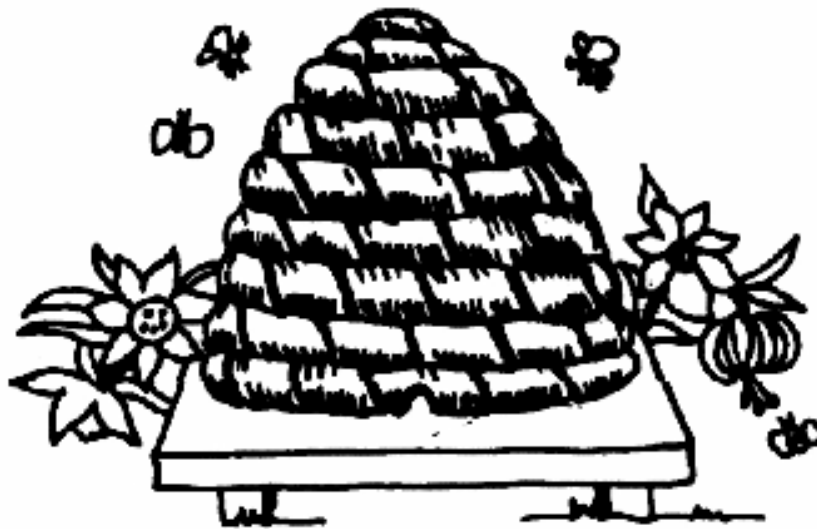


Origins

The medical name for diabetes, **diabetes mellitus**, comes words with Greek and Latin roots.

Diabetes comes from a Greek word that means **to siphon** . The most obvious sign of diabetes is excessive urination. Water passes through the body of a person with diabetes as if it were being siphoned from the mouth through the urinary system out of the body.

Mellitus comes from a Latin word that means sweet like honey. The urine of a person with diabetes contains extra sugar (glucose). In 1679, a physician tasted the urine of a person with diabetes and described it as sweet like honey.



Mellitus Means Sweet Like Honey

Anyone can get diabetes. In fact, 14 million Americans have diabetes, including famous entertainers, athletes, and political leaders. Although they must carefully control their diet and medication, most people with diabetes lead full, active lives.

A History of Diabetes

| Time | Event |
|---------|---|
| 1500 BC | Ebers Papyrus first describes diabetes |
| 400 BC | Susruta records diabetes symptoms and classifies types of diabetes. Charaka refines this work in 6AD. |
| 10 AD | Celsus develops a clinical description of diabetes |
| 20 AD | Aretaeus coins the term diabetes. |
| 1869 | Langerhans describes clusters of cells (islets) in the pancreas. |
| 1889 | von Mering and Minkowski observe that diabetes develops when an animal's pancreas is removed. |

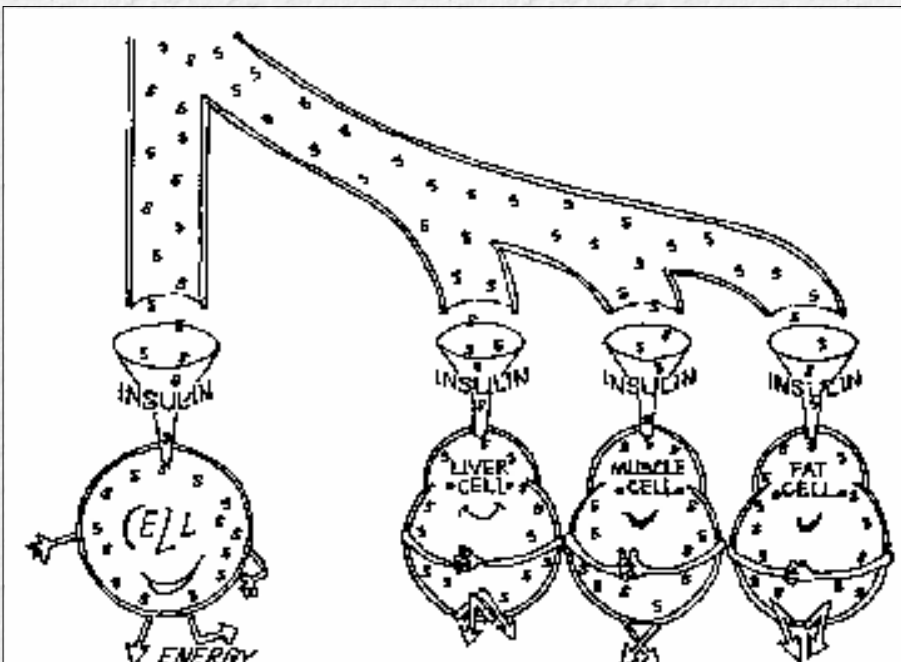
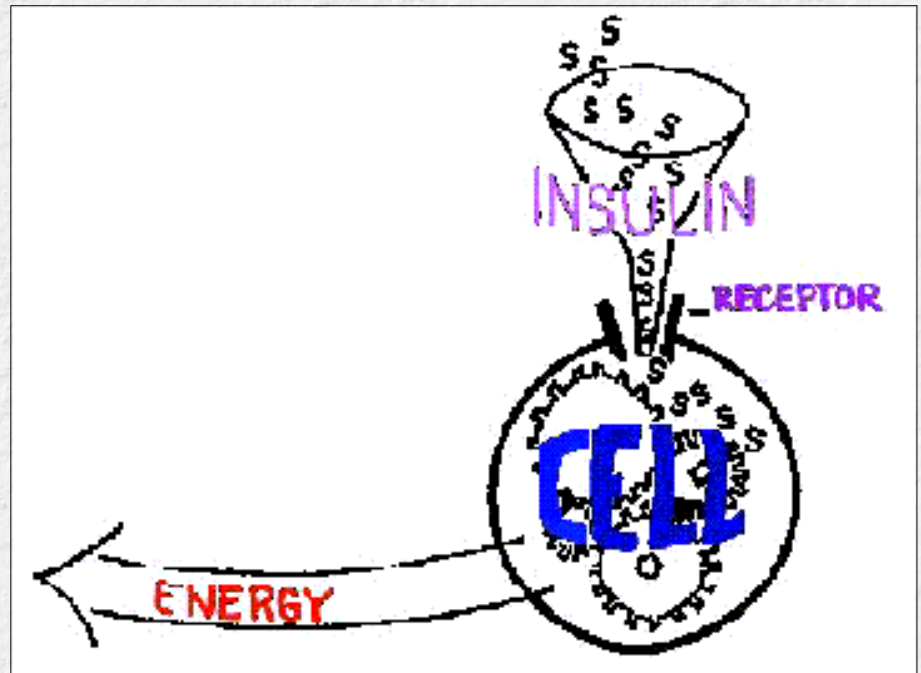
1921

Banting and Best obtain and purify islets of Langerhans from an animal pancreas, inject the material (insulin) into a diabetic animal, and find a fall in blood sugar level.

The Role of Insulin

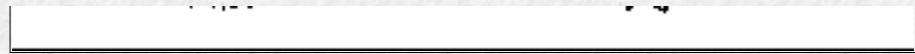
Insulin is a hormone produced in the pancreas to regulate the amount of sugar in the blood. In persons with diabetes, the pancreas produces no insulin, too little insulin to control blood sugar, or defective insulin. To understand how this affects you, you need to understand more about how insulin works in your body.

Think of each of the billions of cells in your body as a tiny machine. Like all machines, cells need fuel. The foods you eat are made up of carbohydrates, proteins, and fats, which are broken down to provide fuel for the cells. **The main fuel used by the cells is called glucose, a simple sugar.**



Glucose enters your cells through receptors. Receptors are sites on cells that accept insulin and allow glucose to enter. Once inside, glucose can be used as fuel. But glucose has difficulty entering your cells without insulin.

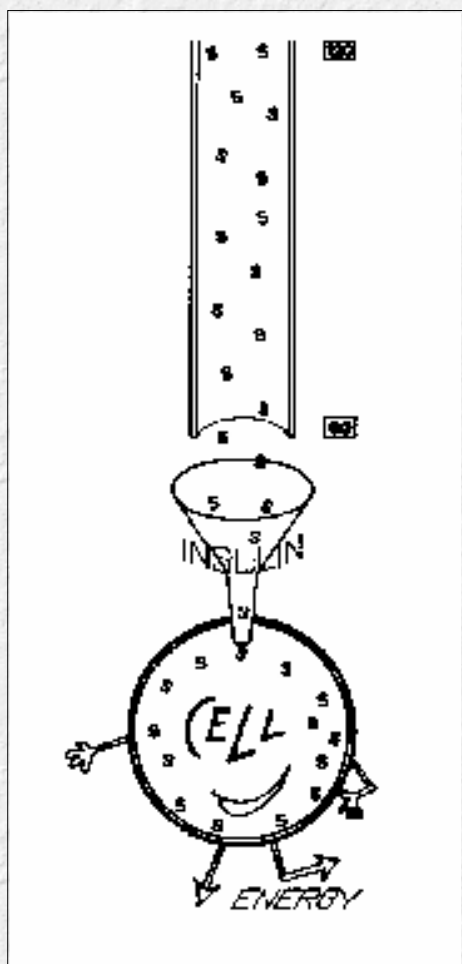
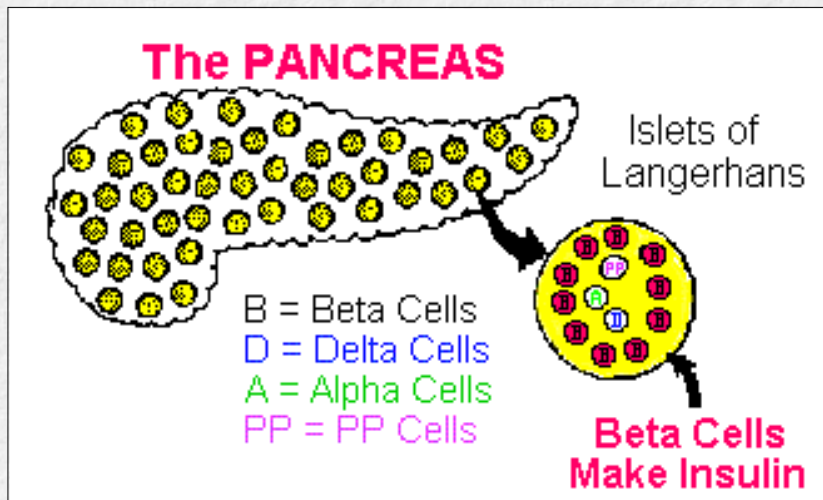
Think of **insulin** as the **funnel** that allows glucose (sugar) to pass through the receptors into your cells



Excess glucose is stored in the liver and muscles in a form called **glycogen**. Between meals, when your blood sugar is low and your cells need fuel, the liver glycogen is released to form glucose.

The Pancreas, Islets of Langerhans, and Beta Cells

The **pancreas** is located in the abdomen, behind the stomach. It is attached to the small intestine and the spleen. Inside the pancreas are small clusters of cells called **Islets of Langerhans**. Within the islets are **beta cells**, which produce insulin.



In people who do not have diabetes, glucose in the blood stimulates production of insulin in the beta cells.

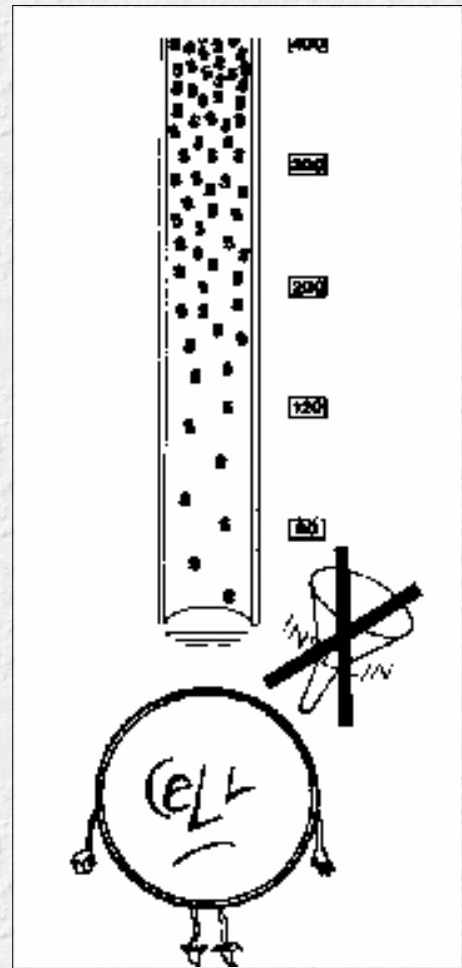
Beta cells "measure" blood glucose levels constantly and deliver the required amount of insulin to funnel glucose into cells.

They keep blood sugar in the normal range of **60 mg to 120 mg**.

When there is little or no insulin in the body, or when insulin is not working properly, glucose has difficulty entering your cells.

Also, when there is not enough insulin, excess glucose cannot be stored in the liver and muscle tissue. Instead, glucose accumulates in your blood.

This high concentration of glucose in the blood is called **hyperglycemia** or high blood sugar.



Where Does Blood Sugar Come From

Everyone knows that eating sugar can put sugar into the blood. And every person with diabetes knows that one of the key parts of controlling blood sugar is paying attention to the diet (See [Chapter 6](#)).

But what many people do not know is that **not all the sugar in the blood comes from sugar that we eat**. Because sugar in the blood is so important to our bodies, we have a backup source of sugar to use when we are not eating. The main source is the liver. The liver is like a big factory that makes many of the things that we need to live. One of those things is blood sugar.

During the day, when we are eating, the liver puts some sugar into storage. (Doctors call this stored sugar "glycogen.") During the night when we are asleep and not eating, the liver puts that sugar into the blood. And if we skip breakfast, the liver may actually make new sugar for us to use. It makes this new sugar from proteins that are taken away from our muscles!

The sugar that comes from the liver (and to a smaller degree from our kidneys, too!) explains why persons with diabetes can have a high blood sugar even when they are not eating!

Diabetes Symptoms

People with diabetes experience different symptoms.

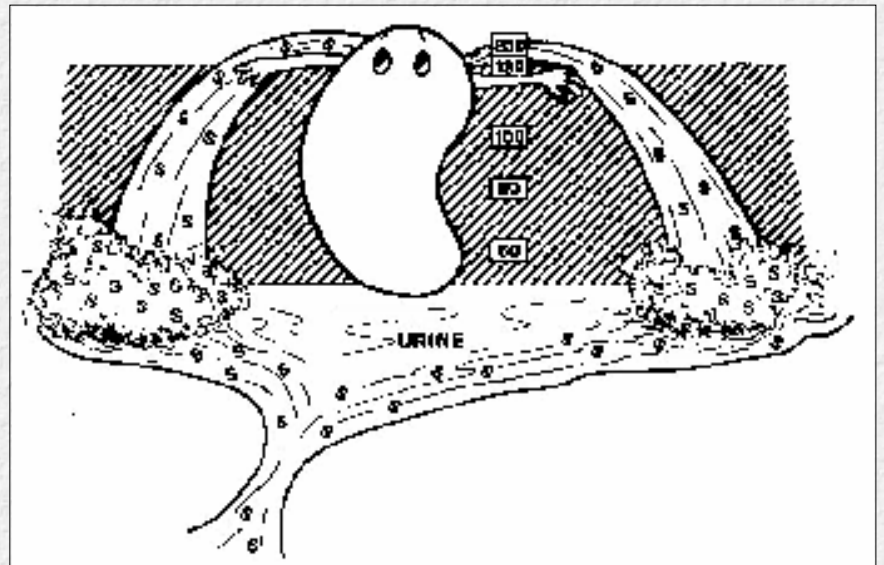
You may experience all, some, or none of the following:

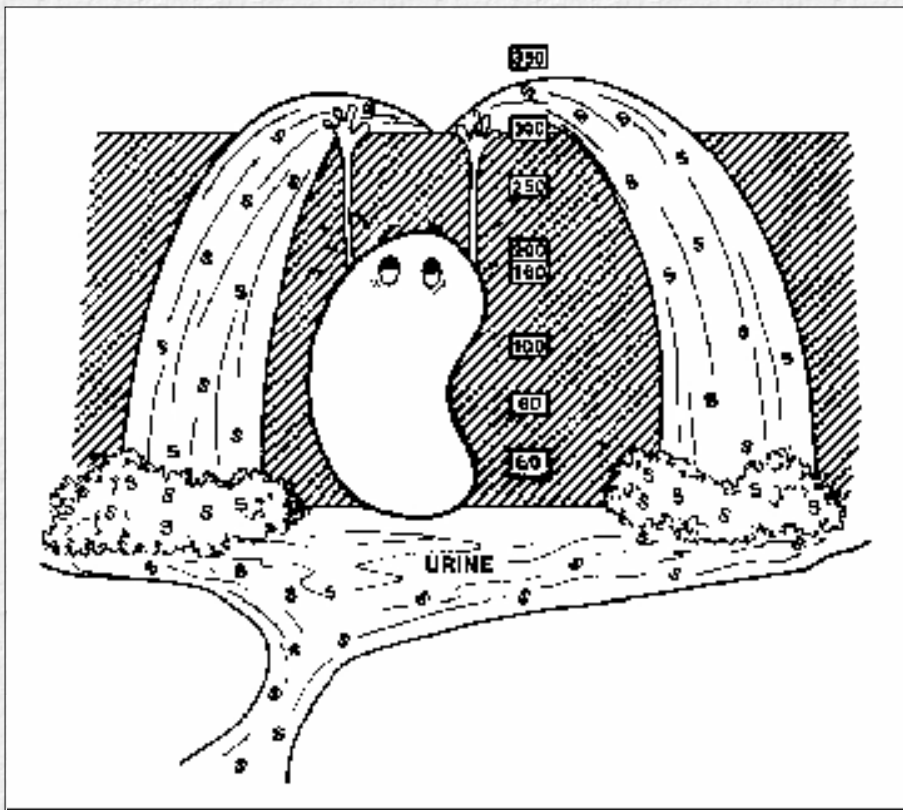
- Frequent urination (even at night)
- Excessive thirst
- Dry skin
- Itchy skin
- Slow healing of cuts
- Blurry eyesight
- Always being very hungry
- Feeling tired and weak
- Weight loss
- Skin infections
- Numbness or tingling in feet



The Kidney Dam

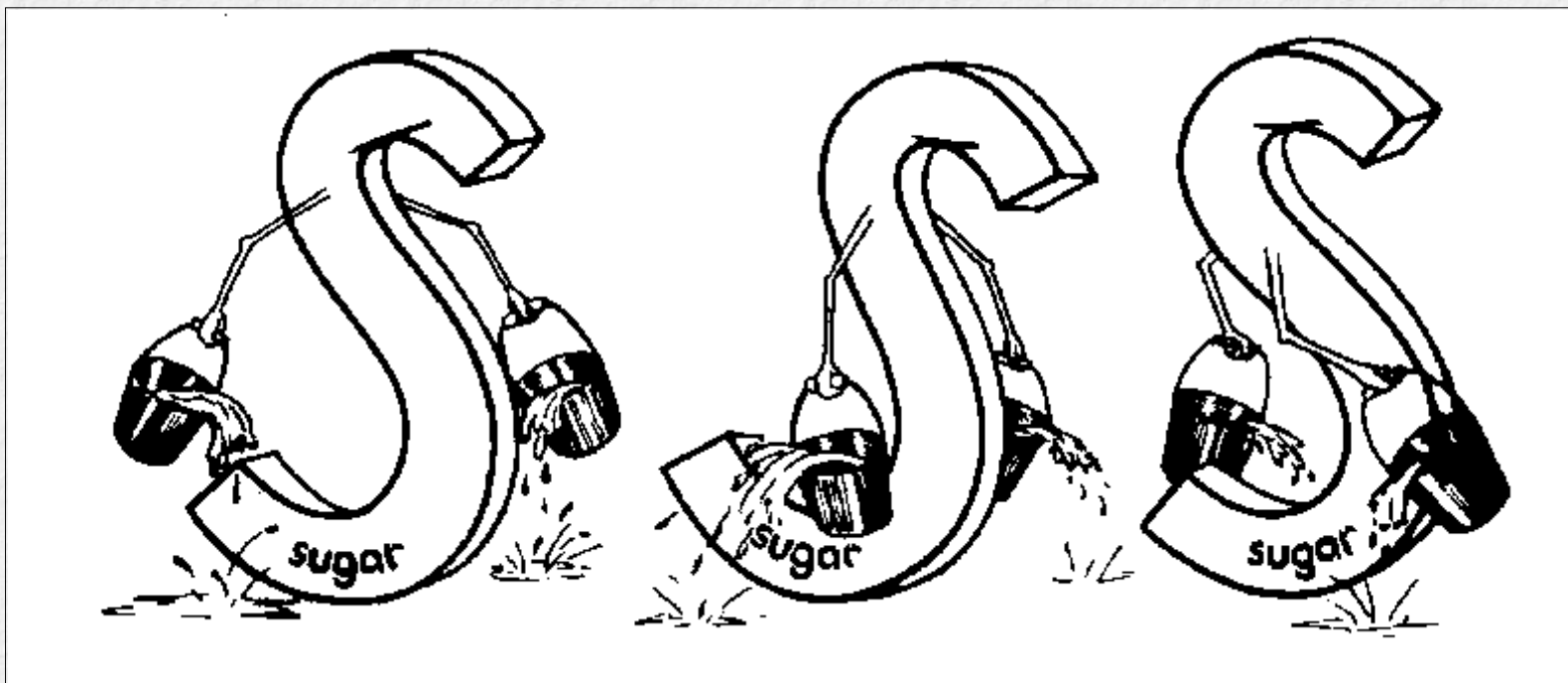
When blood glucose rises above a certain level, it is removed from the body in urine. Picture the kidney as a dam: when there is too much glucose in the blood, the excess "spills" out. The maximum blood glucose level reached before sugar spills out is called the kidney threshold (usually about 180 mg/ml).





Some people with long-term diabetes or kidney disease can have a very high kidney threshold. Sugar will not "spill" into the urine until the blood sugar is very high.

Glucose cannot be passed out of the body alone. Sugar sucks up water so that it can "flow" from the body. The result is **polyuria** or **excessive urination**. People with excess glucose in their blood, as in uncontrolled diabetes, make frequent trips to the bathroom. These people also have sugar in their urine; the medical term for sugar in the urine is **glycosuria**.



Loss of water through urination triggers the brain to send a message of thirst. This results in a condition called **polydipsia**, or **excessive thirst**. This symptom is not always pronounced, however; you may notice nothing more than a dry mouth.

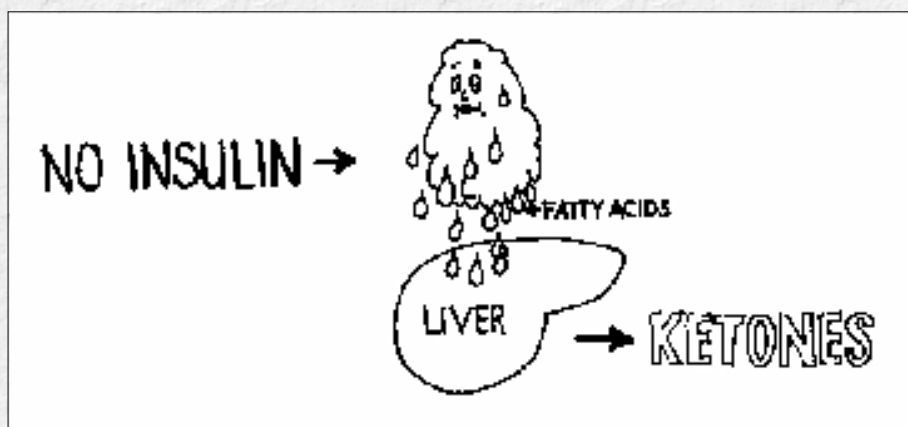
Excessive urination can result in **dehydration**, leading to dry skin.

Blurred vision can be caused by fluctuations in the amount of glucose and water in the lenses in your eyes during periods of dehydration.

When there is no insulin to funnel glucose into the body's cells, or when the insulin funnel is not working to pass glucose through the receptors, the cells get no fuel and they starve.



This triggers the brain to send a message of hunger, resulting in polyphagia or excessive hunger. Because the glucose that should be fueling your cells is flowing out in urine, the cells cannot produce energy, and without energy, you may feel weak or tired. Weight loss may occur in people whose bodies produce no insulin because without insulin, no fuel enters their cells.



Insulin also works to keep fuels inside the cells. When insulin is low, the body breaks down the fuels, and rapid weight loss results. The breakdown of fat cells forms fatty acids which pass through the liver to form ketones. Ketones are excreted in the urine. The medical term for ketones in the urine is ketonuria.

Skin infections sometimes occur because excess sugar in the blood suppresses the natural defense mechanism like the action of white blood cells. And sugar is an excellent food for bacteria to grow in.

Numbness and tingling in feet and night leg cramps may result from nerve damage due to prolonged high glucose levels that cause changes in the nerves.

Types of Diabetes

Almost all people with diabetes have one of two major types. About 10% have Type I or insulin dependent diabetes mellitus (IDDM). Their bodies produce no insulin. When diagnosed, most people with Type I diabetes are under 40 and usually thin. Symptoms are often pronounced and come on suddenly. Because their bodies produce no insulin, people with Type I diabetes must obtain it through injection. If you've been diagnosed with Type I diabetes, you'll want to pay special attention to [Chapter 3](#), which describes IDDM.

About 85% of persons with diabetes have Type II or non-insulin dependent diabetes mellitus (NIDDM). Their bodies produce some insulin, but it is not enough or it doesn't work properly to funnel glucose through the receptors into their cells. When diagnosed, most people with Type II diabetes are over 40 and usually are overweight. Symptoms are usually not pronounced and appear over a long period of time. Type II diabetes can sometimes be controlled with a carefully planned diet and exercise, but oral medications or insulin injections may be necessary. If you have Type II diabetes, you can find information about NIDDM in [Chapter 4](#).

The following table highlights some of the differences between Type I and Type II diabetes.

| | Type I (IDDM) | Type II (NIDDM) |
|-------------------------|----------------------|----------------------------------|
| <i>Age at onset</i> | Usually under 40 | Usually over 40 |
| <i>Body weight</i> | Thin | Usually overweight |
| <i>Symptoms</i> | Appear suddenly | Appear slowly |
| <i>Insulin produced</i> | None | Too little, or it is ineffective |
| <i>Insulin required</i> | Must take insulin | May require insulin |
| <i>Other names</i> | Juvenile diabetes | Adult onset diabetes |

Other Types of Diabetes

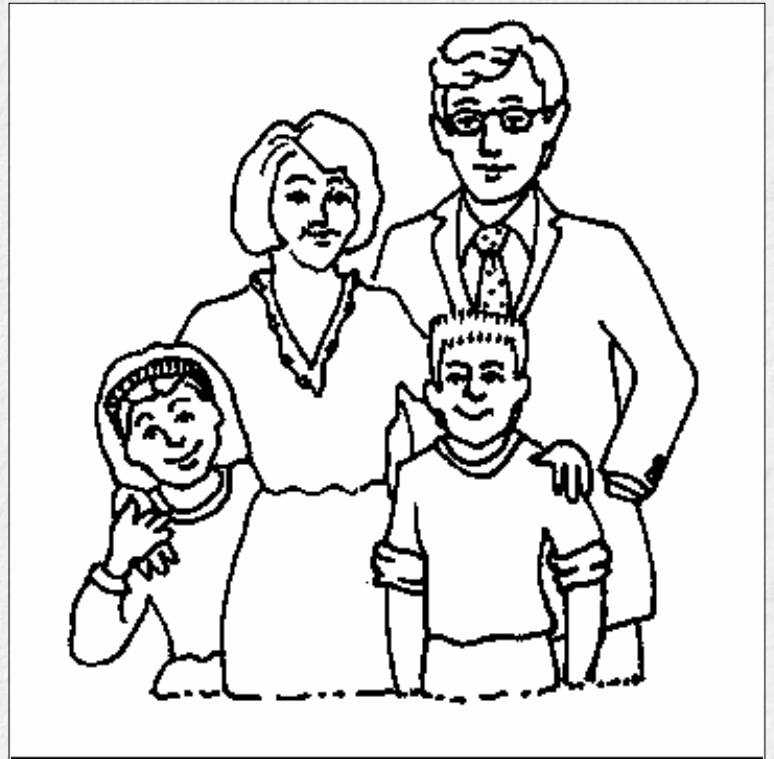
People whose blood contains more glucose than normal, but less than occurs in diabetes, may be diagnosed with a condition called impaired glucose tolerance (IGT).

Some women experience a rise in their blood glucose level during pregnancy. These women have a condition called gestational diabetes mellitus (GDM). Their blood glucose levels usually return to normal after their babies are born. Other types of diabetes may occur as a result of diseases of the pancreas or the endocrine (gland) system, genetic disorders, or exposure to chemical agents.

Causes of Diabetes

Two factors are especially important in the development of diabetes:

Heredity: If you have a parent, grandparent, brother, or sister, or even a cousin who has diabetes, you are more likely to develop diabetes yourself. There is about a 5% risk of developing Type II diabetes if your mother, father, or sibling has diabetes. There is a higher risk (up to 50%) of developing Type II diabetes if your parent or siblings have Type II diabetes and you are overweight.



Obesity: Eighty percent of people with Type II diabetes are overweight when diagnosed. Diabetes symptoms disappear in many of these obese patients when they lose weight.

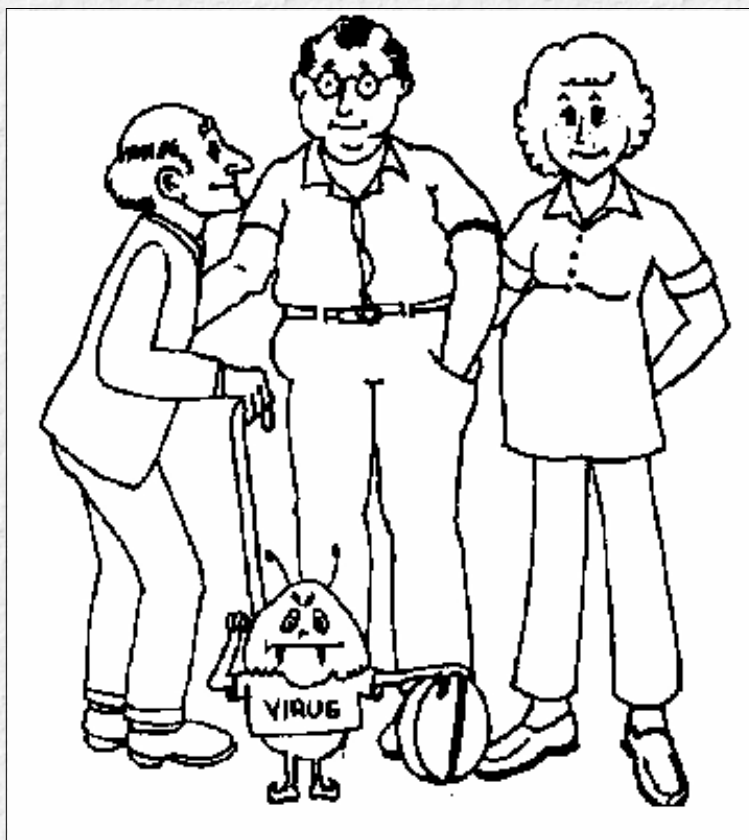


Other Factors Can Cause Or Trigger Diabetes, Including:

- **Age:** As people age, their bodies may have fewer insulin-producing beta cells.
- **Viruses:** Certain viruses may destroy beta cells in susceptible people.
- **Faulty immune system:** Scientists now believe that there is not one cause of diabetes, but multiple factors that may trigger the immune system to destroy beta cells.
- **Physical trauma:** An accident or injury may destroy the pancreas, where insulin is normally

produced.

- **Drugs:** Drugs prescribed for another condition may unmask diabetes.
- **Stress:** Hormones released during periods of stress may block the effect of insulin.
- **Pregnancy:** Hormones produced during pregnancy may block the effect of insulin.



Controlling Diabetes

There are no easy cures for most cases of diabetes. Some persons with diabetes can be cured by a [transplant of insulin producing cells](#), but there are significant risks associated with the surgery and with the immunosuppression-type drugs that need to be taken.

But even if diabetes cannot usually be cured, it can be controlled. Control of diabetes means balancing the amounts of glucose and insulin in your blood. To achieve this balance, your diabetes nurse educator or doctor will prescribe a regimen of diet, exercise, and possibly insulin injections or oral medications. Sticking to your regimen helps keep you healthy and greatly reduces your likelihood of developing diabetes complications.

People with diabetes are vulnerable to a variety of [complications](#) over time. Health-care providers all agree that strict control of blood sugar makes complications less likely. This was shown clearly by the [Diabetes Control and Complications Trial](#). Control of blood sugar is the best way to minimize the risk of complications.

If you're feeling fine, you may wonder whether you really have to stick to your regimen. Remember that not everyone who has diabetes experiences the same or any symptoms, but even if you notice no symptoms, you still have diabetes and keeping your blood glucose in control is still important. High blood glucose is a toxic condition. Over time, it can result in damage to your blood vessels, kidney, eyes, and nerves. Although your body may adapt to a high glucose level, and you may feel fine, the closer your blood glucose level is to normal, the healthier your body will be.

For More Information

Keep informed about diabetes. The more you know, the better you will be able to take care of yourself. By joining the organizations listed below, you gain access to a network that can provide the latest information on diabetes research and treatment.

- [American Diabetes Association](#)
General Membership
P.O. Box 2055
Harlan, IA 51593-0238
- [American Diabetes Association Local Affiliates](#)
There are many local chapters of the ADA!
- [Juvenile Diabetes Foundation International](#)
120 Wall Street
19th Floor New York, NY 10005-4001
212-785-9595
(membership fee includes subscription to *Countdown* magazine)
- Juvenile Diabetes Association Local Affiliates
Contact the JDF for a list of their local affiliates.
Our local affiliate is:
Juvenile Diabetes Foundation (JDF)
Worcester, MA Chapter
P.O. Box 544
Greendale Station
Worcester, MA 01605

You may also want to subscribe to some of the following publications

- [Countdown](#)
(subscription included in JDF membership fee)
- [Diabetes Forecast](#)
(subscription included in ADA membership fee)
- [Diabetes Self-Management](#)
P.O. Box 51125
Boulder, CO 80321-1125
- [Diabetes in the News](#)
P.O. Box 3105
Elkhart, IN 46515

Finally, you may want to consult some of the growing number of [Online Resources for Persons with Diabetes](#). The list is expanding and frequently being updated.

This handbook probably won't answer all the questions you have about diabetes. In several chapters, you'll find references to other books you may want to look at for more information.

⚠️ REMEMBER: The care of diabetes is a team effort involving you, your physician, and the diabetes education staff where you receive your medical care. This handbook cannot-and was not meant to-replace

this team effort.

This handbook embodies the approach of the diabetes care team at the University of Massachusetts Medical Center. Different diabetes care teams may approach some aspects of diabetes care in ways that differ from those in this handbook. While most teams are in close agreement regarding the GENERAL PRINCIPLES of diabetes care, they may differ in the DETAILS. There can be more than one "right" way to approach a specific issue in diabetes management.

Always remain in touch with your diabetes care team, and bring any questions you may have about the materials in this handbook to their attention!

Copyright 1995, 1996, 1997, 1998 Ruth E. Lundstrom, R.N., John P. Mordes, M.D., Aldo A. Rossini, M.D. All rights reserved.

Feedback: send e-mail to [Dr. Aldo Rossini](#)

This page was last revised on January 1, 1998.

[[Table of Contents](#) | [Glossary](#) | [Next chapter](#)]

The Healing Handbook *for* Persons with Diabetes

[[Table of contents](#) | [Previous chapter](#) | [Next chapter](#)]

Chapter 2 Coping with Diabetes

- [Psychological Aspects](#)
- [Coping Skills](#)
- [Social Aspects](#)
- [Driver's Licenses](#)
- [Life Insurance](#)
- [Health Insurance](#)
- [Diabetes Identification](#)
- [Your Rights](#)
- [Treatment Plans](#)
- [Regular Assessments](#)
- [Continuing Education](#)
- [Special Situations](#)
- [Your Role](#)

Your diabetes diagnosis probably left you feeling confused and overwhelmed. You may be having trouble concentrating on learning all the things you have to do to follow your diabetes care plan. Maybe you're thinking, "How will I ever be able to stick to the diet?" or "I can't give myself an injection!" or "I pass out when I see blood -- I can't do a blood test! " And you're probably wondering, "What will diabetes do to me?"

All of these things have been said by people who are now living successfully with their diabetes. How did they do it? By taking one day at a time and learning all they could each day. The more you know about diabetes and your self-care plan, the less frightened you will be.



Psychological Aspects of Diabetes

Some people just don't believe they have diabetes. They don't see why they need to follow a diabetes care plan. Other people understand in their minds that they have diabetes, but still do not follow their care plans. These are forms of **denial**. It can take time to overcome denial, but the sooner you accept your diagnosis and begin learning about your diabetes, the sooner you'll achieve independence and good health under your care plan.

Most people diagnosed with diabetes experience **anger**. It is perfectly normal to feel this way at times, but you won't help yourself by remaining angry and hostile all the time. Try talking to family members, friends, or others with diabetes to get these feelings out. And consider directing the energy you're using on anger to something positive by volunteering or fund raising for diabetes organizations.

Maybe you feel **guilty** that something you did caused your diabetes. Was it all the candy you ate? All that binge eating? Are you being punished for something bad you did?

NO!

None of these things cause diabetes. If they did, almost everyone would have it. Whenever you feel that diabetes is a punishment for something you did, review the [Causes of Diabetes](#) in Chapter 1 to remind yourself that diabetes can happen to **anyone**.

Depression can be a serious problem for people with diabetes. Symptoms of depression include feelings of helplessness or hopelessness, loneliness, lack of self-esteem, fatigue, irritability, and changes in sleep patterns or eating habits. If you experience any of these symptoms, get help. Your doctor or diabetes educator can refer you to counselors with experience in helping people with diabetes.

Many people with diabetes will go through a time of **grieving**. It is normal to grieve over the loss of your healthy self when first diagnosed with diabetes or when a complication occurs. With time and support from family, health-care providers, religious leaders, and friends, you will be able to resolve your grief.

One of the most difficult things you have to face is the knowledge that even if you follow your diabetes care plan to the letter, you may not achieve perfect control. There is no guarantee that following your regimen will keep you healthy forever. Then why bother? Because working at good control will make you feel better, both physically and emotionally. You'll feel better when you know you're doing everything you can to stay well. And the only way to reduce your risk of complications is to stay in good control of your diabetes.

Your Own Coping Skills

How do you feel about having diabetes? Do you see it as a daily challenge, one that requires your own strength, energy, and attention as well as the support of your friends and family? If so, you're probably coping well with your diabetes. You understand that diabetes is a serious condition, but you are optimistic about your treatment plan. You're committed to taking responsibility for your self-care, to following your regimen, and to learning as much as you can about your diabetes. You trust your

health-care team, and you feel free to participate in decisions about your diabetes care plan. Your attitude is positive.

On the other hand, you're not coping well if you believe your diabetes isn't a serious condition, or that your care plan is impossible to follow, or that your treatment won't work. Maybe you feel that it's your doctor's responsibility to keep you well, that you can't change your lifestyle to fit your diabetes regimen, that you have no time for medical appointments, or that you can't depend on family and friends for support. These are all poor coping responses.

If you feel you're not coping well with your diabetes, ask yourself why not. Do you think you are not strong enough, smart enough, or well enough educated, to take responsibility for your self care? Are you afraid you can't afford diabetes supplies? Your first step is to seek out health-care professionals you can trust and work with as a team member. It takes courage and hope to get involved in your own care, but it's worth it.

For more information on psychological aspects of diabetes, see *The Physician Within* by Catherine Feste. You can order this book from Diabetes Center, Inc., P.O. Box 739, Wayzata, MN 55391.

Another book that has brought comfort to many is *When Bad Things Happen to Good People* by Harold Kushner. You can find this book in your library and at most book stores.

Social Aspects of Diabetes

Job discrimination is against the law, but it happens. Employers who have had bad experiences with employees who had diabetes may be reluctant to hire you. Title V of the Federal Rehabilitation Act of 1973 defines diabetes as a "handicap" if it is used to "exclude qualified workers from jobs, promotions, or other employment activities." This law may protect you against unfair employment practices if you work for:

- An agency of the executive branch of the federal government or the US Postal Service
- A business with contracts valued over \$2,500 annually with the federal government
- Any program that receives federal financial assistance

All states have anti-discrimination statutes. To find out about the relevant laws in your state, contact the state commission on human or civil rights, the office of fair employment, or the department of labor.

People with diabetes are banned by law from certain types of employment. Regulations of the US Department of Transportation bar people with Type I (insulin-dependent) diabetes from driving trucks on interstate routes (these regulations are being changed to allow people with diabetes who follow strict guidelines to drive trucks on interstate highways). People with diabetes cannot serve in the armed forces or hold commercial pilot's licenses. In some states, they cannot join police forces. Federal Occupational Safety and Health Administration (OSHA) guidelines limit the types of machinery that can be operated by people with diabetes.

The [American Diabetes Association](#) (ADA) advocates for case-by-case determination of employment eligibility. The ADA's position is that "Any person, whether insulin dependent or non-insulin dependent, should be able to accept any employment for which he or she is individually qualified." Your local ADA

affiliate can provide information about the ADA's Attorney's Network, a group of lawyers experienced in helping people with diabetes. You can also contact the local bar association for referrals to lawyers with experience in employment discrimination cases.

Help yourself. Don't accept a job that will conflict with your diabetes care plan. Seek employment where you will be allowed time for your regular checkups, and where a good health plan is offered. Your state vocational rehabilitation office can assist with vocational counseling, job placement, and retraining.

Driver's Licenses

Most states now require a doctor's certification that a person with diabetes is in good control before granting a driver's license. Bring a note from your doctor when you apply for or renew your license.

Life Insurance

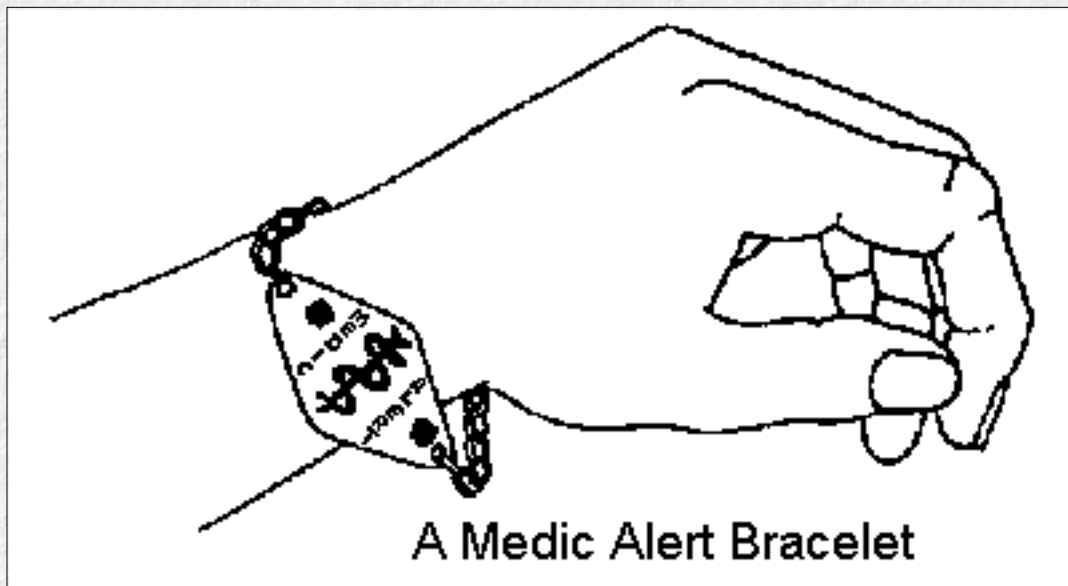
You may have trouble purchasing life insurance after your diabetes diagnosis. If you find a company that will accept you, your premiums may be triple those charged to people who do not have diabetes. Diabetes Forecast magazine advertises a Diabetes Group Insurance Trust Plan with in-hospital benefits and group term insurance for AD members. Contact your local ADA affiliate or the national organization (see Chapter 1 for addresses) for more information.

Health Insurance

The best health insurance deal is employer-provided group coverage. Policies vary, and many either do not cover preexisting conditions or include waiting periods for coverage of preexisting conditions. In Massachusetts, most group policies cover at least 80% of the cost of insulin, syringes, oral hypoglycemic medications, and blood glucose meters. Very few cover the cost of blood glucose test strips. Medicare covers 80% of the cost of test strips for persons on insulin.

Diabetes Identification

Your health-care provider may suggest that you wear a bracelet, tag, or necklace, or carry a card in your wallet that identifies you as having diabetes. This is helpful in emergency situations where you might not be able to speak to the health care provider assisting you.



YOUR GUIDE TO BETTER DIABETES CARE: RIGHTS & ROLES

An individual with diabetes can, in general, lead a normal, healthy, and long life. Looking after yourself and learning about your diabetes provide the best chance to do this. Your doctor and the other members of the health-care team (made up of doctors, nurses, dietitians, and chiropodists) are there to advise you and to provide the information, support, and technology for you to look after yourself and live your life in the way you choose. It is important for you to know what your health-care providers should provide to help you reach these goals and what you should do.

Your Rights

The health-care team should provide:

- A treatment plan and self-care targets
- Regular checks of blood sugar (glucose) levels and of your physical condition
- Treatment for special problems and emergencies
- Continuing education for you and your family
- Information on available social and economic support

Your role is to build this advice into your daily life and to be in control of your diabetes on a day-to-day basis.

Treatment Plan and Self-Care Targets

You should receive the following:

- Personalized advice on proper eating -- types of food, amounts, and timing of meals

- Advice on physical activity
- Your dose and timing of tablets or insulin and how to take them; advice on how to change doses based on your self-monitoring
- Your target values for blood glucose, blood fats, blood pressure, and weight

Regular Assessments

At each visit, your health-care professional should:

- Review your self-monitoring results and current treatment
- Talk about your targets and change where necessary
- Talk about any problems and questions you may have
- Continue diabetes education

The health-care team should check:

- Your blood glucose control by taking special tests. (These tests -- done two to four times per year if diabetes is well controlled -- include measures of "glycohemoglobin" (sometimes abbreviated as HbA1c or GHb) or "fructosamine." Fasting blood glucose tests are advised for individuals treated without insulin.
- Your weight
- Your blood pressure and blood fats, if necessary

The following should be checked at least once per year:

- Your eyes and vision
- Your kidney function (blood and urine tests)
- Your feet
- Your risk factors for heart disease, such as blood pressure, blood fats, and smoking habits
- Your self-monitoring and injection techniques
- Your eating habits

Continuing Education

The following are important items you should learn about:

- Why to control blood glucose levels
- How to control your blood glucose levels through proper eating, physical activity, tablets, and/or insulin
- How to monitor your control with blood or urine tests (self-monitoring) and how to act on the results
- The signs of low and high blood glucose levels and ketosis, how to treat them, and how to prevent them

- What to do when you are ill
- Prevention and treatment of long-term complications, including possible damage to eyes, nerves, kidneys, feet, and hardening of the arteries
- How to deal with life-style variations, such as exercise, traveling, and social activities (including alcohol consumption)
- How to handle possible problems with employment, insurance, and driving licenses

Special Situations

Advice and care should be available in special circumstances, especially if you are a child, adolescent, an elderly person, or planning to become or are pregnant.

The first months after your diabetes has been discovered are often difficult. Remember, you cannot learn everything during this period; learning will continue for the rest of your life.

If you have problems with your eyes, kidneys, feet, blood vessels, or heart, then you should be able to see specialists quickly. In addition, you should receive clear information on what to do in emergencies.

Your Role

You must learn to take control of your diabetes on a day-to-day basis. This will be easier the more you learn about your diabetes.

Learn about and practice self-care. This includes self-monitoring of blood glucose and learning how to change your treatment regimen according to the results.


Follow these guidelines:

- Examine your feet on a regular basis.
- Follow good life-style practices. These include choosing the right food, maintaining a health weight, getting regular exercise, and avoiding smoking.
- Know when to contact your health-care team.
- Keep in regular contact with your health-care team about any questions or concerns you may have. Have your questions prepared beforehand and repeat them if the answer is unclear to you.
- Speak to your health-care team, others, with diabetes, and your local or national diabetes association.
- Read pamphlets and books about diabetes provided by your health-care team or diabetes association.
- Make sure that your family and friends know about your needs as someone with diabetes.

If you feel that adequate facilities and care are not available to help you manage your diabetes, then contact your local or national diabetes association.

Adapted from "Patient Rights and Roles," a document prepared under the auspices of the St Vincent Declaration Working Group of WHO Europe and the European Regional Council of IDF. Publication

supported by Boehringer Mannheim. Members of the group who produced the document include: KGMM Alberti (United Kingdom), J Apfel (United Kingdom), FA Gries (Germany), J Jervell (Norway), C Juinot (France), S Keranyi (Hungary) HMJ Krans (Netherlands), M Massi-Benedetti (Italy), V Sparre-Enger (Belgium), and K Staehr Johansen, a WHO observer. "Patients Rights and Roles" has also been published in *Diabetic Medicine* (1991). The copyright is owned by the International Diabetes Federation.

 **REMEMBER:** The care of diabetes is a team effort involving you, your physician, and the diabetes education staff where you receive your medical care. This handbook cannot-and was not meant to-replace this team effort.

This handbook embodies the approach of the diabetes care team at the University of Massachusetts Medical Center. Different diabetes care teams may approach some aspects of diabetes care in ways that differ from those in this handbook. While most teams are in close agreement regarding the GENERAL PRINCIPLES of diabetes care, they may differ in the DETAILS. There can be more than one "right" way to approach a specific issue in diabetes management.

Always remain in touch with your diabetes care team, and bring any questions you may have about the materials in this handbook to their attention!

Copyright 1995, 1996, 1997, 1998 Ruth E. Lundstrom, R.N., John P. Mordes, M.D., Aldo A. Rossini, M.D. All rights reserved.

Feedback: send e-mail to [Dr. Aldo Rossini](#)

This page was last revised on January 2, 1998.

[[Table of contents](#) | [Glossary](#) | [Previous chapter](#) | [Next chapter](#)]

The Healing Handbook *for* Persons with Diabetes

[[Table of contents](#) | [Previous chapter](#) | [Next chapter](#)]

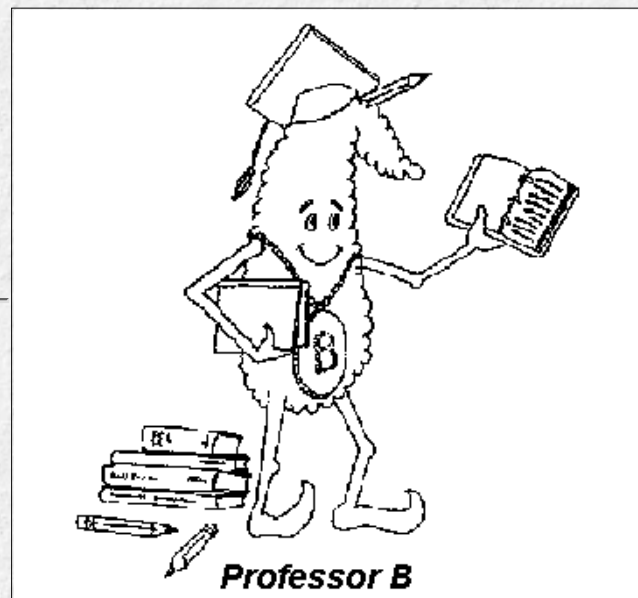
Chapter 3

Insulin Dependent Diabetes Mellitus (IDDM or Type I Diabetes)

- [Goals for People with Type I Diabetes](#)
- [Controlling Type I Diabetes](#)
- [Keeping in Balance](#) (Diet, exercise, and insulin)
- [Questions and Answers](#)
- [For More Information...](#)

Goals for People with Type I Diabetes

Learning that you have Type I diabetes may be frightening, but you can help yourself by learning to control your condition. Keep the following goals in mind:



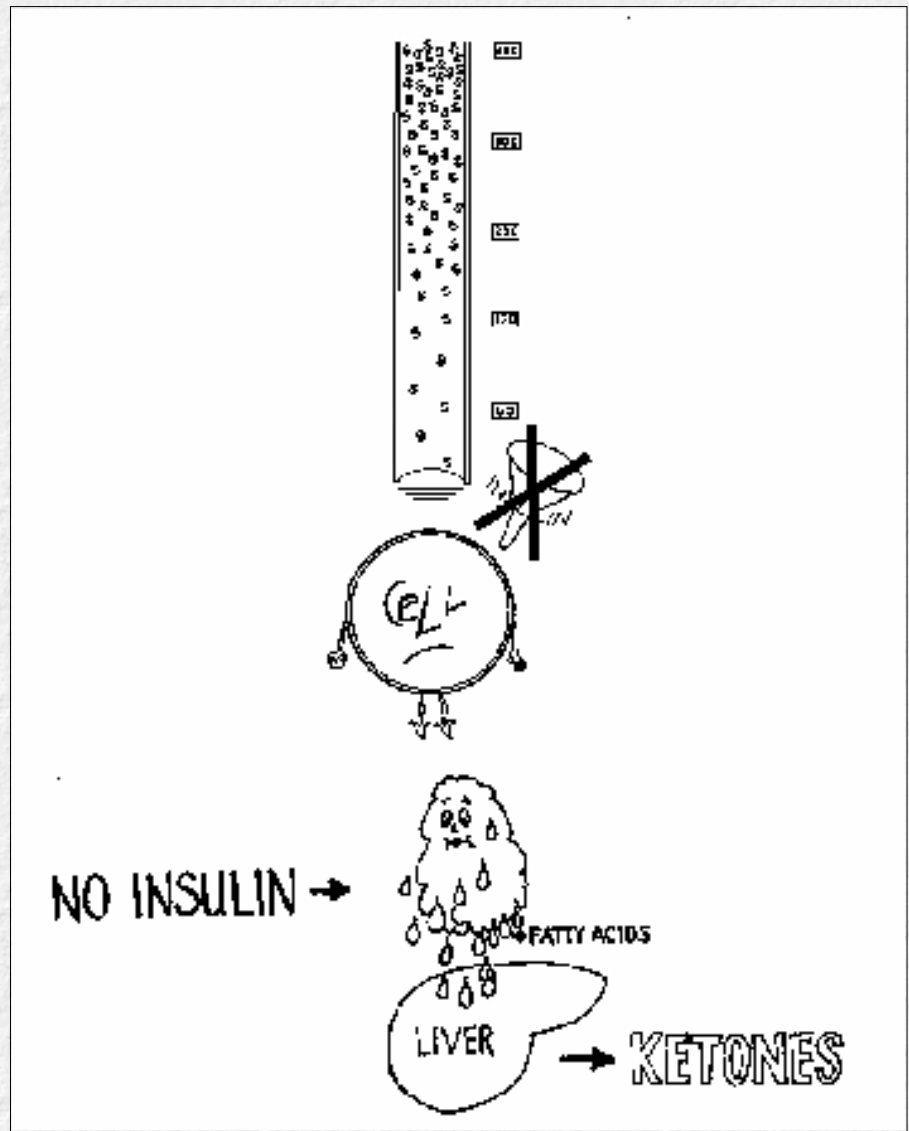
- Becoming self-reliant and self-sufficient
- Balancing diet, exercise, and insulin
- Leading an active life that is as close to normal as possible
- Protecting your heart, nerves, blood vessels, eyes, and kidneys by controlling your blood glucose level
- Maintaining a good body weight
- Growing and developing normally (especially for children)



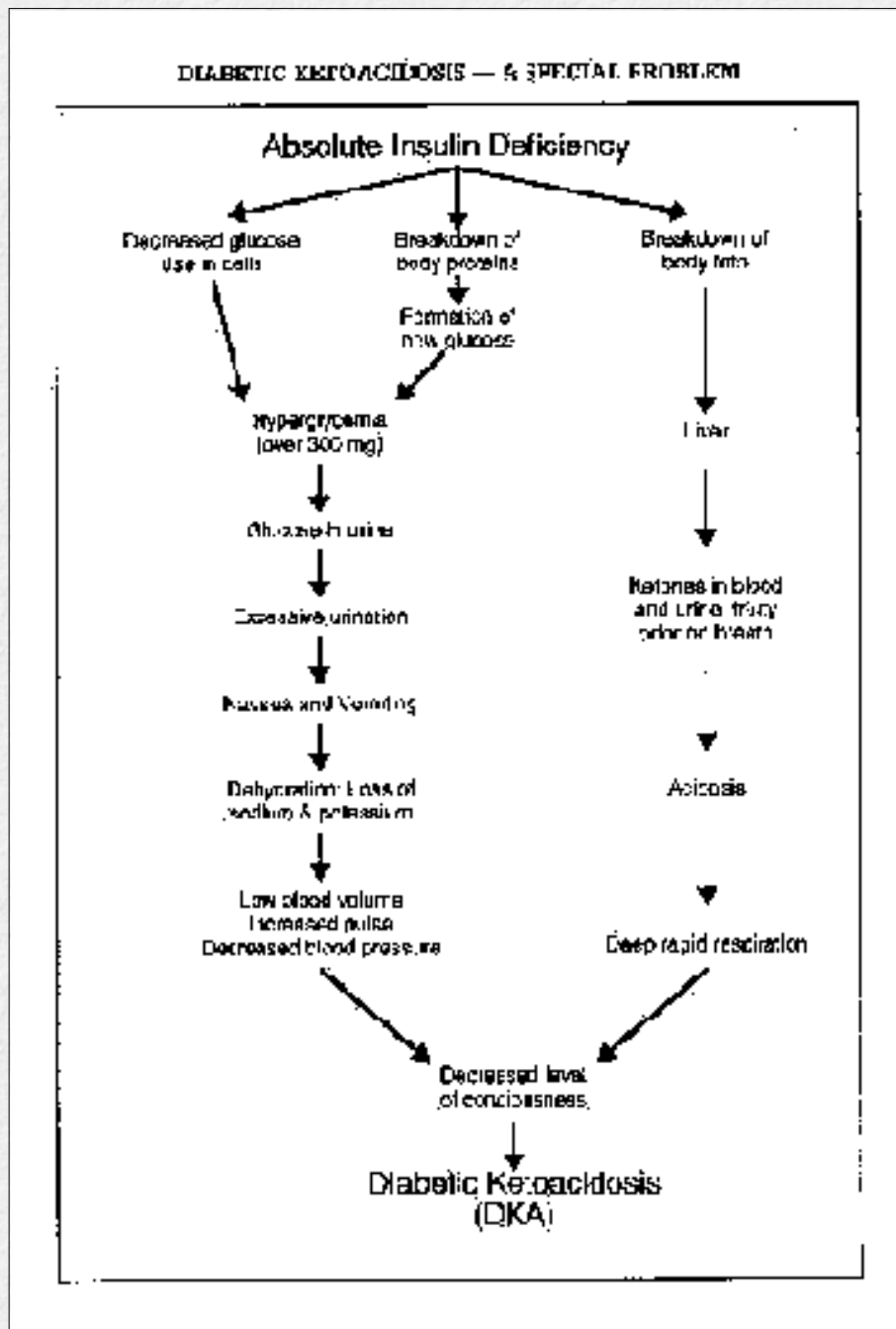
If you have Type I (insulin dependent) diabetes, your body is producing no insulin. With an absolute lack of insulin, you have probably experienced the most common symptoms, excessive thirst (polydipsia), frequent urination (polyuria), extreme hunger (polyphagia), extreme fatigue, and weight loss.

These symptoms were caused by hyperglycemia and a breakdown of body fats. If you have had these symptoms, you are ketosis-prone (See [Chapter 1](#)).

When you were diagnosed with Type I diabetes your blood sugar was probably over 300 mg and ketones were present in your urine.

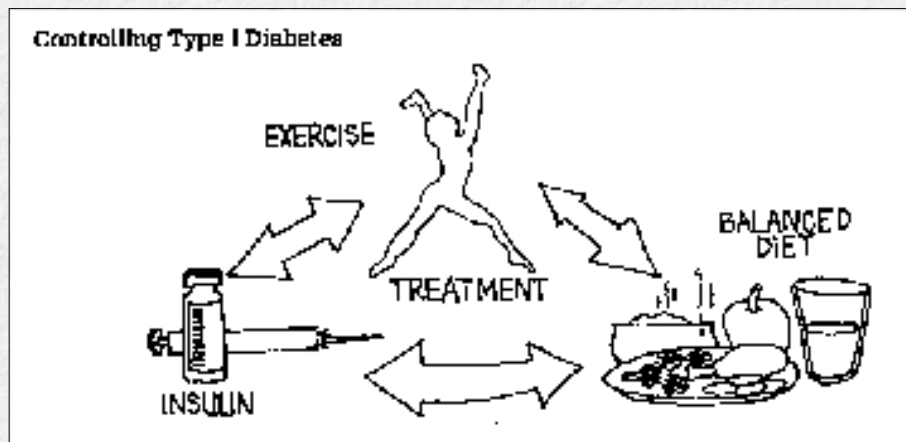


Without insulin, these symptoms progress to dehydration, resulting in low blood volume, increased pulse rate, and dry, flushed, skin. Ketones accumulate in the blood faster than the body is able to eliminate them through the urine or exhaled breath. Respiration becomes rapid, and shallow and breath has a fruity odor. Other symptoms indicating a progression towards diabetic ketoacidotic coma (DKA) include vomiting, stomach pains, and a decreased level of consciousness. Insulin and intravenous fluids can reverse this condition.



Although the DKA is unavoidable at certain times, the best way to reduce your risk of this condition is to always take your insulin and follow Sick Day Rules when ill. For information see [Chapter 10](#).

Controlling Type I Diabetes



To control your diabetes, your health-care provider will prescribe a regimen of insulin injections, diet, and exercise, and you will learn to monitor your blood glucose level.

- **Insulin injections** are necessary because your body does not produce insulin to funnel glucose into your cells. For information on insulin, see [Chapter 8](#).
- Your **diabetes diet** is a well-balanced meal plan that controls the types and amounts of food you eat. For information on the diabetes diet, see [Chapter 6](#).
- **Exercise** reduces your insulin requirements by increasing the efficiency of the insulin you inject. Exercise also improves muscle tone and increases strength and well being. For information on exercise programs for people with diabetes, see [Chapter 7](#).
- **Monitoring your blood glucose** provides the information necessary to design your diabetes care program and remain in good control. For information on monitoring, see [Chapter 5](#).

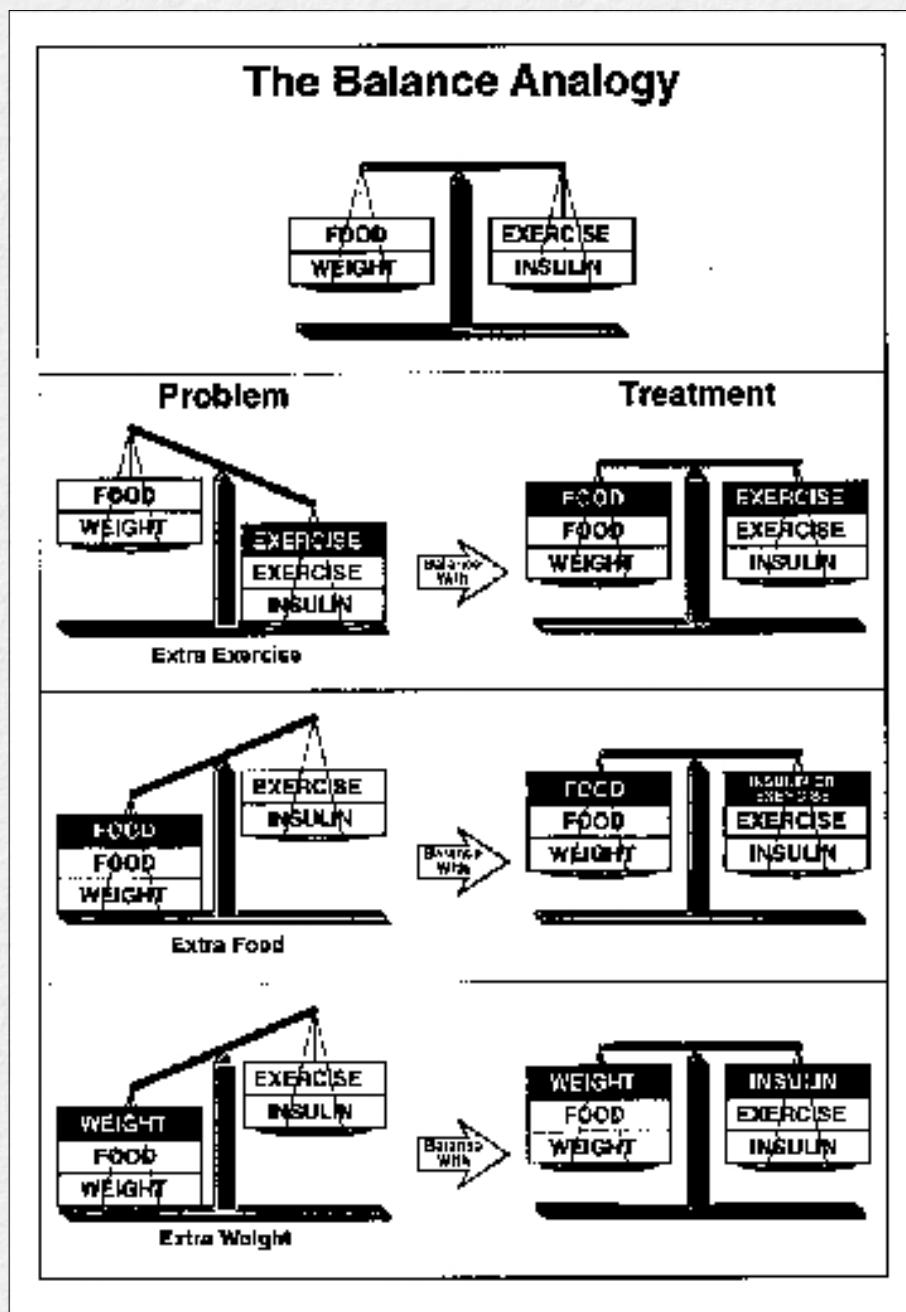
Keeping in Balance

To stay healthy, you need to learn to balance insulin, food, and exercise. The body of a person without diabetes produces just the right amount of insulin to maintain a normal blood glucose level. If he does not eat, very little insulin is produced. If he eats a lot, his body produces much more insulin.

Because your body is not producing insulin, you must obtain it through injections. The insulin you inject in the morning controls a predefined amount of blood glucose. If you skip a meal, the insulin keeps right on working, plunging your blood glucose lower and lower. If you eat more food than the insulin you injected can handle, your blood sugar will go very high. If you exercise, you need to eat more food, because exercise makes insulin work more efficiently.

BALANCING DIET, EXERCISE, AND INSULIN

- To keep in balance, you must stick to your meal and exercise plans, maintain your proper weight, and follow your prescribed insulin injection schedule each day. Your daily insulin dosage may be adjusted to your diet, activity level, and weight.
- On days when you exercise more than usual, you need more food to keep in balance.
- On days when if you eat more food than your meal plan allows, you need to increase your insulin dosage or exercise more to stay in balance.
- If you're gaining weight, you may need to increase your insulin dosage to balance the extra weight, or you may need to diet and exercise more to lose that weight. For growing children, the doctor or diabetes educator may adjust insulin to balance normal weight gains.
- If you accidentally inject more insulin than you should one day, you must add extra food to keep in balance. Check your blood glucose every 2-3 hours (see [Chapter 5](#)) and eat additional snacks or meals.



Questions and Answers

Why can't I take insulin by mouth?

- Insulin is a protein. If you swallow it, it is digested as smaller particles that are no longer insulin.

My friend takes pills for diabetes. Why can't I?

- The pills for diabetes you've probably heard about work by signalling the beta cells in the pancreas to make more insulin (see Chapter 1), and by helping insulin work better. Your beta cells have been destroyed and your body is producing no insulin at all, so the pills can't help you. Research is being conducted to find alternative ways to give insulin.

What if I just ignore my diabetes?

- You'll probably feel tired, you'll be thirsty, and you'll be running to the bathroom a lot. If you get seriously out of balance and ignore these symptoms for several days, you could face the danger of a diabetic coma.

What is Juvenile Diabetes?

- Juvenile Diabetes and Brittle Diabetes are other names for Type I or Insulin Dependent Diabetes Mellitus (IDDM). In this handbook, IDDM and Type I diabetes are used interchangeably. Some people refer to this type of diabetes as "juvenile" because people with Type I diabetes are usually young at the time of diagnosis.

What is Brittle Diabetes?

- The term "brittle" suggests that this type of diabetes is difficult to control, but when you follow a control regimen designed just for you, and learn to help in your own care, this term will probably not apply.

For More Information

For more information on Type I diabetes, read *A Diabetic Doctor Looks at Diabetes: His and Yours*, by Peter A. Lodewick, M.D. You can order a copy from RMI Corporation, 341 Broadway, Cambridge, MA 02139, Attention: Order Processing Department.

⚠️ REMEMBER: The care of diabetes is a team effort involving you, your physician, and the diabetes education staff where you receive your medical care. This handbook cannot-and was not meant to-replace this team effort.

This handbook embodies the approach of the diabetes care team at the University of Massachusetts Medical Center. Different diabetes care teams may approach some aspects of diabetes care in ways that differ from those in this handbook. While most teams are in close agreement regarding the GENERAL PRINCIPLES of diabetes care, they may differ in the DETAILS. There can be more than one "right" way to approach a specific issue in diabetes management.

Always remain in touch with your diabetes care team, and bring any questions you may have about the materials in this handbook to their attention!

Copyright 1995, 1996, 1997, 1998 Ruth E. Lundstrom, R.N., John P. Mordes, M.D., Aldo A. Rossini, M.D. All rights reserved.

Feedback: send e-mail to Dr. Aldo Rossini

This page was last revised on January 1, 1998.

[[Table of contents](#) | [Glossary](#) | [Previous chapter](#) | [Next chapter](#)]

The Healing Handbook *for* Persons with Diabetes

[[Table of contents](#) | [Previous chapter](#) | [Next chapter](#)]

Chapter 4 Non-Insulin Dependent Diabetes Mellitus (NIDDM or Type II Diabetes)

- [Goals for People with Type II Diabetes](#)
- [Controlling Your Type II Diabetes](#)
- [The Weight Factor](#)
- [Oral Hypoglycemic Pills](#)
- [For More Information](#)



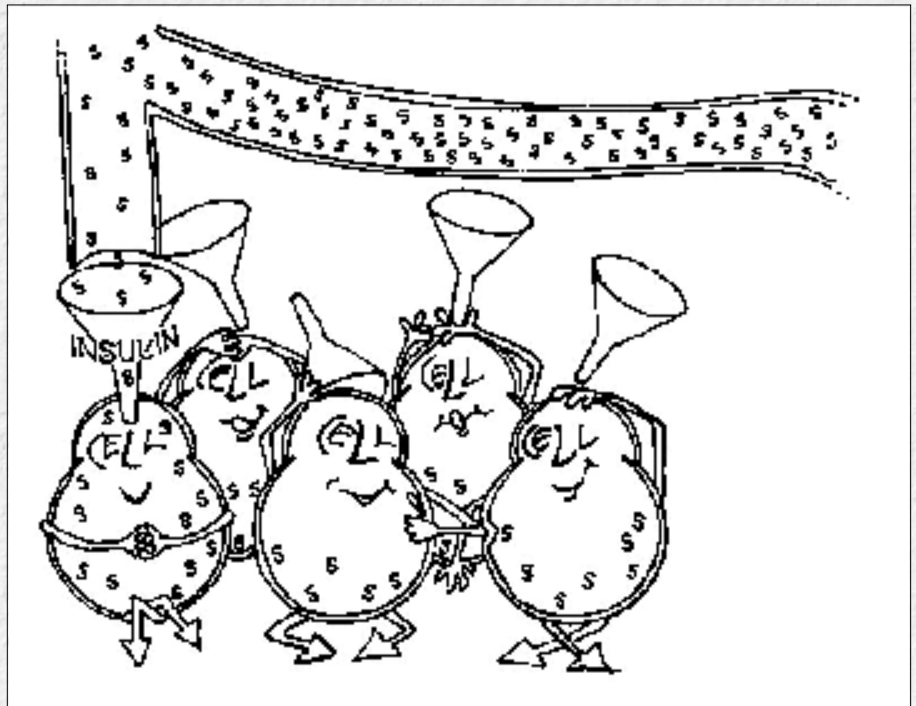
Goals for People with Type II Diabetes

With Type II diabetes, you can enjoy a healthy, normal life by maintaining control of your condition. Keep the following goals in mind:

- Learning about your diabetes and how to take care of yourself
- Keeping your body healthy by achieving your ideal weight
- Sticking to your meal plan
- Strengthening your heart and lungs through exercise
- Minimizing the risk of complications by maintaining good blood sugar levels

If you have **Type II** (non-insulin dependent) diabetes, your body has a "relative" deficiency of insulin.

The beta cells in your pancreas are producing some insulin, but the insulin is either too little or isn't working properly to let glucose get into your cells to produce energy.



If your Type II diabetes is not controlled, excess glucose accumulates in your blood, resulting in hyperglycemia, or high blood sugar. Your symptoms have come on so slowly that you may not have noticed them. You may have experienced some of the following: more tired, increased thirst, frequent urination, dry, itchy skin, blurred vision, slow-healing cuts or sores, more infections than usual, numbness and tingling in feet.

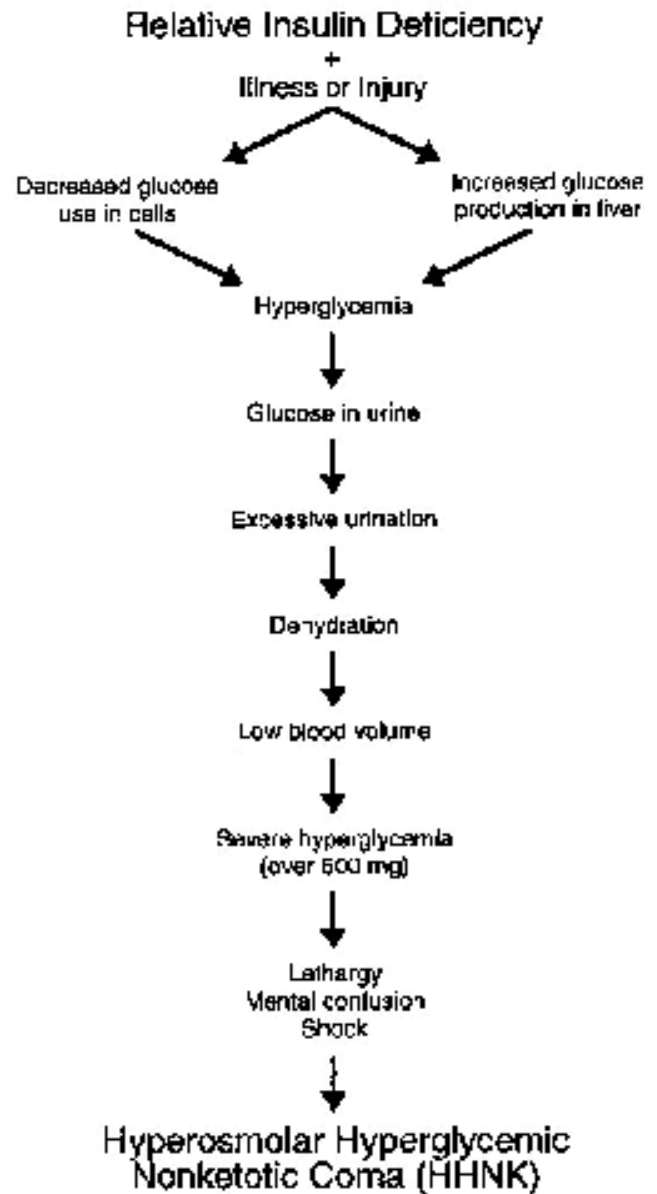
If you ignore these symptoms for several days, dehydration may result, leading to low blood volume.

If Type II diabetes remains uncontrolled for a long period of time, more serious symptoms may result. These include severe hyperglycemia (blood sugar over 600 mg) lethargy, confusion, shock, and ultimately what doctors call "hyperosmolar hyperglycemic nonketotic coma".

These symptoms are more common in elderly people with diabetes and in people suffering from an illness or infection.

You can avoid these symptoms by keeping your Type II diabetes in good control, and by calling your doctor when your blood sugars are persistently high.

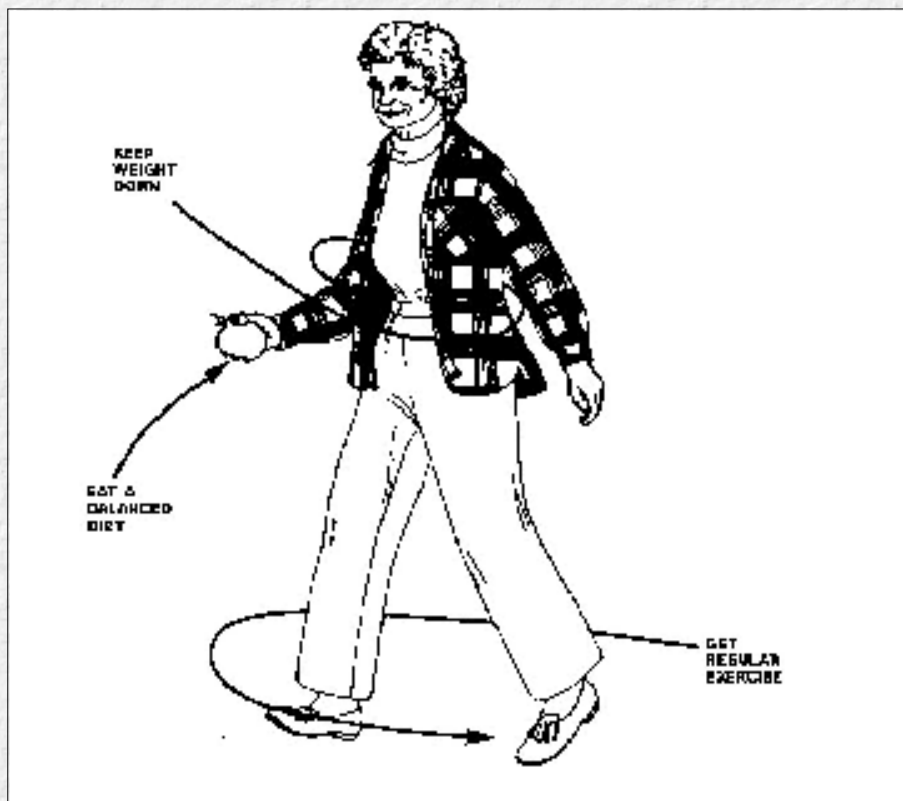
HYPEROSMOLAR HYPERGLYCEMIC NONKETOTIC COMA — A SPECIAL PROBLEM



Controlling Your Type II Diabetes

To control your Type II diabetes, you need to eat right, stay active, monitor your control, follow your diabetes educator's or doctor's orders, and have regular checkups.

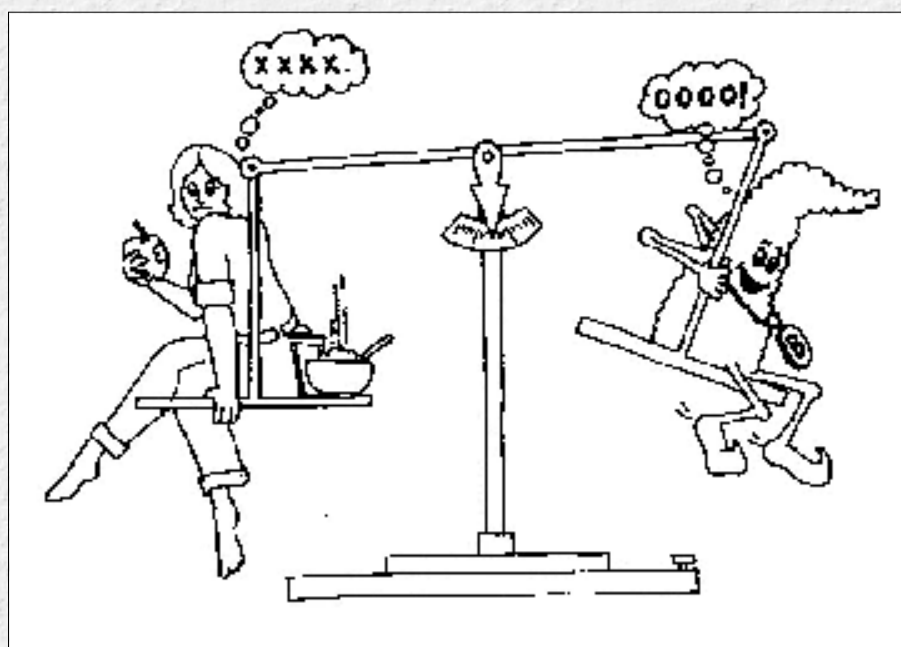
- **Eating right** helps you control your weight. Weight is the most important factor in Type II diabetes control. Eat healthy foods, and if you are overweight, follow a meal plan to lose weight. For information on nutrition for people with diabetes, see [Chapter 6](#).
- **Staying active** with exercise burns calories to help you control your weight. Exercise also stimulates insulin functioning to make the insulin your body produces work more effectively. For information on exercise programs for people with diabetes, see [Chapter 5](#).

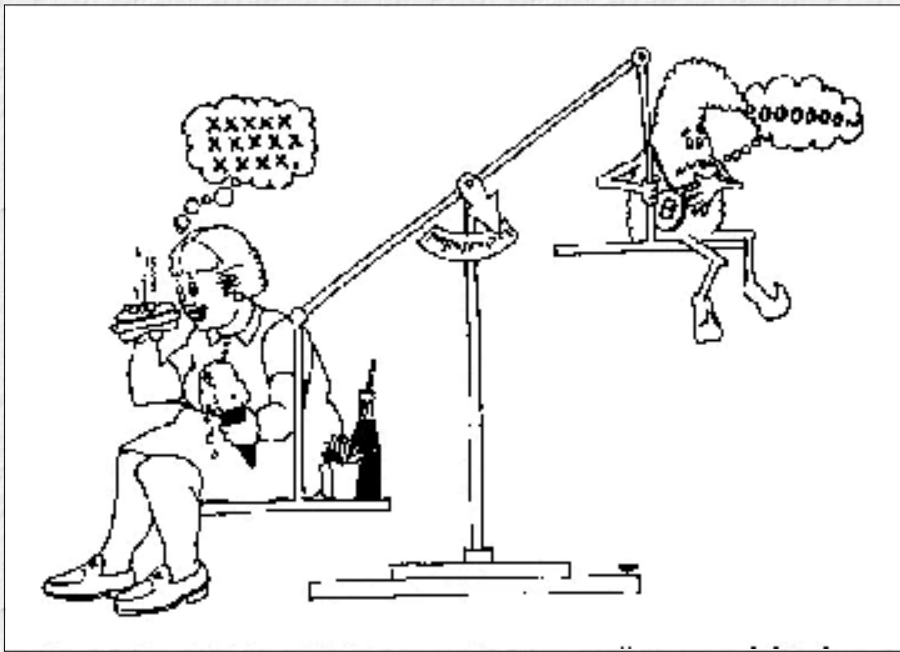


- Following your diabetes educator's or doctor's orders means sticking to your diet, exercise, and blood glucose monitoring instructions every day. Be sure to take prescribed medications at the correct times.
- At your regular checkups, always have your blood pressure and your feet checked. And have your vision checked at least once a year.

The Weight Factor

Why is weight such an important factor in Type II diabetes? This scale illustrates how extra body fat affects you. Food is represented by X's and insulin is represented by O's. In people who do not have diabetes, a balance between X's and O's is always achieved.





In people with Type II diabetes, who are usually overweight, the beta cells cannot produce enough insulin to maintain a balance. There are too many X's (food) for the O's (insulin) to handle. The best treatment is to decrease stored fat (X's) to balance with the available insulin (O's)!

Oral Hypoglycemic Pills

Your doctor may prescribe oral hypoglycemic pills to stimulate the beta cells in your pancreas to produce more insulin and help the insulin work more effectively. For more information on oral hypoglycemic pills, see [Chapter 9](#).

Sick Days

How to take care of your Type 2 diabetes when you are sick can be a difficult problem. If you cannot eat, it may be necessary to reduce the amount of medication or oral hypoglycemic pill that you take. This is explained in [Chapter 10](#). As always, the specific course of action to take when you are sick should be discussed with your diabetes educator or physician!

Questions and Answers

If I lose weight, will my diabetes go away?

- No. Diabetes cannot be cured, but it can be controlled, sometimes by diet and exercise alone. If you lose weight, your diabetes symptoms may disappear, but you will still have diabetes if your weight goes back up.

If I take oral diabetes pills, do I still have to stay on my diet?

- Yes. Even oral hypoglycemic pills cannot stimulate insulin production enough or reduce the need for insulin enough to make up for a careless diet.

Will I have to take insulin by injection?

- There is no guarantee that your diabetes will always be controlled by diet or by diet and oral medications. But weight control and careful attention to diet and exercise increase your chances of staying in good control without insulin injections.

For More Information

For more information on Type II diabetes, you may want to order a copy of *Diabetes Type II* from Diabetes Supplies, 8181 North Stadium Drive, Houston, TX 77054; or PARNA Publications, 5623 Matilija Ave, Van Nuys, CA 91401.

⚠ REMEMBER: The care of diabetes is a team effort involving you, your physician, and the diabetes education staff where you receive your medical care. This handbook cannot-and was not meant to-replace this team effort.

This handbook embodies the approach of the diabetes care team at the University of Massachusetts Medical Center. Different diabetes care teams may approach some aspects of diabetes care in ways that differ from those in this handbook. While most teams are in close agreement regarding the GENERAL PRINCIPLES of diabetes care, they may differ in the DETAILS. There can be more than one "right" way to approach a specific issue in diabetes management.

Always remain in touch with your diabetes care team, and bring any questions you may have about the materials in this handbook to their attention!

Copyright 1995, 1996, 1997, 1998 Ruth E. Lundstrom, R.N., John P. Mordes, M.D., Aldo A. Rossini, M.D. All rights reserved.

Feedback: send e-mail to Dr. Aldo Rossini

This page was last revised on January 2, 1998.

[[Table of contents](#) | [Glossary](#) | [Previous chapter](#) | [Next chapter](#)]

The Healing Handbook *for* Persons with Diabetes

[[Table of contents](#) | [Previous chapter](#) | [Next chapter](#)]

Chapter 10 Sick Day Management

- [Sick Day Management at a Glance](#)
- [Adding Insulin](#)
- [Reducing Insulin](#)
- [A Sick Day Rules Diagram](#)
- [Oral Hypoglycemic Pills and Illness](#)
- [Food for Sick Days](#)
- [Nausea, Vomiting, and Diarrhea](#)
- [Nonprescription Medicines For When You Are Sick](#)

Many kinds of illnesses can disrupt your blood glucose control. Viral colds or flu, infections, injuries, fever, vomiting, and diarrhea all increase your need for insulin. Emotional stress and surgery can also affect blood glucose level. Learning to manage "sick days" at home can help you avoid hospitalization and make you feel more comfortable until your illness has passed.



SICK DAY MANAGEMENT AT A GLANCE

1. **NEVER omit your insulin**, even if you can't eat. You may need additional insulin, but do not take additional oral hypoglycemic pills.
2. Test your blood sugar every 4 hours. If you need help, ask for it!
3. If you have Type I Diabetes, test your urine for ketones every 4 hours.
4. Drink clear liquids (at least ½ cup every hour), and eat light foods if you can.
5. Rest. Do not exercise during an illness.
6. Call your doctor or diabetes educator if:
 - You have an obvious infection
 - Your illness lasts longer than 2 days
 - You have vomiting or diarrhea more than 8 hours

- Your blood sugar is over 400 mg in two consecutive tests
- All urine tests are positive for large amounts of sugar
- You have moderate to large urine ketones with a blood glucose level over 200 mg for more than 8 hours
- You feel very ill or experience pain
- You have extreme fatigue, shortness of breath, or dizziness

Adding Insulin

When your blood sugar is high on sick days, add Regular insulin only. Additional Regular insulin helps your body use the sugar in blood and prevents breakdown of fat cells.

For blood sugar over 150 mg/dl, add 10% of your total daily dose as Regular insulin every 4-6 hours.

- Here is an example: Blood sugar is 210 mg and urine ketones are negative.

| | | |
|--------------------------------|----------------|---------------------|
| Total usual AM dose of insulin | NPH Regular | 22 units 4 units |
| Total usual PM dose of insulin | NPH Regular | 10 units 4 units |
| GRAND TOTAL: | | 40 Units |

- 10% of the total dose = 4 units.
- Add 4 units regular insulin to usual dose every 4-6 hours, when blood sugar is over 150 mg.

For blood sugar over 150 mg/dl PLUS moderate to large ketones in the urine, add 20% of your total daily dose as Regular insulin every 4-6 hours.

- Example: Blood sugar is 300 mg, urine ketones - positive.

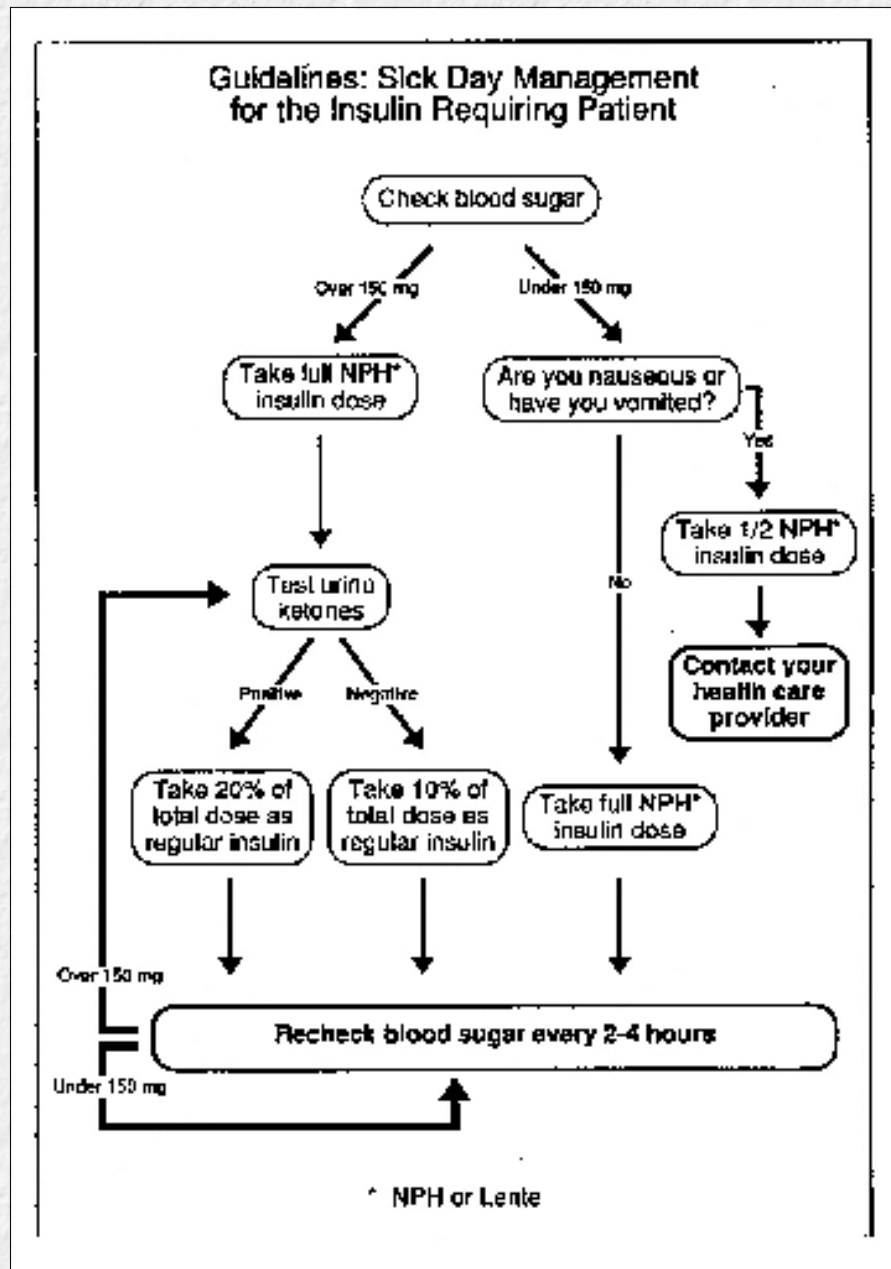
| | | |
|-------------------------------------|----------------|---------------------|
| Total usual AM dose of insulin | NPH Regular | 14 units 2 units |
| Total usual PM dose of insulin | Regular | 4 units |
| Total usual bedtime dose of insulin | NPH | 10 units |
| GRAND TOTAL: | | 30 Units |

- 20% of the total dose = 6 units.
- Add 6 units regular insulin to usual dose every 4-6 hours, when blood sugar is over 150 mg and urine ketones are positive.

Reducing Insulin

- When your blood sugar is below 150 mg and you are unable to eat meals due to nausea and vomiting, take only NPH or Lente insulin and no regular insulin.
- Contact your diabetes educator or doctor if this occurs. They will provide guidance regarding how much of your usual NPH or Lente dose should be used.

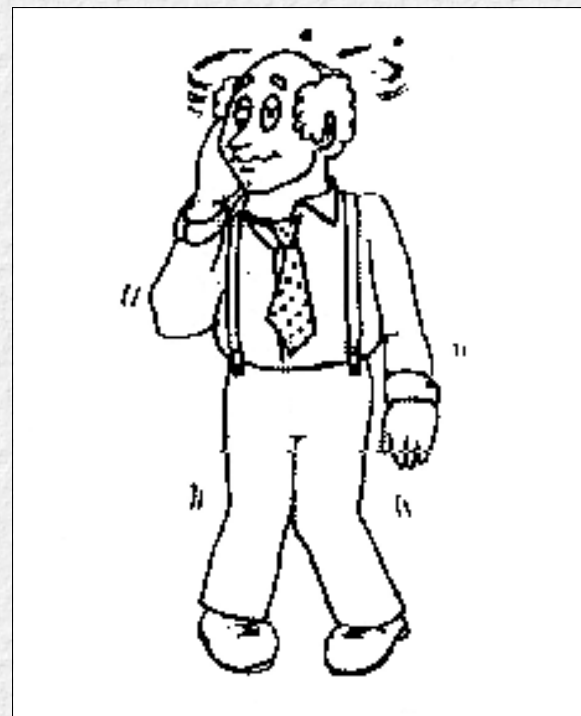
A Sick Day Rules Diagram



Oral Hypoglycemic Pills and Illness

If you take oral hypoglycemic pills, you must watch for signs of **low blood sugar** during any illness that causes you to vomit or keeps you from eating and drinking normally. The hypoglycemic pills you took before your illness continue working to lower your blood sugar even when you do not increase it by taking in food. Try to replace missing carbohydrates by eating soup, crackers, or toast, or by drinking ginger ale or cola.

Test your blood glucose or urine every few hours. If your blood glucose levels are all below 120 or your urine tests are all negative for sugar, and you are shaky, nervous, sweaty, pale, weak, or dizzy, or have tingling or numbness in your hands or feet, **call your doctor immediately or seek emergency assistance**. You will need help to get through this time.



Food for sick days

If you are too sick to follow your meal plan, try to replace carbohydrates with liquids or soft foods. Carbohydrates provide sugar so that the body does not have to burn fat for energy. Burning fat produces ketones, which can be dangerous. Carbohydrates also prevent blood sugar from dropping too low.

Small, frequent feedings may be easier for you to tolerate during an illness, and help your digestive system provide energy to your cells more quickly.

Try to drink 4 ounces of clear liquids such as tea, apple juice, or diet soda every hour.

If you can keep food down, but still have no appetite, try 1/2 cup cream soup, 1/2 cup cooked cereal, 1 cup plain yogurt, Jell-O, 1/2 banana, 1 scrambled egg, 1/2 cup custard, or 1/2 cup sherbet. Once you're feeling better, try adding toast, vanilla wafers, and small amounts of food from your regular meal plan. Avoid spicy foods.

Nausea, Vomiting, and Diarrhea

When you experience these symptoms, take small pieces of crushed ice, or 1-2 ounces of regular cola or ginger ale (decarbonate by stirring) every 30 minutes.

If you can keep this down, try adding soup or broth, tea, and clear juices.

Soups and broths help to replace sodium and potassium lost through vomiting and diarrhea.

Nonprescription Medicines For When You Are Sick

People with diabetes get colds, allergies, and upset stomachs, just like people without diabetes. Over-the-counter medicines for these ailments may contain ingredients that raise or lower blood glucose, or that mimic symptoms of high or low blood glucose.

Read the label before you purchase or use any over-the-counter medication. If there is a warning that people with diabetes should check with their doctors before using the product, do so. Some people with diabetes may be able to use the product, while others may not.

Here are some medications you **can** use:

| | |
|-------------------------|--|
| For Coughing | Sorbutusess Syrup, Toclonol Expectorant |
| For Sore Throat | Cerose or Cerose DM, Scot-tussin |
| Decongestants | Afrin or Neo-Synephrine Nasal sprays (both may have opposite effect if overused), Afrinal, Chlortrimaton Tablets, Actifed, Sudafed, Drixoral |
| Allergy Products | Allerest, A.R.M Allergy Relief Medicine, Dimetapp Elixir, Contact (all these may cause drowsiness) |
| For Diarrhea | Pepto-Bismol, Kaopectate, Donogel, Parapectolin, Immodium |
| For Constipation | Konsyl, Kondremul, Agoral Neoloid, Phospho-soda, Milk of Magnesia, Colace, Metamucil (or any enema or suppository) |
| Antacids | Digel, Gelusil, Maalox, Mylanta, Riopan |
| Nausea/Vomiting | Coke syrup or Emitrol (products contain sugar, but may be used in moderation, especially when one is not eating) |
| Motion Sickness | Dramamine tablets, Scopolamine Patch, Bonine |

Warnings

- Do not use appetite suppressants. Follow your diet and exercise plan to lose weight.
- Large amounts of aspirin may interact with oral hypoglycemic agents, lowering blood sugar. A couple of aspirin now and then cause no harm for adults, however.

⚠ REMEMBER: The care of diabetes is a team effort involving you, your physician, and the diabetes education staff where you receive your medical care. This handbook cannot-and was not meant to-replace this team effort.

This handbook embodies the approach of the diabetes care team at the University of Massachusetts Medical Center. Different diabetes care teams may approach some aspects of diabetes care in ways that

differ from those in this handbook. While most teams are in close agreement regarding the GENERAL PRINCIPLES of diabetes care, they may differ in the DETAILS. There can be more than one "right" way to approach a specific issue in diabetes management.

Always remain in touch with your diabetes care team, and bring any questions you may have about the materials in this handbook to their attention!

Copyright 1995, 1996, 1997, 1998 Ruth E. Lundstrom, R.N., John P. Mordes, M.D., Aldo A. Rossini, M.D. All rights reserved.

Feedback: send e-mail to [Dr. Aldo Rossini](#)

This page was last revised on January 2, 1998.

[[Table of contents](#) | [Glossary](#) | [Previous chapter](#) | [Next chapter](#)]

The Healing Handbook *for* Persons with Diabetes

[[Table of contents](#) | [Previous chapter](#) | [Next chapter](#)]

Chapter 5 Monitoring

NOTICE: July 29, 1998: The Food and Drug Administration has recalled a SureStep Blood Glucose Meter. [Click here](#) for information.

● [Self Monitoring of Blood Glucose](#)

(SMBG)

● [Equipment for SMBG](#)

● [SMBG Instructions](#)

● [What Should my Blood Glucose](#)

[Levels Be?](#)

● [Recording SMBG Results](#)

● [SMBG Meters and Sensors](#)

● [Choosing a Lancet Device](#)

● [Glycosylated Hemoglobin](#)

● [Urine Tests](#)

● [Testing for Urine Ketones](#)

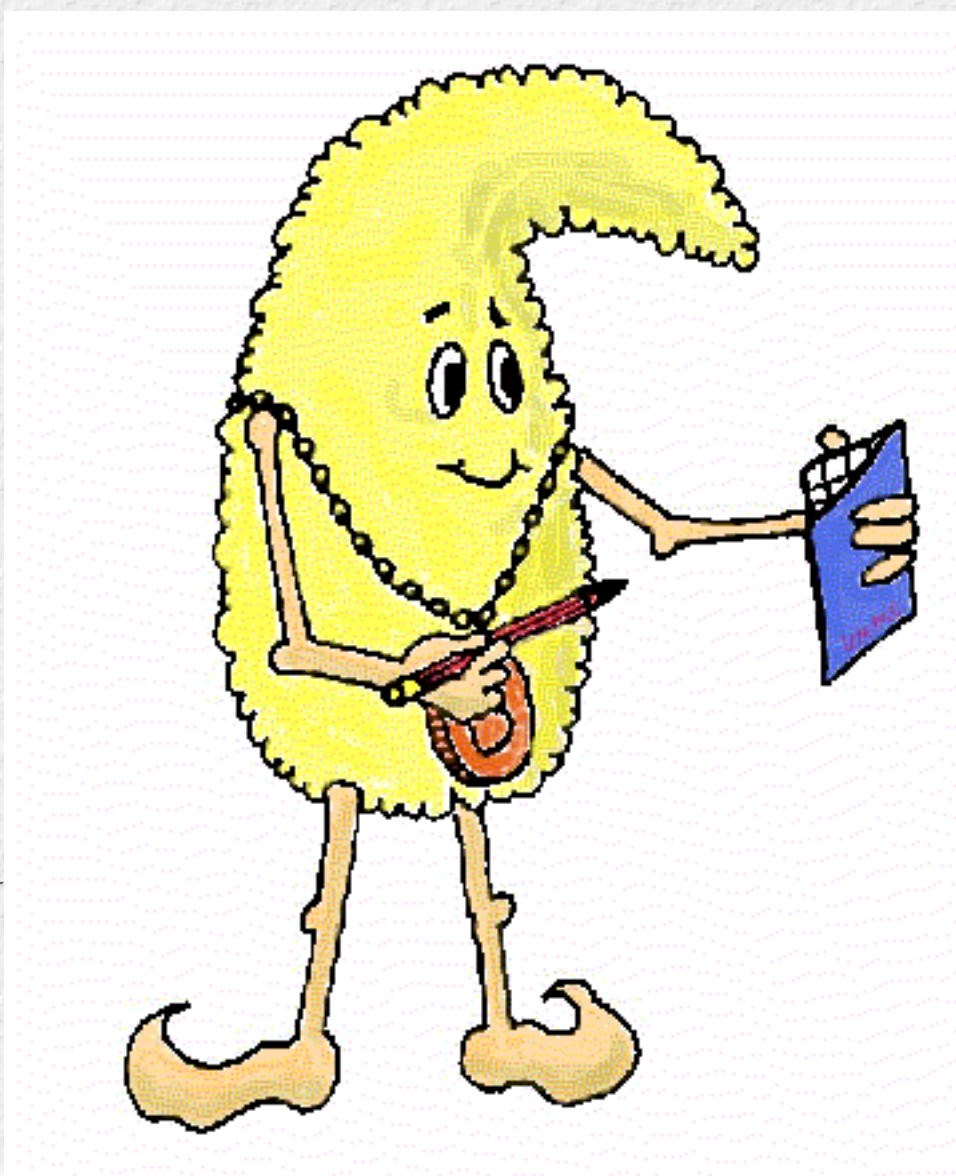
● [Testing for Urine Sugar](#)

● [Urine Testing Details](#)

Self-Monitoring of Blood Glucose

Self-monitoring blood glucose (SMBG) and urine testing are guides to diabetes control. Urine testing is an indirect method for measuring blood sugar. SMBG is a more direct method of monitoring your blood glucose level. Your diabetes educator or doctor may prescribe SMBG urine testing. Most health-care professionals prefer SMBG because of the following limitations of urine testing:

Urine testing is an indirect method for measuring blood sugar. SMBG is a more direct method of monitoring your blood glucose level. Your diabetes educator or doctor may prescribe SMBG urine testing. Most health-care professionals prefer SMBG because of the following limitations of urine testing:



- You cannot test for low blood sugar (hypoglycemia) with urine testing.
- Sugar shows up in urine only when the blood glucose level exceeds the kidney threshold, and this threshold could be high.
- Because urine collects in the bladder over time, urine testing provides general information on blood glucose level over a few hours, rather than exact information on the level at test time.

SMBG -- Your Guide to Good Control

- SMBG allows you to determine the pattern of blood glucose levels and make necessary changes in your diet and exercise program or insulin dose.
- With SMBG, you can measure precisely the effects of changes in exercise, diet, and insulin on your blood glucose level.
- SMBG helps you avoid insulin reactions.
- The precise, immediate information provided by SMBG allows you to respond quickly to an elevation or decline in blood sugar.
- During an illness, the accurate information provided by SMBG can serve as a basis for treatment.

Self Monitoring Blood Glucose

If your diabetes educator or doctor recommends SMBG, he or she will prescribe a testing schedule of 1 to 4 times a day. You may be asked to test at various times.

- Before meals
- 2 hours after a meal
- At bedtime
- At 3 a.m.
- Before an insulin reaction
- Anytime you sense that your blood glucose level is high
- More frequently on sick days

You may need fewer tests once you have established your blood glucose patterns.

Your SMBG test times: _____

Remember, SMBG results are your guide to good control.

Equipment for SMBG

- Lancet Device
 - Lancets
 - Test Strips
 - Meter/Sensor
 - Alcohol Wipes
 - Log Book
 - Optional equipment: a computer and software for analyzing results that are stored in the memory of most new meters.
-

SMBG Instructions

SMBG instructions vary, depending on the meter or sensor you use. Make sure you carefully follow the instructions for your device.

All SMBG tests require a drop of blood. The side of the tip of the middle or ring finger is usually the most convenient and least painful place to obtain blood, but you can use any finger, or even an earlobe. Using the same finger (or pair of fingers) causes a callus to build up. You'll feel less discomfort but still obtain enough blood for each test.

Here are the steps for obtaining a drop of your blood:

1. Wash your hands with soap and warm water and dry them completely
or
Clean the area with alcohol and dry completely.
 2. Prick the finger tip with a small, pronged lancet. A spring lancet device gives a quick puncture with less discomfort.
 3. Hold your hand down, and milk the finger from the palm towards the tip. If little blood appears, wait a couple seconds and milk again. Do not squeeze close to the puncture.
 4. Turn your hand palm down, so that the drop hangs.
 5. Catch the drop of blood on the special test strip pad or designated area.
 6. Follow the instructions included with your SMBG sensor or meter, and instructions from your diabetes educator, for measuring blood glucose.
 7. Record your test result.
-

What should my blood glucose levels be?

Your personal goal depends on your age, type of diabetes and how long you've had it, other health conditions, life style, and desire for control. Here are some guidelines:

| Time: | <i>Excellent</i> | <i>Good</i> | <i>Fair</i> | <i>Poor</i> |
|-------------------------------|------------------|-------------|-------------|-------------|
| Before a Meal (or fasting) | 60-100 | 100-140 | 140-180 | over 180 |
| After a Meal | 110-140 | 140-180 | 180-220 | over 220 |

Your diabetes educator and physician will help you set your own goals. For some people, a blood sugar level below 80 mg is too low, while for others a level under 100 mg is too low. A level over 120 before a meal is too high for some, while for others it is normal.

Recording SMBG Results

Keeping a record of SMBG test results is vital. You and your health-care professionals use this information to make safe adjustments to your diet, exercise plan, and insulin or oral hypoglycemic pills. Make sure your SMBG test record includes any unusual events, such as illness, stress, and changes in exercise or activity level.

SMBG Meters and Sensors

Meters and sensors for testing your blood glucose level vary in size, weight, test timing, range, and calibration method. They can read blood sugars as low as 0 and as high as 600 mg. Results may be obtained in 20 seconds to 2 minutes. Some tests require blotting or wiping, while others do not. All the available meters and sensors have been tested for accuracy. costs vary from \$50 to \$150. Insurance may pay 80% of the cost for people with insulin dependent diabetes. Trade-in offers and rebates can help reduce costs. At this time, all meters require test strips, which cost \$.65 to \$.80 each and are not covered by most insurance plans.

Photometric (color reflectance) meters have been around the longest and have proven reliable and accurate. They use a light source with filters and a lens to detect the color change on a strip pad caused by glucose in the blood. A digital result is produced. Photometric meters include the Accu-Chek, One-Touch, Tracer, Diascan and Glucometer.

An alternative technology for glucose measurement uses electrochemical detection. Glucose in the blood causes a reaction on the test strip that produces a tiny current. The meter detects the current and reports a digital test result. The Exactech Companion uses this technology.

Choosing a Lancet Device

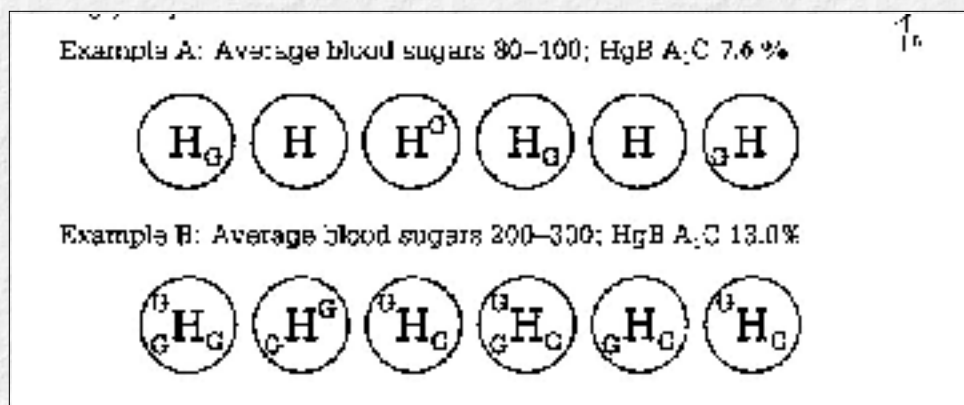
Some people prefer to see the lancet stick their fingers, while others prefer a hidden lancet. Button activated, pen-shaped devices are easy to use. Reliable lancets like the Softouch, Glucolet, Penlet, and B-D Autolance are available for \$15 to \$20.

NOTE: *Diabetes Forecast* magazine publishes its Yearly Consumer Issue and Buyer's Guide in October. In this issue, you'll find information on available meters and sensors, including prices and accuracy evaluations.

Glycosylated Hemoglobin

Glycosylated hemoglobin, or Hgb A1C, is a test that reflects the average of your blood sugar levels over the past 2-3 months. **Hemoglobin** is a protein found **inside red blood cells**. Glucose binds to hemoglobin, causing it to become glycosylated. The higher the percentage of hemoglobin that is glycosylated, the higher your average blood sugar for the past 2-3 months.

In these examples, the circles represent red blood cells, the large H inside the circles represent hemoglobin, and the small G's represent glucose. Where a G is present in a cell, the hemoglobin is glycosylated.



Urine Tests

Testing for Urine Ketones (Type I Diabetes)

If you have Type I diabetes, your diabetes educator or doctor may instruct you to test your urine for ketones when your blood sugar is over 200 mg, even if you use SMBG to monitor your blood glucose control. This is because SMBG does not alert you to presence of ketones.

Remember that when there is not enough insulin present to funnel glucose into your cells, your body tries to use stored fat to make fuel available to your cells. Fat in fat cells is broken down to "fatty acids," which pass through the liver and form ketones ([acetone](#)). Ketones are exhaled and excreted in urine.

Ketones in your urine is a warning sign of a low insulin level that requires quick action. If your urine tests positive for ketones and your blood sugar is high, contact your doctor or diabetes educator immediately, or, if instructed, use Sick Day Management guidelines (see [Chapter 10](#)). The only exceptions are when you have ketones following an insulin reaction or if your blood glucose level is near normal.

You can test for ketones with Ketostix, Chemstrip UK, or Acetest tablets. Shop around for the best

prices. And be sure to follow the package instructions.

Urine Sugar Testing (SMBG gives so much information -- why does anyone still test urine sugar?)

Urine testing is easy, painless, and inexpensive. For SMBG, you need to invest up to \$120 in a meter/sensor and also buy test strips at 65 to 80 cents each. Not all insurance policies cover strips, this can get expensive for people on fixed incomes. And some people just can't learn to draw a drop of blood. So diabetes educators and doctors may decide that urine testing is the best option for some patients.

Urine Testing Details

- Urine testing is simple and inexpensive, and it may be an adequate means of measuring blood sugar for some people. If your diabetes educator or doctor prescribes urine testing, he or she will recommend a testing schedule.

Your Urine test times: _____

Urine Testing Instructions


- Urine test strips or tapes are easy to use -- just dip and read. Test timing is specific, however. Be sure to read the directions that come with your urine test, and review these instructions with your diabetes educator to make sure you understand them. Available urine tests include TesTape, Diastix, and Chemstrip uG. Prices vary, so do some comparison shopping.

Urine Test Results

- The result of your urine test is a percentage figure that indicates the concentration of sugar in your urine. The higher the figure, the higher the concentration of sugar. Your test results will vary from one-half % to 5%, depending on the concentration of sugar. Use the percentage value when recording test results.
- When you are in good control, your urine tests should be negative (no sugar) most of the time. A negative urine test indicates that your blood glucose level is probably below 180 mg/ml. Your doctor or diabetes educator may instruct you to call for help when two or more consecutive urine tests show a positive result (1% to 5%).

Recording Urine Test Results

- Keeping a record of your urine test results is helpful. Your record should include date, type of medication, urine test results, and any unusual circumstances such as illness, stress, overeating, or change in activity level. Be sure to bring your record when you visit your doctor or diabetes educator.
-

 **REMEMBER:** The care of diabetes is a team effort involving you, your physician, and the diabetes education staff where you receive your medical care. This handbook cannot-and was not meant to-replace this team effort.

This handbook embodies the approach of the diabetes care team at the University of Massachusetts Medical Center. Different diabetes care teams may approach some aspects of diabetes care in ways that differ from those in this handbook. While most teams are in close agreement regarding the GENERAL PRINCIPLES of diabetes care, they may differ in the DETAILS. There can be more than one "right" way to approach a specific issue in diabetes management.

Always remain in touch with your diabetes care team, and bring any questions you may have about the materials in this handbook to their attention!

Copyright 1995, 1996, 1997, 1998 Ruth E. Lundstrom, R.N., John P. Mordes, M.D., Aldo A. Rossini, M.D. All rights reserved.

Feedback: send e-mail to [Dr. Aldo Rossini](#)

This page was last revised on October 6, 1998.

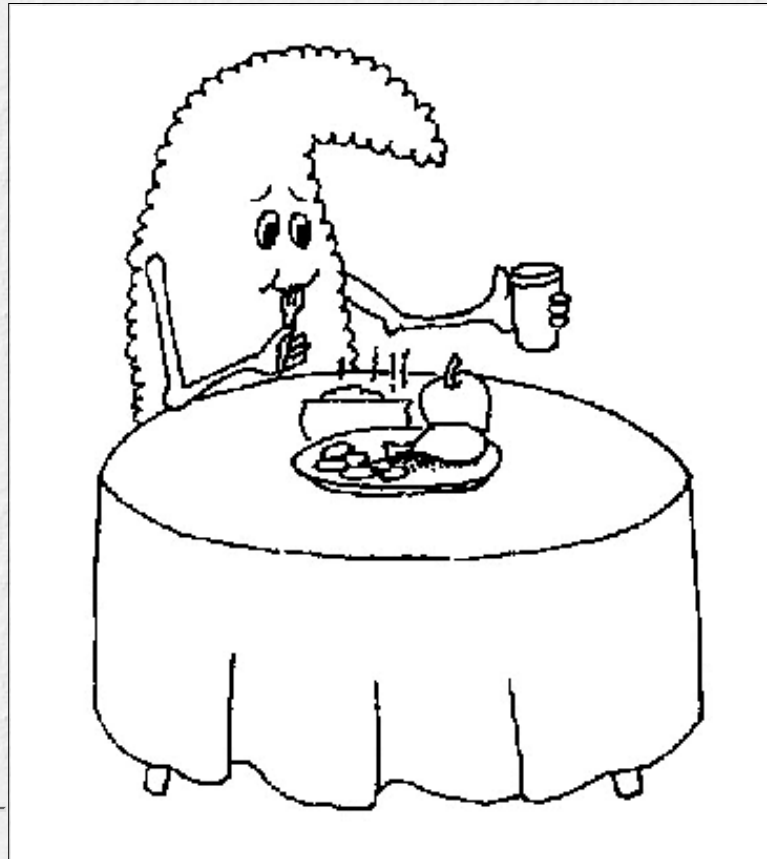
[[Table of contents](#) | [Glossary](#) | [Previous chapter](#) | [Next chapter](#)]

The Healing Handbook *for* Persons with Diabetes

[[Table of contents](#) | [Previous chapter](#) | [Next chapter](#)]

Chapter 6 Diet

- [The Diabetic Diet](#)
- [Cookbooks](#)
- [Basic Nutrition for People with Diabetes](#)
- [Guidelines for Healthier Eating](#)
- Exchange Lists: [General Principles](#) and Specifics
 - [Starch/Bread](#) [Meat](#) [Vegetables](#)
 - [Fruits](#) [Milk](#) [Combination Foods](#)
 - [Free Foods](#) [Fat](#) [Occasional Use Foods](#)
- [Special Management Tips:](#)
 - [Alcohol](#) [Eating Out](#) [Fast Food](#)
- [Exercise and Exchanges](#)
- [A Sample Diet](#)



Diet is a vital component in your overall diabetes control program. Your diabetes educator, dietitian, and doctor will develop a personal [meal plan](#) to help you attain appropriate blood sugar (glucose) and blood fat (cholesterol and triglyceride) levels.

If you have non-insulin dependent diabetes, sticking to your meal plan helps you achieve and maintain your correct weight, and balances the foods you eat with the insulin your body produces.

If you have insulin dependent diabetes, you must stick to your meal plan to insure a balance between injected insulin and the foods you eat.

The Diabetic Diet

Your diabetic diet is a well-balanced meal plan tailored to your individual needs, tastes, activity level and life style. Meal times and types and amounts of foods are planned and adjusted just for you. You may need to learn more about foods, and you may have to make some changes in your eating habits. The better you understand your diet, the more flexibility you can enjoy.

Your dietitian is there to get you started on your way to good nutrition and better health. He or she can help you tailor favorite recipes to fit your prescribed meal plan. Your dietary needs are not like anyone else's. That's why your dietitian's help is so important. Once you understand your dietary needs, you'll be able to design your own menus and make safe judgments about your diet.

Cookbooks

These cookbooks can help you plan healthy, varied meals that fit perfectly into your personal diabetes diet. Most are available at your local bookstore.

ADA Family Cookbook, Vol. III

ADA Family Cookbook, Vol. IV (The American Tradition)

The UCSD Healthy Diet for Diabetes

The Art of Cooking for the Diabetic

The Calculating Cook

Exchanges for All Occasions

The International Menu Diabetic Cookbook

Oriental Cooking for the Diabetic

Sugar Free Kid's Cookery

Attention Vegetarians!

Ask your dietitian about vegetarian options, and check your book store for *Vegetarian Cooking for Diabetics* by Patricia Mozzar (published by The Book Publishing Company).

Basic Nutrition for People with Diabetes

Although foods contain many nutrients, it is easiest to categorize them in three groups: carbohydrates, proteins, and fats.

- **Carbohydrate** foods include bread, potatoes, rice, crackers, cookies, sugar, fruit, vegetables, and pasta. When digested, carbohydrates provide fuel for energy.
- **Protein** foods include meat, poultry, fish, eggs, cheese, dried beans, and legumes. When digested, protein is used to build and repair your body. Some protein may also be used as fuel for energy.
- **Fat** foods include butter, margarine, cooking oil, cream, bacon, and nuts. When digested, fats are stored as fat cells or later used as fuel for energy.

Your meal plan will include carbohydrates, proteins and fats in amounts that will promote good diabetes control

while providing adequate fuel for energy and building and repairing your body.

Calories

A calorie is a unit of heat used to express the energy-producing content of foods. Your dietitian will determine how many calories you need every day, and how they should be divided among types of food, by considering your height, weight, age, activity level, growth needs, metabolism, and general life style. For example, an active young person of normal weight needs more calories than an inactive older person or an overweight person.

Remember, if you eat more calories than you need to produce energy, the excess calories are stored as body fat.

Obesity

If you are overweight, losing weight is your primary goal. You can lose weight by eating fewer calories than your body needs for your usual activity level and by increasing your exercise.

A pound of fat is equal to 3,500 calories. To lose a pound in a week, you'd have to cut your calorie intake by 500 calories a day ($500 \text{ calories} \times 7 \text{ days} = 3,500 \text{ calories}$, or one pound). If that sounds like a lot of dieting for very little weight loss, remember a pound a week is 52 pounds a year. But you have to stick with it.

To achieve your ideal weight you have to develop good eating habits, and to maintain that weight you must continue those habits.

Be realistic. Making a big change in your life takes time. It might help to keep a record of your weight each week, so you know when you're making progress, and when you're not. And don't worry about occasional relapses. Don't be harsh with yourself if you overeat once or twice, or regain a pound or two you thought you'd lost forever. But do try to identify the causes of your relapses, so that you can avoid them in the future.

Guidelines for Healthier Eating

There are some very simple things you can do every day to make sticking to your diet easier:

- **Plan** your meals so that you eat healthy food, not just whatever is easiest
- **Think** before you eat instead of raiding the refrigerator every time you feel hungry.
- Use a **smaller plate**, so that you can't heap on much more than you really want or need
- **Chew** slowly and completely, savoring every mouthful, instead of packing in as much as you can as quickly as you can.

The following guidelines are a little more complicated, but well worth the effort:

EAT LESS FAT

- Cut down on meat. Eat more fish and poultry instead. When you do eat red meat, choose the leanest cuts.
- Roast, bake, or broil instead of frying. Trim the fat off meat and the skin off poultry, and avoid adding fat in cooking. Beware of sauces and gravies. They often contain lots of fat.

- Eliminate or cut down on high-fat foods like cold cuts, bacon, sausage, hot dogs, butter, margarine, nuts, salad dressings, lard, and shortening.
- Eat less ice cream, cheese, sour cream, cream, and other high-fat dairy products. Check for low-fat versions; they're increasingly available in grocery stores. And drink skim or low-fat milk instead of whole milk.

Know Your Fats

Cholesterol is a fatty substance found in animal foods (meat, poultry, egg yolks, whole milk, cheese, ice cream, butter). Have your cholesterol level tested; your goal is a level under 200 mg/dl.

High-density lipoprotein (HDL) is a type of cholesterol that may protect against heart disease (good cholesterol).

Low-density lipoprotein (LDL) is a harmful type of cholesterol that deposits on artery walls and increases the risk of heart disease (bad cholesterol).

Monounsaturated fat is a type of unsaturated fat that lowers blood cholesterol. It is found in olive oil and peanut oil

Polyunsaturated fat is a vegetable fat that lowers total blood cholesterol. It is found in cottonseed, soybean, sunflower, and safflower oils.

Saturated fat is an animal fat that raises total blood cholesterol. It is found in hydrogenated vegetable fats, coconut and palm oils, cocoa butter, meat fat, whole milk, butter cream, and fatty cheeses.

Triglycerides are fats in the blood that may increase the risk of heart disease.

INCREASE FIBER

- Switch to whole-grain breads, cereals and crackers.
- Eat more vegetables -- raw and cooked. Instead of fruit juice, eat fresh, whole fruit.
- Sample high-fiber foods that may be new to you, like bran, barley, bulgur, brown and wild rice, and dried beans, peas, and lentils.

What is Fiber?

Also known as roughage, fiber is the part of plant food your body cannot digest.

Fiber relieves constipation, lowers blood cholesterol levels, and apparently slows down the rate of carbohydrate digestion, reducing carbohydrate-induced elevations of blood sugar.

Fiber also causes gas if you eat too much too quickly.

REDUCE SODIUM

- Don't add salt in cooking, and try not to put salt on your food at the table.
 - Cut down on high-salt foods like canned soups, ham, sauerkraut, hot dogs, and pickles. Food that tastes salty probably is salty.
 - Eat fewer convenience foods and try to avoid fast-food restaurants. Even when they don't taste salty, these foods are often loaded with sodium.
-

REDUCE SUGAR

- Don't eat table sugar. If you're used to adding sugar to food beverage, substitute an artificial sweetener that has no calories, like saccharin or aspartame (NutraSweet).
 - Avoid honey, syrup, jam, jelly, candy, sweet rolls, regular gelatin, cake with icing, and pie. Instead of fruit canned in syrup, choose fresh fruit, or fruit canned in natural juice or water.
 - Drink diet soft drinks. One twelve-ounce can of regular cola contains nine teaspoons of sugar!
-

Exchange Lists

Your dietitian may use **exchange lists** to help you plan meals and snacks. Exchange lists are groups of foods that contain roughly the same mix of carbohydrates, protein, fat, and calories. There are six exchange lists:

1. Starches and Breads
2. Meats and Meat Substitutes
3. Vegetables
4. Fruits
5. Milk
6. Fats

You need foods from all six lists for complete nutrition. Foods on the exchange lists are familiar, everyday items you can buy at the supermarket. For more information on cooking and eating with exchange lists. See *Exchanges for All Occasions*.

The Exchange Lists are the basis of a meal planning system designed by a committee of the American Diabetes Association and the American Dietetic Association. While designed primarily for people with diabetes and others who must follow special diets, the Exchange Lists are based on principles of good nutrition that apply to everyone. © 1989 by the American Diabetes Association, Inc. and by the American Dietetic Association.

Exchange Lists and Nutrition

This chart shows the amounts of carbohydrate, protein, fat, and calories in one serving from each exchange list.

| | | Carbohydrate (grams) | Protein (grams) | Fat (grams) | Calories |
|---------------------|------------|-------------------------|--------------------|----------------|----------|
| Starch/Bread | | 15 | 3 | trace | 80 |
| Meat | Lean | -- | 7 | 3 | 55 |
| | Medium fat | -- | 7 | 5 | 75 |
| | High fat | -- | 7 | 8 | 100 |
| Vegetable | | 5 | 2 | -- | 25 |
| Fruit | | 15 | -- | -- | 60 |
| Milk | Skim | 12 | 8 | trace | 90 |
| | Low fat | 12 | 8 | 5 | 120 |
| | Whole | 12 | 8 | 8 | 150 |
| Fat | | -- | -- | 5 | 45 |

As you read the exchange lists, you will notice that serving sizes vary for different choices on each list. Because foods are so different, portions are adjusted so that each choice on a list contains the same amount of carbohydrate, protein, fat, and calories.

If one of your favorite foods is not included on any exchange list, ask your dietician about it. You can probably work that food into your meal plan, at least now and then.

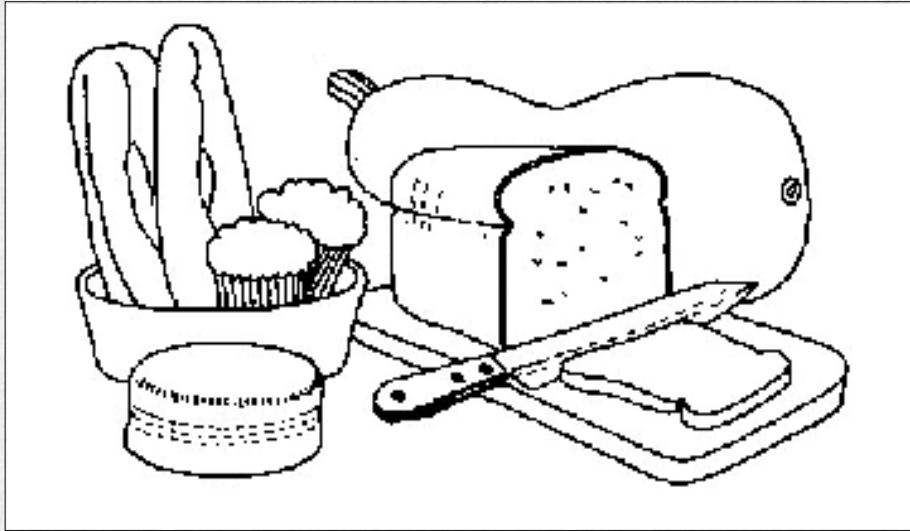
My Meal Plan in Exchanges

It's often helpful to use a little chart like this one to help you make a meal plan that's nutritious, that's good for taking care of your diabetes, and that has foods in it that you like.

| My Meal Plan | | | | | | |
|-----------------------------|------------------------|-----------|--------------------|------------|-------------------|----------|
| Carbohydrate _____ grams | Protein _____ grams | | Fat _____ grams | | Calories _____ | |
| | 1 Starch/Bread | 2 Meat | 3 Vegetable | 4 Fruit | 5 Milk | 6 Fat |
| Breakfast | | | | | | |

| | | | | | | |
|-------------------|--|--|--|--|--|--|
| Snack Time | | | | | | |
| Lunch | | | | | | |
| Snack Time | | | | | | |
| Dinner | | | | | | |
| Snack Time | | | | | | |

STARCH / BREAD LIST



- Choose your starch exchanges from this list. Each item is 1 exchange and contains about 80 calories. If you want to eat a starch food that is not on this list, the general rule is:
- 1/2 Cup of cereal, grain, or pasta is one serving
- 1 ounce of a bread product is one serving

Your dietitian can help you be more exact.

CEREALS / GRAINS / PASTA

| | |
|--|-----------|
| Bran cereals, concentrated | 1/3 Cup |
| Bran cereals, flaked (Bran Buds®, All Bran®) | 1/2 Cup |
| Bulgur, cooked | 1/2 Cup |
| Cooked cereals | 1/2 Cup |
| Cornmeal, dry | 1 1/2 tsp |
| Grapenuts | 3 tbsp |
| Grits, cooked | 1/2 Cup |
| Pasta, cooked | 1/2 Cup |
| Rice (white or brown), cooked | 1/2 Cup |
| Shredded Wheat | 1/2 Cup |
| Unsweetened cereals | 3/4 Cup |
| Wheat germ | 3 tsp |

DRIED BEANS/PEAS/LENTILS

| | |
|---|---------|
| Lentils, cooked | 1/3 Cup |
| Baked beans | 1/4 Cup |
| Beans and peas, cooked (kidney, white, split, blackeye) | 1/3 Cup |

STARCHY VEGETABLES

| | |
|---|----------------|
| Corn 1/2 Cup | 1/2 Cup |
| Corn on cob, 6" 1 | 1 |
| Lima beans 1/2 Cup | 1/2 Cup |
| Peas, green (canned or frozen) 1/2 Cup | 1/2 Cup |
| Plantain 1/2 Cup | 1/2 Cup |
| Potato, baked 1 small (3 oz) | 1 small (3 oz) |
| Potato, mashed 1/2 Cup | 1/2 Cup |
| Squash, winter (acorn, butternut) 3/4 Cup | 3/4 Cup |
| Yam, sweet potato, plain 1/3 Cup | 1/3 Cup |

BREAD

| | |
|---|-----------------|
| Bagel 1/2 (1 oz.) | 1/2 (1 oz.) |
| Bread sticks, crisp, 4" x 1/2" | 2 (2/3 oz.) |
| Croutons, low fat | 1 Cup |
| English muffin | 1/2 |
| Frankfurter or hamburger bun 1/2 | 1/2 (1 oz.) |
| Pita, 6" | 1/2 |
| Plain roll, small | 1 (1 oz.) |
| Raisin bread, unfrosted | 1 Slice (1 oz.) |
| Rye, pumpernickel | 1 Slice (1 oz.) |
| Tortilla, 6" 1 | 1 |
| White bread (including French or Italian) | 1 Slice (1 oz.) |
| Whole wheat bread | 1 Slice (1 oz.) |

CRACKERS/SNACKS

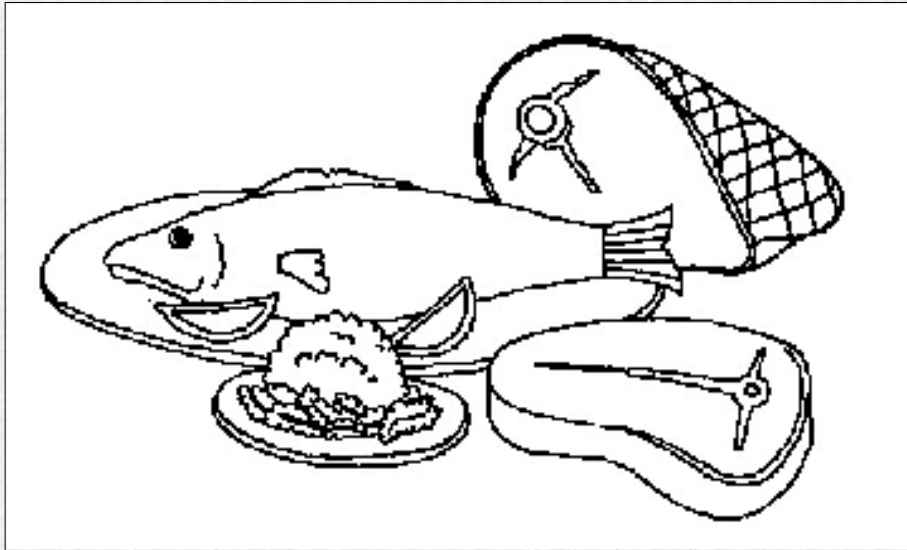
| | |
|--|----------------------|
| Animal crackers | 8 |
| Graham crackers, 1.5" square | 3 |
| Matzo | 3/4 oz. |
| Melba toast | 5 slices |
| Oyster crackers | 24 |
| Popcorn (popped, no fat added) | 3 Cups |
| Pretzels | 3/4 oz. |
| Rye crisp 2" x 3.5" | 4 |
| Saltine-type crackers | 6 |
| Whole wheat crackers, no fat added (crisp breads, such as Finn [®] , Kavli [®] , Wasa [®]) | 2-4 slices (1/4 oz.) |

STARCH FOODS PREPARED WITH FAT

(Count as 1 starch/bread serving, plus 1 fat serving)

| | |
|---|-------------|
| Biscuit, 2.5 in. across | 1 |
| Chow mein noodles | 1/2 Cup |
| Corn Bread, 2 inch cube | 1 (2 oz.) |
| Cracker, round butter type | 6 |
| French fried potatoes, 2 to 3.5 inch | 10 (1.5 oz) |
| Muffin, plain, small | 1 |
| Pancake, 4 inch | 2 |
| Stuffing, bread, (prepared) | 1/4 Cup |
| Taco shell, 6 inch | 2 |
| Waffle, 4.5 inch square | 1 |
| Whole wheat crackers, fat added (Triscuits) | 4-6 (1 oz.) |

MEAT LISTS



Choose meat and meat substitute exchanges from the lean, medium-fat, and high-fat lists. Each item is 1 exchange (usually 1 ounce of meat) and contains from 3 to 8 grams of fat and from 55 to 100 calories.

Include mostly lean and medium-fat meats, poultry, fish, and meat substitutes in your meal plan. By decreasing your fat intake, you can decrease your risk for heart disease. Items from the high-fat list are high in saturated fat, cholesterol, and calories, so limit your high-fat choices to 3 times per week.

Remember that meat and meat substitutes contribute no fiber to your meal plan.

TIPS FOR CUTTING DOWN FAT:

1. Bake, roast, broil, grill, or boil meats and substitutes rather than frying with added fat. When pan-frying, use a pan spray or non-stick pan.
2. Do not add flour, bread crumbs, or coating mixes when preparing meats and substitutes.
3. Trim off visible fat before and after cooking.
4. Weigh meat after removing bones and fat, and after cooking. Three ounces of cooked meat is equal to

about 4 ounces of raw meat. Sample meat portions are:

- 2 ounces meat (2 meat exchanges)
 - = 1 small chicken leg or thigh
 - = 1/2 Cup cottage cheese or tuna
- 3 ounces meat (3 meat exchanges)
 - = 1 medium pork chop
 - = 1 small hamburger
 - = 1/2 of a whole chicken breast
 - = 1 unbreaded fish fillet
 - = any cooked meat about the size of a deck of cards

LEAN MEAT AND MEAT SUBSTITUTES

| | | |
|----------------|---|--|
| Beef | USDA Good or Choice grades of lean beef: steaks (round, sirloin, or flank), tenderloin, chipped beef | 1 oz. |
| Pork | Lean pork: ham (fresh, canned, cured, or boiled), Canadian bacon, tenderloin | 1 oz. |
| Veal | All cuts are lean, except for veal cutlets (ground or cubed). Examples of lean veal include chops and roasts | 1 oz. |
| Poultry | Chicken, turkey, Cornish hen (without skin) | 1 oz. |
| Fish | All fresh and frozen fish Crab, lobster, scallops, shrimp, clams (fresh or canned in water) Oysters Tuna (canned in water) Herring (uncreamed or smoked) Sardines (canned) | 1 oz. 2 oz. 6 medium 1/4 Cup 1 oz. 2 medium |
| Game | Venison, rabbit, squirrel, pheasant, duck goose (without skin) | 1 oz. |
| Cheese | Any cottage cheese Grated parmesan Diet cheeses (less than 55 calories per oz.) | 1/2 Cup 2 tbsp 1 oz |
| Other | 95% fat-free luncheon meat Egg whites Egg substitutes (less than 55 calories per 1/4 Cup) | 1 oz. 3 whites 1/4 Cup |

MEDIUM-FAT MEAT AND MEAT SUBSTITUTES

| | | |
|----------------|--|---|
| Beef | Most beef products: ground beef (all types), roast (rib, chuck, rump), steaks (cubed, Porterhouse, T-bone), meat loaf | 1 oz. |
| Pork | Pork Most pork products: chops, loin roast, 1 oz. Boston butt, cutlets | 1 oz. |
| Lamb | Lamb: Most lamb products: chops, leg, roast | 1 oz. |
| Veal | Veal: Cutlets (ground or cubed, unbreaded) | 1 oz. |
| Poultry | Poultry: Chicken (with skin), domestic duck or goose (well-drained of fat), ground turkey | 1 oz. |
| Fish | Tuna (canned in oil and drained), 1/4 Cup salmon (canned) | 1/4 Cup |
| Cheese | <i>Skim or part-skim milk cheeses:</i> Ricotta Mozzarella Diet cheeses (56-80 calories per oz.). | 1/4 Cup 1 oz. 1 oz. |
| Other | 86% fat-free luncheon meat Eggs (high in cholesterol; limit to 3 per 1 week) Egg substitutes (56-80 calories per 1/4 Cup) Tofu (2.5" x 2.75" x 1") Liver, heart, kidney, sweetbreads (all high in cholesterol) | 1 oz. 1 1/4 Cup 4 oz. 1 oz. |

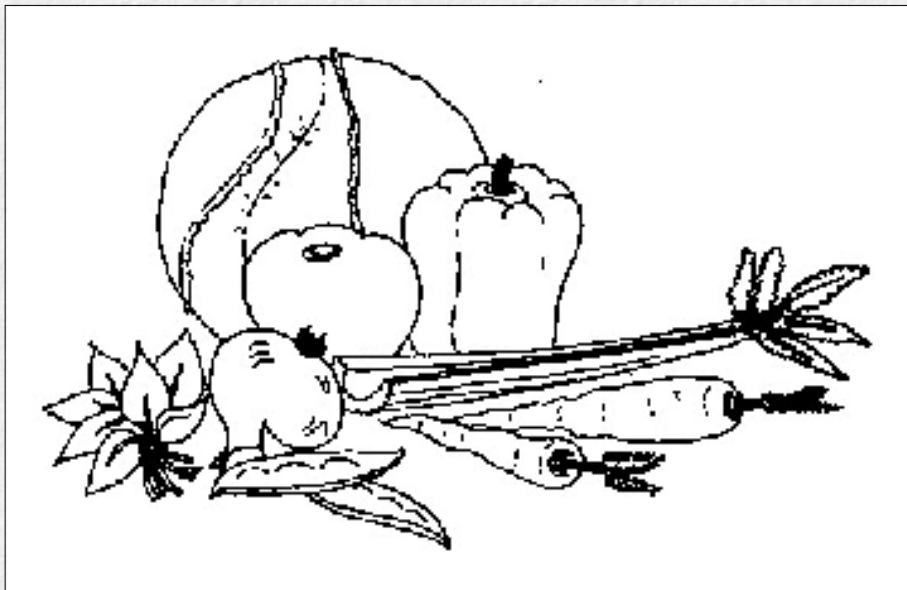
HIGH-FAT MEAT AND MEAT SUBSTITUTES

(Use only 3 times per week)

| | | |
|---------------|---|-------|
| Beef | Beef Most USDA Prime cuts: ribs, corned beef | 1 oz. |
| Pork | Spareribs, ground pork, pork sausage (patty or link) | 1 oz. |
| Lamb | Lamb Patties (ground) | 1 oz. |
| Fish | Fried fish (any kind) | 1 oz. |
| Cheese | Cheese All regular cheeses: American, blue, cheddar, Monterey jack, Swiss | 1 oz. |

| | | |
|--|---|---|
| Other | Luncheon meats: bologna, salami, pimento loaf Sausage (Polish, Italian) 1 oz. Knockwurst (smoked) Bratwurst Frankfurter (turkey or chicken, 10 per pound) Peanut butter (contains unsaturated fat) | 1 oz. 1oz. 1 oz. 1 oz. 1 frank 1 tbsp. |
| Counts as 1 high fat meat plus 1 fat exchange: | Frankfurter (beef, pork, or combination, 10 per pound) | 1 frank |

VEGETABLE LIST



Choose vegetable exchanges from this list. Unless otherwise noted, serving size is $\frac{1}{2}$ Cup for cooked vegetables and vegetable juices or 1 Cup for raw vegetables. A serving of any item is one exchange and contains about 25 calories and 2-3 grams of dietary fiber. See the Starch/Bread list for starchy vegetables (corn, peas, and potatoes). See the Free Food list for free vegetables.

Vegetables are a good source of vitamins and minerals. Fresh and frozen vegetables contain more vitamins than canned, and have less salt. Rinsing canned vegetables removes much of the added salt.

Artichoke (1/2 medium)

Asparagus

Beans (green, wax, Italian)

Bean sprouts

Beets

Broccoli

Brussels sprouts

Cabbage (cooked)

Cauliflower

Eggplant

Greens (collard, mustard, turnip)

Kohlrabi

Leeks

Mushrooms (cooked)

Okra

Onions

Pea pods

Peppers (green)

Rutabaga

Sauerkraut

Spinach (cooked)

Summer squash (crookneck)

Tomato (one large)

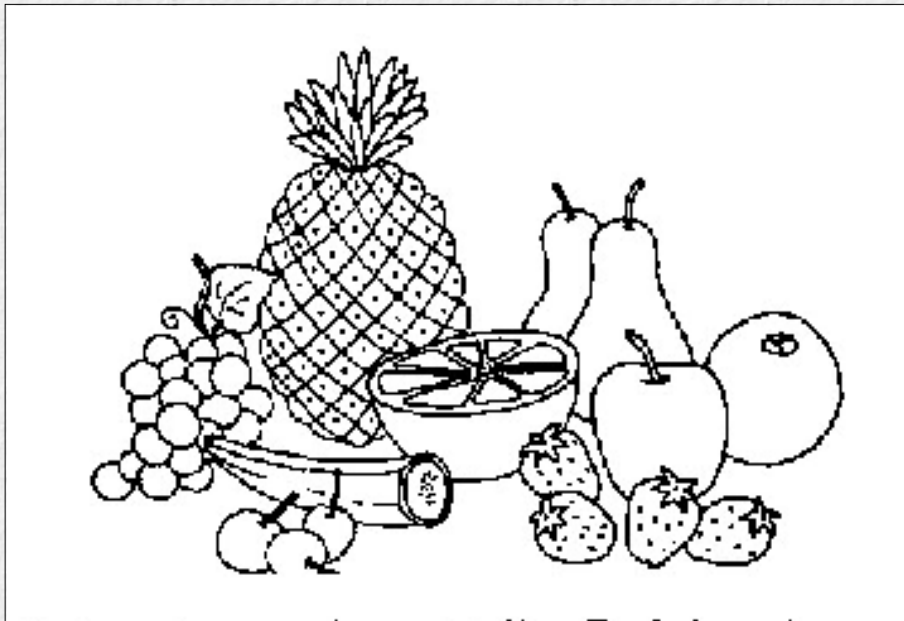
Tomato/vegetable juice

Turnips

Water chestnuts

Zucchini (cooked)

FRUIT LIST



Choose fruit exchanges from this list. Each item is one exchange and contains about 60 calories. Fresh, frozen, and dried fruits contain about 2 grams of [fiber](#) per serving; fruit juices add very little dietary fiber. Whole fruit is more filling than fruit juice, so it may be a better choice for those who are trying to lose weight. Use fresh fruits or fruits frozen without added sugar.

FRESH, FROZEN, AND UNSWEETENED CANNED FRUIT

| | |
|----------------------------|----------------------|
| Apple (raw, 2" diameter) | 1 apple |
| Applesauce (unsweetened) | 1/2 Cup |
| Apricot (medium, raw) | 4 apricots |
| Apricot (canned) | halves |
| Banana (9" long) | 1/2 banana |
| Blackberries (raw) 3/4 Cup | 3/4 Cup |
| Blueberries (raw) 3/4 Cup | 3/4 Cup |
| Cantaloupe (5" diameter) | 1/3 melon |
| Cantaloupe (cubes) | 1 Cup |
| Cherries (large, raw) | 12 cherries |
| Cherries (canned) | 1/2 Cup |
| Figs (2", raw) | 2 figs |
| Fruit cocktail (canned) | 1/2 Cup |
| Grapefruit (medium) | 1/2 grapefruit |
| Grapefruit (segments) | 3/4 Cup |
| Grapes (small) | 15 grapes |
| Honeydew (medium) | 1/8 melon |
| Honeydew (cubes) | 1 Cup |
| Kiwi (large) | 1 kiwi |
| Mandarin oranges | 3/4 Cup |
| Mango (small) | 1/2 mango |
| Nectarine (1.5" diameter) | 1 nectarine |
| Orange (2.5" diameter) | 1 orange |
| Papaya | 1 Cup |
| Peach (2.75" diameter) | 1 peach or 3/4 Cup |
| Peaches (canned) | 2 halves or 1/2 Cup |
| Pear | 1/2 large or 1 small |
| Pears (canned) | 2 halves or 1/2 Cup |
| Persimmon (medium, native) | 2 persimmons |
| Pineapple (raw) | 3/4 Cup |
| Pineapple (canned) | 1/3 Cup |
| Plum (raw, 2" diameter) | 2 plums |
| Pomegranate | 1/2 pomegranage |
| Raspberries (raw) | 1 Cup |
| Strawberries (raw, whole) | 1 1/4 Cup |
| Tangerine (2.5" diameter) | 2 tangerines |
| Watermelon (cubes) | 1 1/4 Cup |

DRIED FRUIT

Apples
Apricots
Dates
Figs
Prunes
Raisins

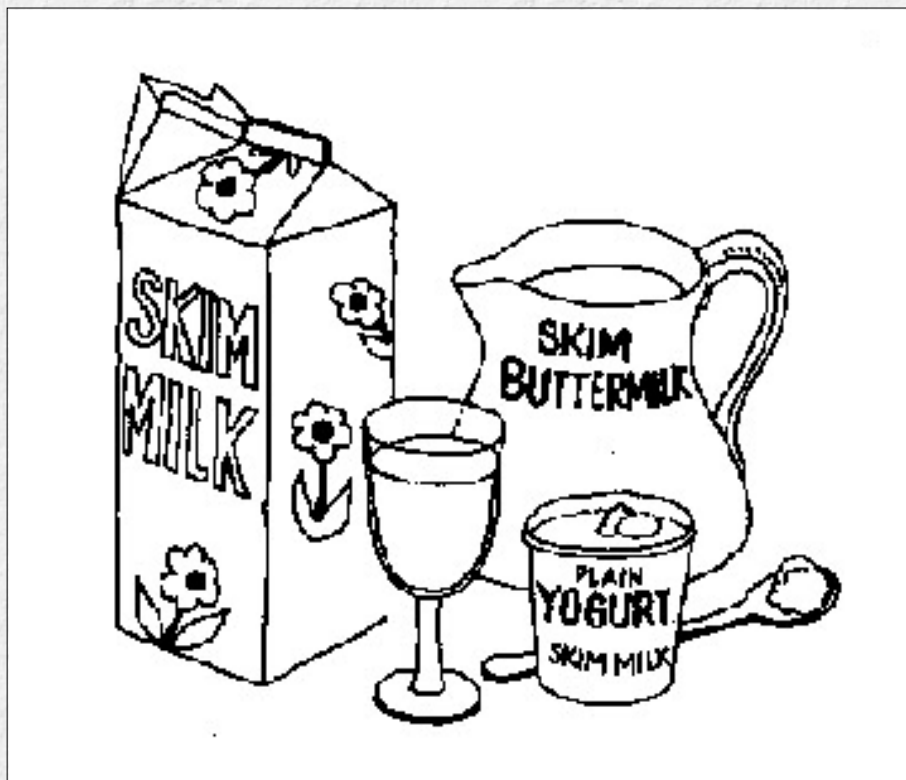
4 rings
7 halves
2 1/2 medium
1 1/2
3 medium
2 tbsp

FRUIT JUICE

Apple juice/cider
Cranberry juice cocktail
Grapefruit juice
Grape juice
Orange juice
Pineapple juice
Prune juice

1/2 Cup
1/3 Cup
1/2 Cup
1/3 Cup
1/2 Cup
1/2 Cup
1/3 Cup

MILK LIST



Choose milk exchanges from the skim and very low-fat, low-fat, and whole-milk lists. Each item is one

exchange and contains trace amounts to 8 grams of fat and from 90 to 150 calories. The amount of fat in milk is measured as the percent of butterfat.

Items on the whole-milk list contain much more fat than those on the skim and low-fat lists. Limit your choices from the whole-milk list as much as possible.

Milk is the body's main source of calcium, needed for growth and the repair of bones. Yogurt is also a good calcium source. Yogurt and dry or powdered milk products have different amounts of fat. Check labels for fat and calorie content.

Milk is good to drink and can be added to cereal and other foods. You can make tasty dishes like sugar-free pudding from milk (see the Combination Foods list). Add flavor to plain yogurt by mixing in one of your fruit exchanges.

SKIM AND VERY LOW-FAT MILK

Skim milk, 1/2% milk, 1% milk, or low-fat buttermilk
 Evaporated skim milk
 Dry non-fat milk 1/3 Cup
 Plain non-fat yogurt 8 oz.

1 Cup
 1/2 Cup
 1/3 Cup
 8 oz.

LOW-FAT MILK

2% Milk
 Plain low-fat yogurt (with added non-fat milk solids)

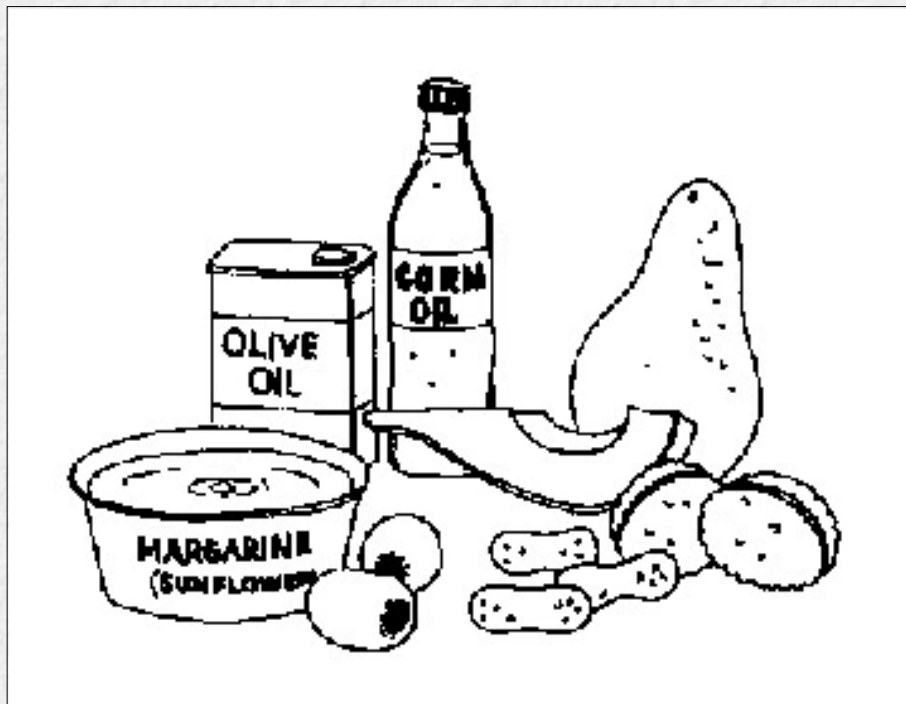
1 Cup
 8 oz.

WHOLE MILK

Whole milk
 Evaporated whole milk
 Whole plain yogurt

1 Cup
 1/2 Cup
 8 oz.

FAT LIST



Choose fat exchanges from these lists. Each item is 1 exchange and contains about 45 calories. These foods are mostly fat, although some contain a small amount of protein.

All fats are high in calories, so measure them carefully, and modify your fat intake by eating unsaturated fats instead of saturated fats. Sodium content of these foods varies widely; check labels for sodium information.

UNSATURATED FATS

| | |
|--|--|
| Avocado Margarine Margarine, diet Mayonnaise Mayonnaise, reduced calorie | 1/8 medium 1 tsp. 1 tbsp. 1 tsp. 1 tbsp. |
| <i>Nuts and seeds:</i> Almonds (dry roasted) Cashews (dry roasted) Pecans Peanuts Walnuts Other nuts Seeds, pine nuts, sunflower (no shells) Pumpkin seeds | 6 whole 1 tbsp. 2 whole 20 small or 10 large 2 whole 1 tbsp. 2 tbsp. 1 tsp. |

| | |
|--|---------------------|
| Oil (corn, cottonseed, safflower, soybean, sunflower, olive, peanut) | 1 tsp |
| Olives | 10 small or 5 large |
| Salad dressing, mayonnaise-type | 2 tsp. |
| Salad dressing, mayonnaise-type, reduced-calorie | 1 tbsp. |
| Salad dressing (all varieties) | 1 tbsp. |
| Salad dressing, reduced-calorie | 2 tbsp. |

(Two tablespoons of low-calorie salad dressing is a free food.)

SATURATED FATS

| | |
|------------------------------|---------|
| Butter | 1 tsp. |
| Bacon | 1 slice |
| Chitterlings | 1/2 oz. |
| Coconut (shredded) | 2 tbsp |
| Coffee whitener, liquid | 2 tbsp. |
| Coffee whitener, powder | 4 tsp. |
| Cream (light, coffee, table) | 2 tbsp. |
| Cream, sour | 2 tbsp. |
| Cream (heavy, whipping) | 1 tbsp. |
| Cream cheese | 1 tbsp. |
| Salt pork | 1/4 oz. |

FREE FOODS

Free foods are foods and drinks that have less than 20 calories per serving. When no serving size is specified, you can eat as much of the item as you want. You can eat 2 or 3 servings of those items that have specific serving sizes each day; be sure to spread them out through the day.

Drinks

Bouillon or broth without fat
 Bouillon, low sodium
 Carbonated drinks, sugar-free
 Carbonated water
 Club soda
 Cocoa powder, unsweetened (1 tbsp)
 Coffee/Tea
 Drink mixes, sugar-free
 Tonic water, sugar-free

Non-stick Pan Spray

All

| | |
|-------------------------------|---|
| Fruit | Cranberries, unsweetened (1/2 Cup) Rhubarb, unsweetened (1/2 Cup) |
| Raw Vegetables (1 Cup) | Cabbage Celery Chinese cabbage Cucumber Green onion Hot peppers Mushrooms Radishes Zucchini |
| Salad Greens | Endive Escarole Lettuce Romaine Spinach |
| Sweet Substitutes | Candy, hard, sugar-free Gelatin, sugar-free Gum, sugar-free Jam/Jelly sugar-free (1-2 tbsp.) Sugar substitutes: saccharin, aspartame Whipped topping (2 tbsp.) |
| Condiments | Catsup (1 tbsp.) Horseradish Mustard Pickles, dill, non-sweetened Salad dressing, low-calorie (2 tbsp.) Taco sauce (1 tbsp.) Vinegar |

SEASONINGS

Seasonings can be helpful in making food taste better. Check labels for sodium content, and choose seasonings that do not contain "sodium" or "salt."

Basil
 Celery seed
 Cinnamon
 Chili powder
 Chives
 Curry
 Dill
 Flavoring extracts (vanilla, almond, walnut,
 peppermint, butter, lemon, *etc.*)
 Garlic
 Garlic powder
 Herbs
 Hot pepper sauce
 Lemon

Lemon juice
 Lime
 Lime juice
 Mint
 Onion powder
 Oregano
 Paprika
 Pepper
 Pimento
 Soy sauce
 Soy sauce, low sodium ("lite")
 Spices
 Wine, for cooking (1/4 Cup)
 Worcestershire sauce

COMBINATION FOODS

Much of what we eat is mixed together in combination foods that do not fit into any one exchange list. Sometimes it's difficult to know the ingredients in a casserole or baked food item. This exchange list will help you fit combination foods into your meal plan. You can always check with your dietitian for information about any other foods you'd like to eat.

The American Diabetes Association/American Dietetic Association Family Cookbooks and the American Diabetes Association Holiday Cookbook contain many recipes and further information about many foods, including combination foods. Check your library or your local bookstore.

| Combination Food | Serving | Exchanges |
|-------------------------------|--------------------|--|
| Casserole, homemade | 1 Cup (8 oz.) | 2 starch 2 medium fat meat 1 fat |
| Cheese pizza, thin crust | 1/4 of 15 inch pie | 2 starch 1 medium fat meat 1 fat |
| Chili with beans (commercial) | 1 Cup (8 oz.) | 2 starch 1 medium fat meat 1 fat |

| | | |
|---|-----------------|--|
| Chow mein (without noodles or rice) | 2 Cups (16 oz.) | 1 starch 2 vegetable 2 lean meat |
| Macaroni and cheese | 1 Cup (8 oz.) | 2 starch 1 medium fat meat 2 fat |
| Bean soup (cooked) | 1 Cup (8 oz.) | 1 starch 1 vegetable 1 lean meat |
| Chunky soup (all varieties) | 10 3/4 oz. Can | 1 starch 1 vegetable 1 medium fat meat |
| Cream soup | 1 Cup (8 oz.) | 1 starch 1 fat |
| Vegetable soup or broth | 1 Cup (8 oz.) | 1 starch |
| Spaghetti and meatballs | 1 Cup (8 oz.) | 1 starch 1 medium fat meat 1 fat |
| Sugar-free pudding (made with skim milk) | 1/2 Cup | 1 starch |
| Beans used as a meat substitute: Dried beans, peas, or lentils | 1 Cup | 2 starch 2 lean meat |

FOODS FOR OCCASIONAL USE

The foods on this list can be included in your meal plan, despite their sugar or fat content, provided you maintain blood-glucose control. Average exchange values are listed for each item; because these foods are concentrated sources of carbohydrates, the serving are small. Check with your dietitian for advice on how often and when you can enjoy these foods.

< /TR>

Special Food

Serving

Exchanges

| | | |
|-----------------------------|-------------------------------|-------------------|
| Angel food cake | 1/12 of cake | 2 starch |
| Cake (no icing) | 1/12 of cake or 3 inch square | 2 starch 2 fat |
| Cookies | 2 small (1 3/4 inches) | 2 starch 2 fat |
| Frozen fruit yogurt | 1/2 Cup | 1 starch |
| Gingersnaps | 3 | 1 starch |
| Granola | 1/4 Cup | 1 starch 1 fat |
| Granola bar | 1 small | 1 starch 1 fat |
| Ice cream (any flavor) | 1/2 Cup | 1 starch 2 fat |
| Ice milk (any flavor) | 1/2 Cup | 1 starch 1 fat |
| Sherbet | 1/4 Cup | 1 starch |
| Snack chips (all varieties) | 1 oz. | 2 starch 2 fat |
| Vanilla wafers | 6 small | 1 starch 1 fat |

MANAGEMENT TIPS

Here are some tips to help you manage the way you eat:

- **Make changes gradually.** Don't try to do everything at once. It may take longer to accomplish your goals, but the changes you make will be permanent.
- **Set realistic, short-term goals.** If weight loss is your goal, try to lose two pounds in two weeks, not 20 pounds in one. Walk two blocks at first, not two miles. Success will come more easily, and you'll feel good about yourself!
- **Reward yourself.** When you achieve a short-term goal, treat yourself to a movie, buy a new shirt, read a good book, or visit a friend.

- **Measure foods.** Be careful about serving sizes, and learn to estimate the amount of food you are served when dining out. Measuring all the food you eat for a week or so will help you do this. Measure liquids with a measuring Cup. Some solid foods (tuna cottage cheese, canned fruits) can be measured with a measuring Cup, too. Use measuring spoons for smaller amounts of foods like oil, salad dressing, or peanut butter. You can use a scale to measure almost anything --especially meat, poultry, and fish.
- **Measure all foods after cooking.** Some foods you buy uncooked will weigh less after you cook it. This is true of most meats. Starches often swell in cooking, so a small amount of uncooked starch can become a much larger amount of cooked food. The following table illustrates these changes:

| | Uncooked | Cooked |
|---------------------|--------------------------------|---------------|
| STARCH FOODS | | |
| Oatmeal | 3 level tbsp. | 1/2 Cup |
| Cream of Wheat | 2 level tbsp. | 1/2 Cup |
| Grits | 3 level tbsp. | 1/2 Cup |
| Rice | 3 level tbsp. | 1/3 Cup |
| Spaghetti | 1/4 Cup | 1/2 Cup |
| Noodles | 1/3 Cup | 1/2 Cup |
| Macaroni | 1/4 Cup | 1/2 Cup |
| Dried beans | 3 tbsp. | 1/3 Cup |
| Dried peas | 3 tbsp. | 1/3 Cup |
| Lentils | 2 tbsp. | 1/3 Cup |
| MEATS | | |
| Hamburger | 4 oz. | 3 oz. |
| Chicken | Small drumstick Half breast | 1 oz. 3oz. |

- **Read food labels.** Remember dietetic does not mean diabetic! "Dietetic" on a food label means that something has been changed or replaced. There may be less salt, less fat, or less sugar, but dietetic food is not necessarily sugar-free or calorie-free. Some dietetic foods may be useful. You can eat dietetic foods that contain up to 20 calories per serving three times a day as free foods.
- **Know your sweeteners.** There are two types of sweeteners on the market: those that contain calories and those that do not. Sweeteners with calories, such as fructose, sorbitol, and mannitol, can cause cramping and diarrhea when used in large amounts. And these sweeteners have calories, which do add up. Sweeteners without calories include saccharin and aspartame (Equal,[®] Nutrasweet[®]) and may be used in moderation.

More Helpful Hints

Dietetic candy may satisfy your craving for sweets, but eat no more than 3 hard candies (usually 3 calories a piece) in a day. "Diet" chocolates contain many more calories in fat, Sorbitol, and milk solids. It is best to avoid these.

Here are a few more rules for keeping your insulin dependent diabetes in control:

- If a meal is unavoidably delayed, you may need to prevent an insulin reaction with fast-acting sugar (see [Chapter 9](#)). You may also have to eat a small snack, such as
- If you are planning a late-evening dinner, eat your usual bedtime snack at your regular dinner hour. Then enjoy your late dinner. Do not have another bedtime snack.
- If you eat extra food, you'll need to adjust your activity level or insulin to accommodate the added blood glucose.

Alcohol

Alcohol can cause control problems for people with diabetes. It can lower blood sugar by blocking the release of glycogen (stored glucose), possibly leading to a severe insulin reaction. Never drink when insulin is at the peak of its action (see [Chapter 8](#)). If you have alcohol on your breath, people may think you're drunk when you're actually having a reaction.

Use Alcohol Only With Meals and Snacks and Only in Moderation

Ask your diabetes educator or doctor for advice and avoid alcohol when your diabetes is not in good control. If you're on a weight reduction diet, remember that alcohol contributes 7 calories per gram, and actually stimulates the appetite.

Alcohol is a depressant. It has an anesthetic effect that impairs the self-control and judgment you need to keep in good control. Try to limit your drinking to special occasions. A non-alcoholic beverage (mineral water or club soda with lemon or lime, diet soft drink, tomato or vegetable juice) is always a safer choice.

Alcohol Exchanges

- Your body digests alcohol as a fat.
- A highball with water or soda water contains about 135 calories.
- Remove one fat exchange for every 45 calories in an alcoholic beverage.

 **WARNING: DO NOT ELIMINATE YOUR REGULAR MEAL TO BALANCE ALCOHOL CALORIES.**

- You could have a severe insulin reaction.

Food Exchanges for Alcoholic Beverages

| Beverage | Exchanges | Approximate Calories |
|---|-----------|--------------------------------|
| Gin, rum, scotch, vodka, whisky (1.5 oz.) | 2-3 fat | 80 proof: 96 100 proof: 120 |
| Dry wine (unsweetened, 4 oz.) | 2 fat | 70 |

| | | |
|-----------------------------|----------------------|-----|
| Low cal beer (12 oz.) | 2 fat, 1/2 fruit | 90 |
| Beer, 4.5% alcohol (12 oz.) | 1 bread, 2 fat | 160 |
| Manhattan (3.5 oz.) | 1/2 bread, 3 fat | 170 |
| Martini (3.5 oz.) | 3 fat | 135 |
| Old Fashioned (4 oz.) | 1/2 bread, 3 1/2 fat | 190 |
| Sherry, dry(3 oz.) | 1/2 bread, 2 fat | 125 |

Eating Out

Sticking to your meal plan doesn't mean you can't eat out in restaurants or accept friends' dinner invitations. But you do have to take precautions:

- Keep your meal plan with you until you know it well.
- Order plainly cooked, familiar foods. Avoid casseroles, fried foods, cream soups, gravies, sauces, stuffings, breaded meats, and desserts.
- Try ordering ala carte. Ask the server about any food you're not familiar with.
- Measure foods at home so you'll be able estimate portions when you go out. Restaurant portions tend to be generous, so plan to share your meal or bring part of it home.
- Call ahead for information about menu offerings so you can plan your meal. This applies to both restaurants and friends. Don't be afraid to explain your meal plan requirements. People will usually cooperate.
- Never eat unacceptable foods to please your hostess or the cook. Your health is more important.
- Try to eat within an hour of your regular meal time. If there is a delay, ask for some crackers or bread sticks.
- Always carry some form of fast-acting sugar (see [Chapter 8](#)).

Fast Food Restaurants

It can be difficult to meet nutritional requirements and maintain good balance with fast food meals. Fast foods typically contain little fiber, and their vitamin and mineral contents vary.

- Vegetables, fruits, whole grain breads, and dairy products are often missing from fast food menus.
- Remember, a fruit drink is not fruit juice.
- And fast food is typically high in sodium, saturated fats, and cholesterol.

If you must eat fast food, choose the low-fat menu selections now available in many chain restaurants. Ask your diabetes educator or dietitian for a copy of Becton Dickinson's *Fast Food Guide*. This fold-out chart lists

calories, nutritional content, and exchanges for many popular fast foods.

Exercise and Exchanges

Food is an important consideration for persons with Type 1 diabetes who do exercise. These issues are discussed in [Chapter 7](#), Exercise which includes a useful chart on [Food Exchanges for Exercise](#).

A Sample 1500 Calorie ADA Diet

This relatively low calorie diet (appropriate for a small adult or a child with diabetes) is only an example. Based on your calorie needs, your dietitian can help you develop a similar diet that is right for your height, weight, age, and level of activity.

| | |
|------------------------|---|
| Breakfast | <ul style="list-style-type: none"> 1 Fruit 2 Starch/Bread 1 Fat 1 Milk * Free Foods |
| Lunch | <ul style="list-style-type: none"> 1 Meat 2 Starch/Bread 1 Vegetable 1 Fruit 1 Fat * Free Foods |
| Afternoon snack | <ul style="list-style-type: none"> 1 Fruit |
| Dinner | <ul style="list-style-type: none"> 2 Meat 2 Starch/Bread 1 Vegetable 1 Fruit 2 Fat * Free Foods |
| Evening snack | <ul style="list-style-type: none"> 1 Starch/Bread 1 Milk 1 Fruit |

⚠ REMEMBER: The care of diabetes is a team effort involving you, your physician, and the diabetes education staff where you receive your medical care. This handbook cannot-and was not meant to-replace this team effort.

This handbook embodies the approach of the diabetes care team at the University of Massachusetts Medical Center. Different diabetes care teams may approach some aspects of diabetes care in ways that differ from those in this handbook. While most teams are in close agreement regarding the GENERAL PRINCIPLES of diabetes care, they may differ in the DETAILS. There can be more than one "right" way to approach a specific issue in diabetes management.

Always remain in touch with your diabetes care team, and bring any questions you may have about the materials in this handbook to their attention!

Copyright 1995, 1996, 1997, 1998 Ruth E. Lundstrom, R.N., John P. Mordes, M.D., Aldo A. Rossini, M.D. All rights reserved.

Feedback: send e-mail to [Dr. Aldo Rossini](#)

This page was last revised on January 2, 1998.

[[Table of contents](#) | [Glossary](#) | [Previous chapter](#) | [Next chapter](#)]

The Healing Handbook *for* Persons with Diabetes

[[Table of contents](#) | [Previous chapter](#) | [Next chapter](#)]

Chapter 7 Exercise

● [Exercise Programs for People with Diabetes](#)

● [Aerobic Exercise Options](#)

● [Monitoring Blood Sugar During Exercise](#)

● [Exercise for the Overweight Person with](#)

[Type II Diabetes](#)

● [Easy Exercises for Beginners](#)

● [Exercise of the Person with Type I](#)

[Diabetes](#)

● [Food Exchanges for Exercise](#)

● [Questions and Answers](#)

Exercise is an important factor in your diabetes control program. Besides improving muscle tone and keeping your heart, blood vessels, and lungs healthy, exercise lowers blood cholesterol and triglyceride levels and burns calories to help people with non-insulin dependent diabetes achieve and maintain ideal body weight. Exercise aids in diabetes control

by stimulating insulin functioning, and may reduce your need for medication. A balanced exercise program reduces stress and tension, improves concentration, and decreases appetite.



Exercise Programs for People with Diabetes

The best activities for you are vigorous aerobic exercises. Aerobic exercises use the large muscle groups, and improve stamina and overall health. Ask your diabetes educator for more information about aerobic exercise, or take a look at *Exercise & Diabetes*, a pamphlet-workbook by Jean Kapetanios (order from Area Health and Education Center, 81 Plantation Street, Worcester, MA 01605) or *The Diabetic's Sports and Exercise Book* by June Biermann and Barbara Toohey.

Aerobic Exercise Options

Here are some aerobic activities you might enjoy:

| | | |
|---------|----------------------|--------------------|
| Walking | Rowing | Swimming |
| Hiking | Jumping rope | Bicycling |
| Jogging | Aerobic Dancing | Basketball |
| Skating | Ice hockey | Stationary cycling |
| Tennis | Cross-country skiing | Stationary running |

The following are NOT considered aerobic activities:

| | | |
|-------------------|------------|------------------|
| Baseball/Softball | Football | Horseback riding |
| Bowling | Volleyball | Golf |

There are many practical ways to increase your activity. Walking is one of the easiest: you can walk to the store instead of driving, walk the dog, park farther from your destination and walk the rest of the way, get off the bus a stop or two early and walk the extra few blocks. Walking is an ideal exercise no matter what your age. It's safe and inexpensive, requires less strength than many sports, and you don't need lessons to begin. You can walk alone or with others, indoors or outside.

For safe walks, wear appropriate shoes. Never go barefoot. Wear loose-fitting clothing and dress in layers you can remove if you get hot. Start slowly, and increase your distance and pace each week. Take long, easy strides, and breath deeply. Carry some fast acting sugar and be aware of low blood sugar symptoms. In hot weather, bring extra fluids. Always check your feet for injuries after walking.

Walking Burns Calories

| Miles Walked | Calories Burned |
|--------------|-----------------|
| 2 | 150 - 240 |
| 3 | 240 - 360 |
| 4 | 350 - 420 |
| 5 | 420 - 480 |

In addition to walking, there are other ways of being active that don't even seem like exercise. Take the stairs instead of the elevator. When watching television, get up and move around during commercials. Use hand

operated appliances rather than electric ones. Mow the lawn, rake the leaves, wash the car -- even washing windows or floors can provide good exercise and burn calories.

⚠️ BEFORE BEGINNING ANY TYPE OF EXERCISE PROGRAM SEE YOUR PHYSICIAN FOR MEDICAL CLEARANCE.

⚠️ WEAR A MEDICAL ALERT IDENTIFICATION BRACELET OR NECKLACE, OR CARRY AN IDENTIFICATION CARD WHEN YOU EXERCISE.

⚠️ NEVER EXERCISE IF YOU HAVE HIGH BLOOD SUGAR PLUS KETONES. DIABETIC KETOACIDOSIS CAN RESULT.

Monitoring Blood Sugar During Exercise

When beginning an exercise program, check your blood sugar before, during, and after exercising (see [Chapter 5](#)). By monitoring your blood sugar, you can:

- Learn your body's response to exercise
- Avoid hypoglycemia
- Determine an appropriate pre-exercise snack

Exercise for the Overweight Person with Type II Diabetes

You may not feel like exercising because you are tired, and moving around takes a lot of effort. But you'll feel better when your diabetes is in good control, and you can help make this happen by following your diet and exercising. Exercise decreases your appetite and helps your own insulin work better. Exercise also burns up food calories and calories stored in body as fat. By using more calories than you eat, you'll lose weight, and when you lose weight, you'll be able to move with less effort.

The number of calories burned during exercise depends on your size and on the type, duration, and intensity of your exercise. Exercise frequently. Bowling once a week is not enough. For best results, exercise 5 times a week for at least 30 minutes each time.

Easy Exercises for Beginners

Bending and stretching exercises are good for beginners because they are easier and less likely to cause injury than more strenuous aerobic exercises. Even after you advance to more strenuous activities, it's a good idea to prepare for each workout with a few minutes of bending and stretching. In addition to bending and stretching, there are safe beginner's exercises you can do lying down on your bed or a floor mat, or sitting in a chair.

Bending and stretching: Standing with legs apart, bend forward, backward, and to each side.

Exercises you can do lying down on your bed or a floor mat:

- Foot and toe exercises: Wiggle and circle toes of both feet.
- Then circle each foot, first in one direction, then the other.
- Knee raises: Lying on your back, bring one knee up as close to your chest as possible, then lower it slowly. Repeat with the other knee.
- Rolling: Lying on your back, raise arms as high over your head as you can. Stretch, then roll side to side, slowly.
- Head/shoulder lifts: Lying on your back, take a deep breath. As you exhale, lift your head and shoulders.
- Leg circles: Lying on your side, raise one leg and move it in a circular pattern. Turn and repeat with the other leg.

Exercises you can do sitting up in a chair:

- Arm circles: Raise both arms in front of you. Make a big circle with each arm, first in one direction and then in the opposite direction. Next, stretch arms out to your sides. Move arms in circles in one direction and then in the opposite direction.
- Push up: While seated, push down on the arms of your chair and try to lift your body off the seat.

Exercise for People with Type I Diabetes

Make it a habit to increase your food when you plan extra exercise. Team sports are fun, and there's no reason you shouldn't participate freely.

But you must take extra food every hour during strenuous exercise to balance the calories you are burning. And you must *always* have fast acting sugar with you in case of a reaction . An insulin reaction is still possible hours after exercising. During prolonged, strenuous exercise (longer than 1 hour) sugar may be borrowed from your muscles and liver. Your body replenishes these stores over the next 12 - 24 hours.

Food Exchanges for Exercise

Exercise Blood Glucose Exchanges to Add:

| Type of Exercise | Blood Sugar | Exchanges to Add |
|------------------|-------------|------------------|
|------------------|-------------|------------------|

| | | |
|---|--|--|
| <p>Short Duration, Low to Moderate Intensity</p> <p>Walking (1/2 mile) or Leisurely cycling (less than 30 minutes)</p> | <p>Under 80 mg/dl</p> <p>Over 80 mg/dl</p> | <p>2 fruit</p> <p>1 fruit</p> |
| <p>MODERATE INTENSITY</p> <p>Tennis, swimming, jogging, golfing, or leisurely cycling (1 hour)</p> | <p>Under 80 mg/dl</p> <p>80-180 mg/dl</p> <p>180-300 mg/dl</p> <p>Over 300 mg/dl</p> | <p>1/2 meat and 2 bread</p> <p>1 fruit or 1 bread</p> <p>No extra food</p> <p>Do not exercise</p> |
| <p>STRENUOUS</p> <p>Football, hockey, racquetball, basketball, strenuous cycling or swimming or shoveling</p> | <p>Under 80 mg/dl</p> <p>80-180 mg/dl</p> <p>180-300 mg/dl</p> <p>Over 300 mg/dl</p> | <p>1 meat, 2 bread, 1 fruit, and 1 milk</p> <p>1 meat and 2 bread</p> <p>1 meat and 1 bread</p> <p>Do not exercise</p> |

When you perform strenuous, all-day exercise (painting your house, digging a garden, taking a bike tour, or running a marathon), you may need to decrease your total daily insulin by 30-50%. But decrease insulin only when you **absolutely certain** the activity will not be rained out or postponed. And be aware that even if you decrease insulin, a drop in blood sugar may occur during strenuous exercise.

CHECK WITH YOUR DIABETES EDUCATOR OR DOCTOR FOR ADVICE ON INSULIN ADJUSTMENTS.

Exercise speeds absorption of insulin, so avoid injecting into parts of your body that will be exercised during your activity. If you are planning leg muscle exercise (jogging, skiing, cycling), inject insulin into the abdomen or arms. For arm muscle activities (scrubbing walls, doing push ups, washing the car), inject into the abdomen or leg. For sports that use all body muscles (swimming, basketball), the safest place to inject is the abdomen.

Always watch for signs of hypoglycemia (see [Chapter 8](#)). Don't wait until you finish exercising to treat a reaction. Stop immediately, treat the reaction, and wait 5 minutes before resuming activity. Exercising at the same time each day is beneficial, but not always possible. Keep in mind your insulin peak times and avoid exercising at these times. Also be aware that exercising at very high or low temperatures may cause you to burn more calories.

Charting Your Progress

Keep a log of your exercise program, including activity, duration, before and after blood sugars, and insulin reactions that occur during and after exercising. This information helps you measure your progress and avoid exercise-related reactions. The chart on the next page covers the first 8 weeks of your exercise program. You'll

be proud of your progress, and you'll feel healthier and stronger each day!

MY 8 WEEK EXERCISE PROGRAM

| Week | Days | Activity | Duration | Blood Sugar Before | Blood Sugar After | Reactions |
|------|------|----------|----------|--------------------|-------------------|-----------|
| 1 | | | | | | |
| 2 | | | | | | |
| 3 | | | | | | |
| 4 | | | | | | |
| 5 | | | | | | |
| 6 | | | | | | |
| 7 | | | | | | |
| 8 | | | | | | |

Questions and Answers

How do I choose a good exercise program?

When choosing an activity, ask yourself: Do I enjoy the activity? Can I do it for a lifetime? Can I do it alone? Is it convenient? Can I fit it into my life style? For better health, choose an aerobic activity. Your work out should consist of three phases:

- A **WARM UP** is necessary to prepare the body for more strenuous exercise and prevent injuries. Stretching and flexing muscles are good warm-up activities.
- The **AEROBIC PHASE** is the period of intense exercise. Heart rate and respiration increase, while blood sugar level and tension decrease, and calories are burned.
- The **COOL DOWN** gradually returns your body to it's normal state. Slower, less strenuous exercises prevent pooling of blood in the arms and legs, which can cause fainting.

If I am active on my job, do I need an exercise program?

If your job is truly active -- if your body is constantly moving 8 to 10 hours a day -- it certainly counts as exercise. But off-the-job physical activity can help alleviate work-related stress. If you substitute work activity for exercise, you eliminate an important relaxation technique.

Why do insulin reactions sometimes occur hours after exercising?

During periods of strenuous exercise, your body consumes substantial amounts of muscle and liver glycogen. It can take up to 24 hours to replace this glycogen; during this time your blood glucose level may drop.

To prevent an insulin reaction, eat extra carbohydrate foods (for example, bread, crackers, or juice) after you exercise.

If your blood glucose is high after strenuous exercising, avoid taking extra insulin right away. During the cool down or recover phase, the blood sugar will fall on its own. Extra insulin may cause a severe insulin reaction!

⚠️ REMEMBER: The care of diabetes is a team effort involving you, your physician, and the diabetes education staff where you receive your medical care. This handbook cannot-and was not meant to-replace this team effort.

This handbook embodies the approach of the diabetes care team at the University of Massachusetts Medical Center. Different diabetes care teams may approach some aspects of diabetes care in ways that differ from those in this handbook. While most teams are in close agreement regarding the GENERAL PRINCIPLES of diabetes care, they may differ in the DETAILS. There can be more than one "right" way to approach a specific issue in diabetes management.

Always remain in touch with your diabetes care team, and bring any questions you may have about the materials in this handbook to their attention!

Copyright 1995, 1996, 1997, 1998 Ruth E. Lundstrom, R.N., John P. Mordes, M.D., Aldo A. Rossini, M.D. All rights reserved.

Feedback: send e-mail to Dr. Aldo Rossini

This page was last revised on January 1, 1997, 1997.

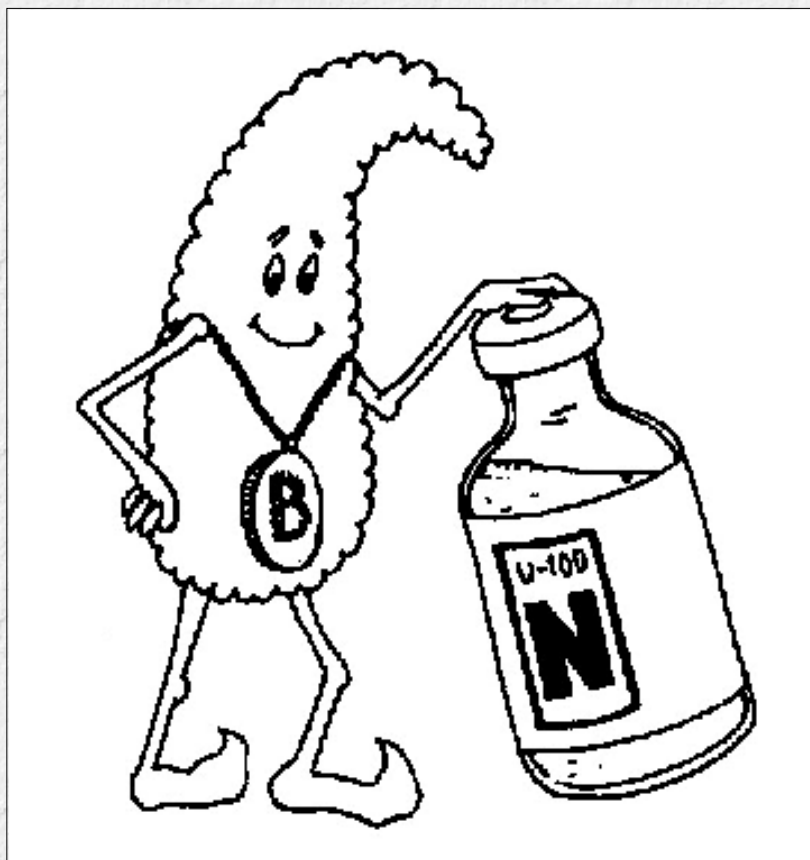
[[Table of contents](#) | [Glossary](#) | [Previous chapter](#) | [Next chapter](#)]

The Healing Handbook *for* Persons with Diabetes

[[Table of contents](#) | [Previous chapter](#) | [Next chapter](#)]

Chapter 8 Insulin

- [Insulin Basics](#)
- [Types of Insulin](#)
- [Your Injection Schedule](#)
- [Correcting High Blood Sugar With Regular Insulin](#)
- [Permanent Insulin Adjustments](#)
- [Common Reasons for Blood Sugar Fluctuations](#)
- [Adjusting Your Own Insulin According to Patterns](#)
- [Buying and Storing Insulin](#)
- [Injecting Insulin](#)
- [Allergic Reactions and Other Mild Reactions](#)
- [Syringes and Needles](#)
- [The Insulin Pump](#)
- [Insulin Reactions](#)
- [Treating an Insulin Reaction Yourself](#)
- [Preventing Insulin Reactions](#)
- [Insulin Reactions: Treatment Instructions For Friends and Family Members](#)
- [Questions and Answers](#)



Insulin Basics

If you have Type I (insulin dependent) diabetes, your body produces no insulin, and you must receive insulin by injection. If you have Type II (non-insulin dependent) diabetes, you may need insulin injections, if your diabetes cannot be brought under control with proper diet, exercise, and oral medication. Remember that insulin can never be taken by mouth because it is protein that would be broken down during digestion.

Insulin is measured in units. The unit is a measure of weight: 24 units = 1 mg. "U100" insulin is called that because there are 100 units of insulin in 1 cc of solution. There are 1000 units in a bottle of U100 insulin. You must inject U100 insulin with U100 insulin syringes.

Types of Insulin

Your insulin is either beef, pork, beef and pork combined, or human. This is the species of your insulin and is indicated on the label of your insulin bottle.

Human insulin is genetically engineered from *E. coli* bacteria (Humulin) or yeast (Novolin). Human insulin now accounts for

over 60% of all the insulin used. It will probably replace all animal insulins in the future.

Types of insulin include Regular, Semi-Lente, NPH, Lente, Ultralente, and the new "insulin analog" called Lispro. The important characteristics of each type of insulin are:

- When it starts to work (onset)
- When it works hardest (peak activity)
- How long it lasts (duration)

Many factors such as species, injection site, and exercise level affect the onset, peak, and duration of insulin.

Regular insulin (pork, beef, beef/pork, or human) is fast acting and lasts a short time in the body. It is used before meals to control the post-meal rise in blood sugar, and to lower blood sugar quickly when an immediate correction is needed.

Semi-Lente insulin (beef/pork) has a short duration, but twice as long as Regular insulin. It is sometimes used to control post-meal rises in blood sugar and may be combined with Lente insulin.

NPH insulin (beef, pork, beef pork or human) contains added protamine for an intermediate-acting effect. NPH insulin provides a basal amount of insulin. Two injections a day are usually prescribed.

Lente insulin (beef, pork, or human) contains added zinc, which gives it an intermediate-acting effect similar to NPH. Lente insulin also provides a basal amount of insulin. Two injections a day are usually prescribed.

Ultralente insulin (beef or human) contains a lot of added zinc to give it the longest-acting effect. Note that Humulin Ultralente has a shorter peak and duration than beef Ultralente. Ultralente insulin provides the steadiest basal amount of insulin. One injection a day is used in combination with Regular insulin before meals.

Insulin Lispro, sold under the trade name Humalog, is a new man-made insulin that is very similar to naturally occurring human insulin. It has a more rapid onset and a shorter duration of action than human regular insulin and is meant to be taken within 15 minutes of eating a meal and in combination with longer-acting insulin. The Diabetes Monitor has made [additional information about Insulin Lispro](#) available online. The University of Massachusetts Diabetes Clinics have found this new insulin to be helpful for many persons who need to take a short-acting insulin before meals but who have difficulty with meal schedules or with after-meal insulin reactions.

70/30 Insulin (human) is a mix of 70% NPH and 30% Regular insulin. Two injections a day are usually recommended.

This table summarizes the different kinds of insulin and how they act:

Insulin Activity

| Type | Onset | Peaks | Duration |
|------------------|---------------|------------------------|-------------|
| Regular | 15-30 minutes | 2-3 hours | 4-6 hours |
| NPH | 1-2 hours | 6-10 hours | 18-24 hours |
| Lente | 1-2 hours | 6-10 hours | 18-24 hours |
| Ultralente | 2-3 hours | 12-18 hours | 24-36 hours |
| Lispro (Humalog) | A few minutes | 30 minutes | 1 hour |
| 70/30 | 15-30 minutes | 2-3 hours & 8-12 hours | 18-24 hours |

Your Injection Schedule

Follow the schedule of insulin injections prescribed by your health-care provider. Your injection schedule is precisely matched to your activity and blood glucose levels, diet, and the type of insulin you use, so follow it exactly.

My insulin type: _____
 Species: _____ When I take it: _____
 Amount: _____

Correcting High Blood Sugar With Regular Insulin

Regular insulin is fast acting and usually recommended as a supplement to correct high blood sugars. The exact amount depends on how high your blood sugar is and how you usually respond to Regular insulin. A child or thin adult may be able to lower blood sugar with 1 unit of Regular insulin. A larger adult, or a person on large doses of insulin may need 2 to 4 units. Consult with your diabetes educator or doctor about handling high blood sugar.

Add _____ units for a blood sugar over _____ mg.

Permanent Insulin Adjustments

You can help in the process of achieving control of your diabetes by watching for high and low blood sugar patterns and keeping track of them as part of your overall blood glucose monitoring routine. A *pattern* occurs when your blood sugar is in a certain range at the same time of day for three consecutive days. For example:

| Blood Glucose Level | | | | |
|---------------------|---------|--------|-----------|---------|
| Day | Morning | Noon | Afternoon | Bedtime |
| Monday | 179 mg | 136 mg | 97 mg | 147 mg |
| Tuesday | 166 mg | 129 mg | 84 mg | 141 mg |
| Wednesday | 209 mg | 145 mg | 92 mg | 159 mg |

Although the numbers are different each day, you can see a pattern. Morning blood sugars are all over 150 and afternoon blood sugars are all under 100. In this case, your health-care provider might recommend an increase in evening NPH (or Lente) insulin to lower your blood glucose in the morning.

When your blood glucose level fluctuates, try to identify the cause of the high or low blood glucose measurement. There are only three causes of fluctuations in blood sugar level: changes in **DIET**, **EXERCISE**, or **INSULIN**. But there are multiple reasons a fluctuation may occur.

Common Reasons for Blood Sugar Fluctuations

- Changes in exercise or activity level
- Snacks added or omitted
- Delayed meals, or a change in the type of amount of food eaten
- Illness or infection

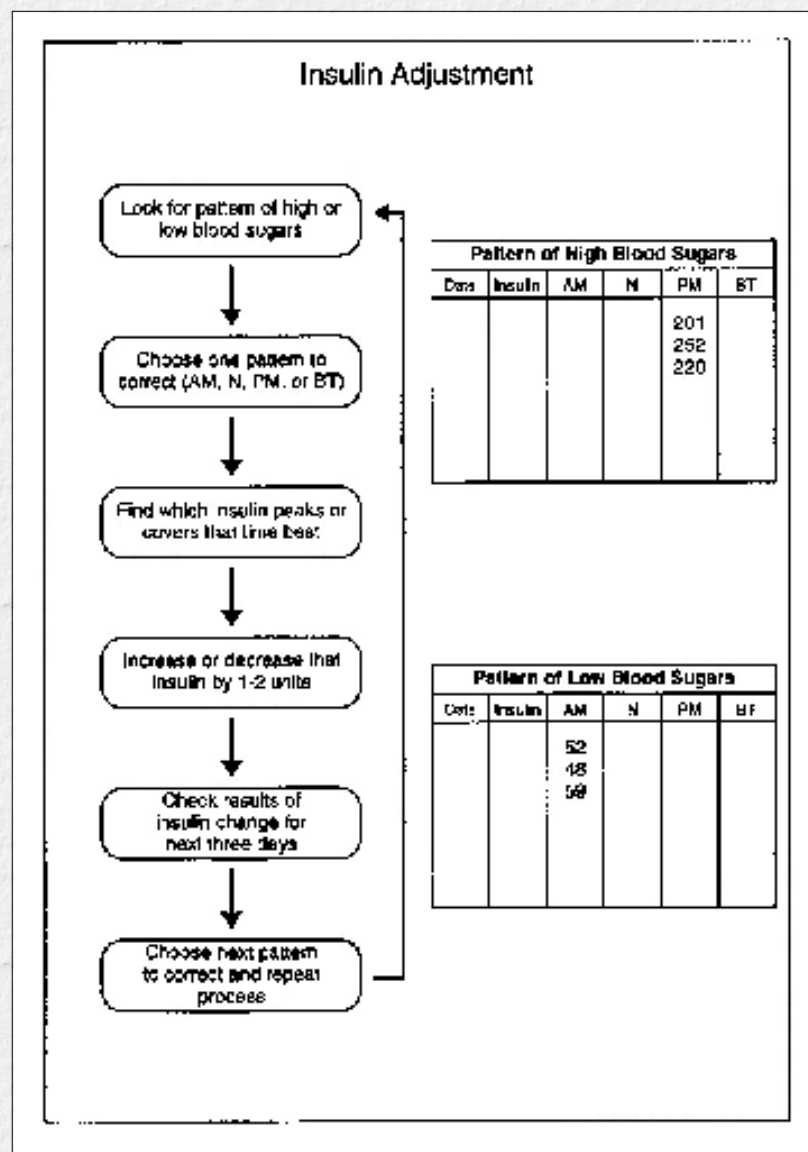
- Alcohol consumption
- Insulin injected into a lumpy area or an exercising arm or leg
- Over-treatment of an insulin reaction
- Skipped insulin injection

Adjusting Your Own Insulin According to Patterns

Your diabetes educator can help you learn how to adjust your own insulin doses according to high and low blood sugar patterns. Here are the steps:

1. Once you have observed a pattern of high or low blood sugars at the same time on three successive days, determine what insulin should be working at that time. Consult the Insulin Summary chart earlier in this chapter for information on insulin peak times and durations.
2. Adjust your dose of that insulin only by 1-2 units:
 Increase insulin for high blood sugar
 Decrease insulin for low blood sugar
Change only one type of insulin at a time.
3. Check the effect of your insulin adjustment for 3 days before making another adjustment.

This diagram summarizes the steps:



Buying Insulin

Insulin prices vary according to purity and source. Pure pork insulin and human insulin tend to lower blood sugar more effectively than beef or beef/pork insulin in some people. Be sure you buy the insulin your doctor prescribes, and do not change brands or species without checking with him or her

Storing Insulin

You may keep opened bottles of insulin at room temperature (less than). Insulin deteriorates only when exposed to temperature extremes, so don't leave it on a sunny window sill or in the freezer.

Store unopened bottles in the refrigerator, and rotate your supply, so that you use the oldest bottles first.

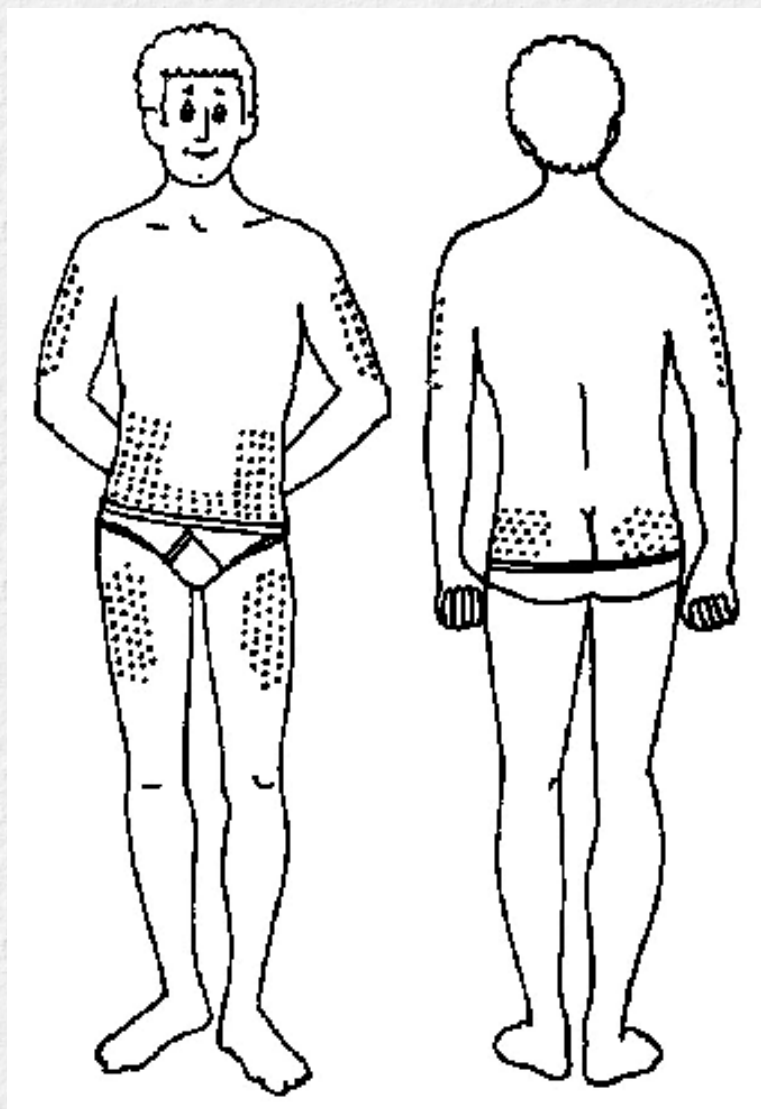
⚠️ ALWAYS HAVE AN EXTRA BOTTLE OF INSULIN ON HAND. KEEP REGULAR INSULIN ON HAND FOR EMERGENCIES AND SICK DAYS, EVEN IF YOU DO NOT INJECT IT DAILY.

Also, keep a good supply of syringes, needles, and alcohol wipes.

- Before injecting insulin, always check the expiration date on the bottle. **DO NOT USE INSULIN AFTER THE EXPIRATION DATE.**
 - If insulin is exposed to freezing temperatures, or temperatures above 85 Fahrenheit or 30 Celsius, **THROW IT AWAY.**
 - If insulin contains small, hard, white particles that do not mix, **THROW IT AWAY.**
 - If insulin sticks to the bottle, creating a frosted appearance, **THROW IT AWAY.**
-

INJECTING INSULIN

Injection sites include the abdomen, outer upper arms, the thighs, buttocks, or hip areas. Do not inject insulin near bony places or joints. Do not give injections closer than 1 inch apart. Insulin absorption can vary from site to site. The best absorption site is the abdomen. In the past it was important to rotate (change) the insulin site daily to prevent building up lumpy areas. With newer, purer insulins, this is less of a problem. Follow your diabetes educator's advice on injection sites.

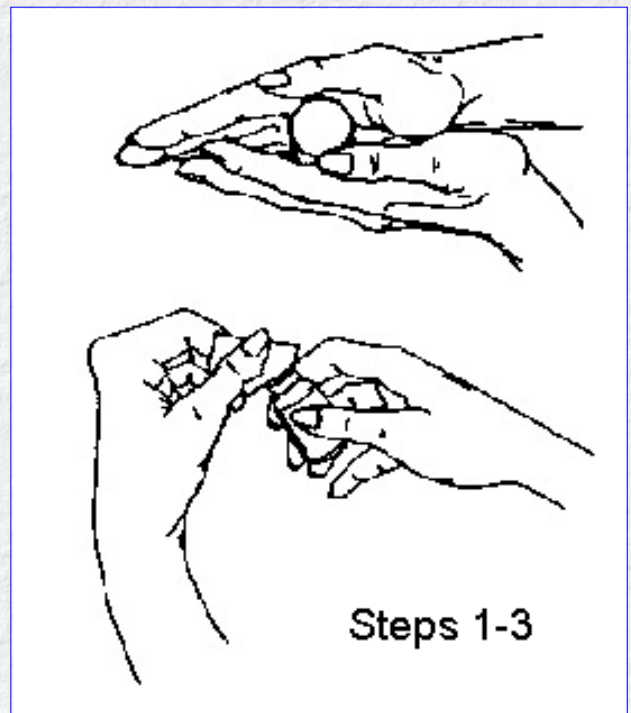


Preparing for Injection

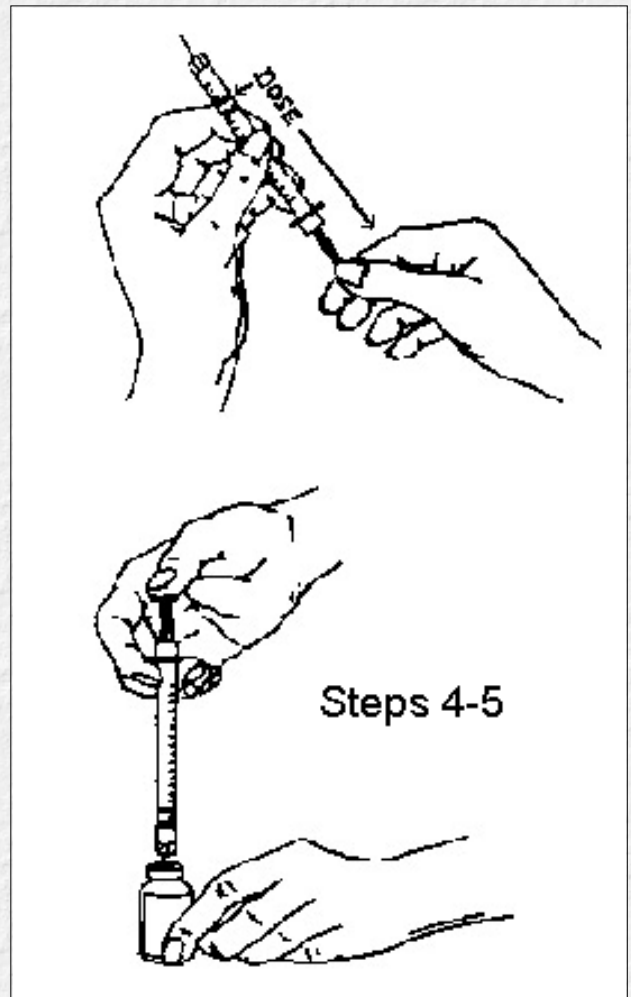
- Steps for preparing your syringe differ, depending on whether you use one type of insulin or a mixture of two or more insulins.

If you use one type of insulin:

1. Wash your hands.
2. Turn the insulin bottle on its side and roll it between your palms to mix it, **but DO NOT SHAKE IT.**
3. Wipe the top of the insulin bottle with an alcohol wipe. **CLICK the picture to see a video (0.7 megabytes)!**

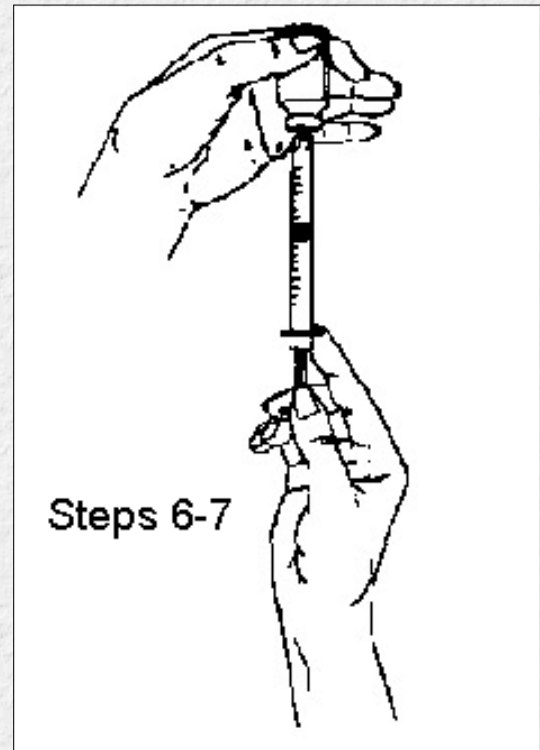


4. Pull plunger to draw in enough air to equal your insulin dose: _____ units.
5. Push the needle through the bottle top and inject air into the bottle.



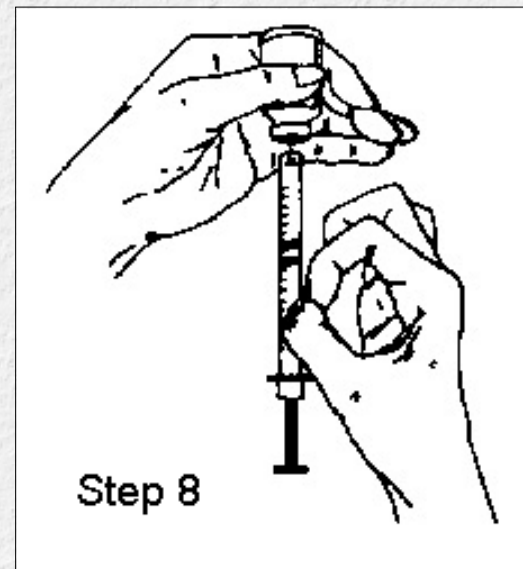
6. With the needle in the bottle, turn it upside and pull the plunger to fill the syringe past your dose of insulin.

7. Push slowly to the line of your correct dose of insulin: _____ units.



8. Check for air bubbles. If bubbles are present, tap the syringe to make them rise. Then repeat steps 6 and 7 and check for bubbles again.

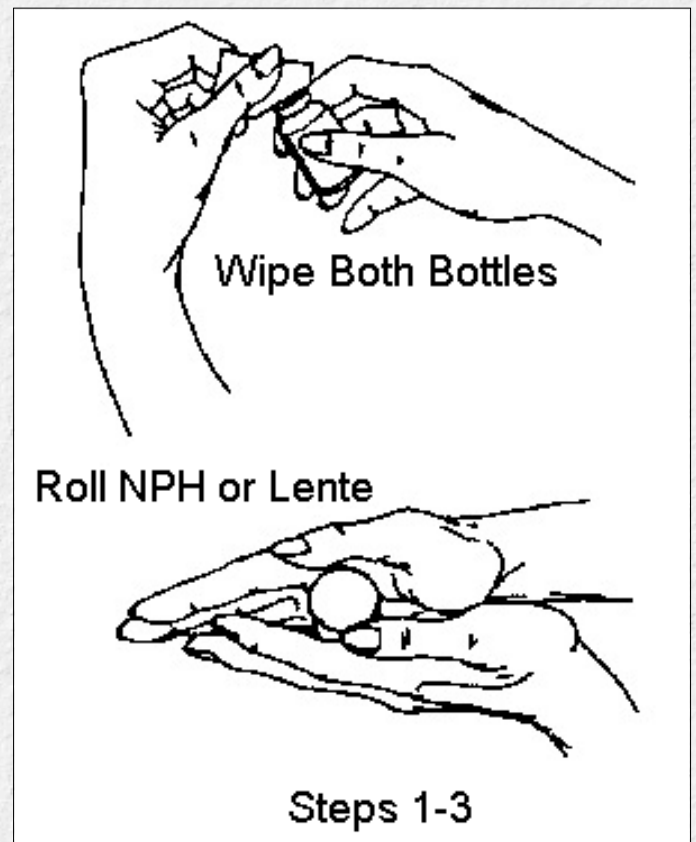
Continue repeating steps 6 and 7 until no air bubbles are present.



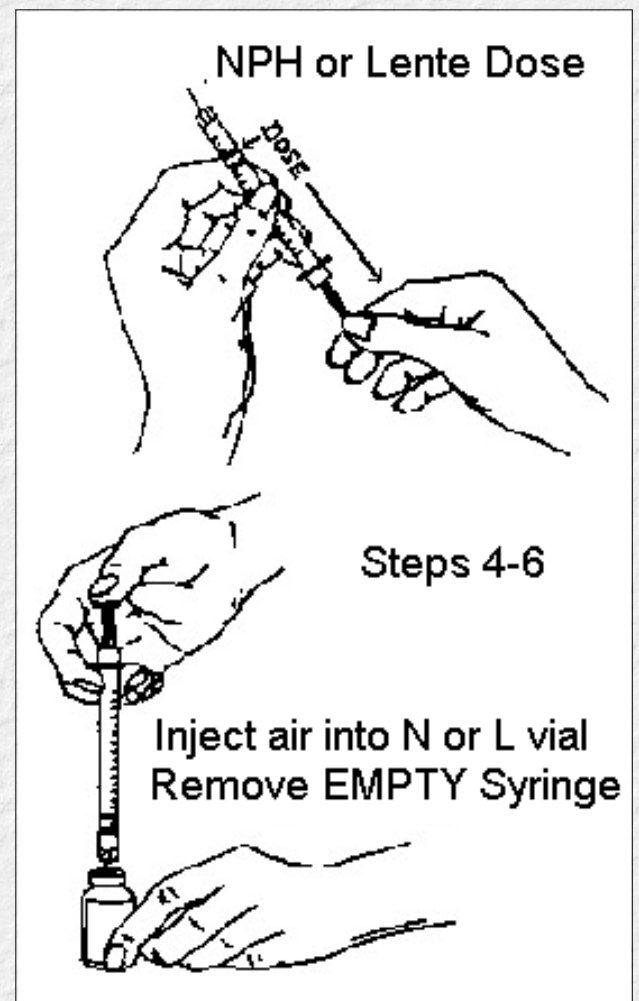
9. Remove the needle from the bottle, and **carefully** rest the syringe so that the needle touches nothing.

If you use more than one type of insulin:

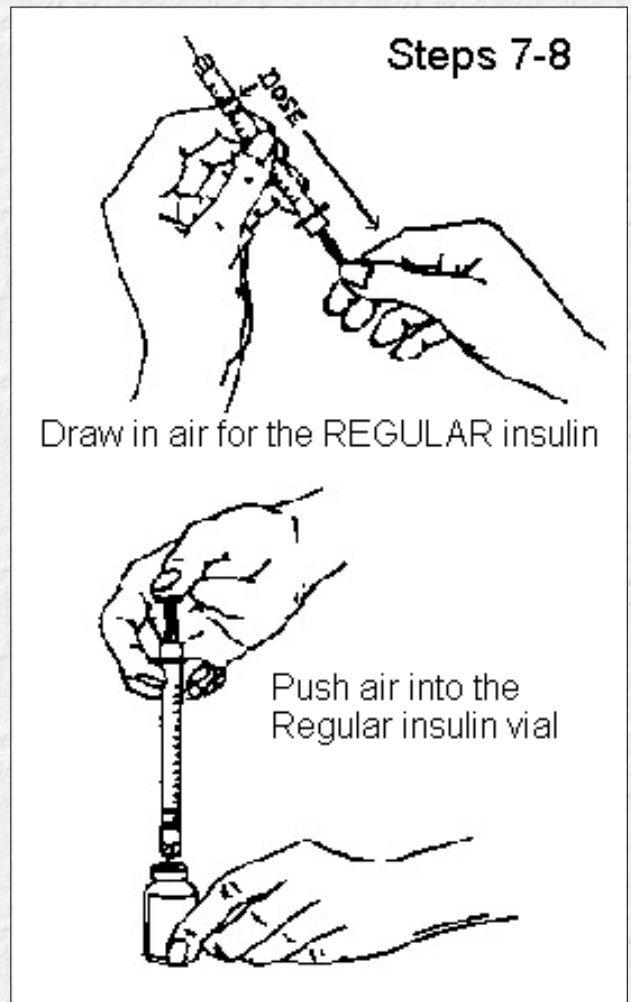
1. Wash your hands.
2. Wipe the tops of **both** insulin bottles with an alcohol wipe.
3. Turn the NPH or Lente insulin bottle upside down and roll between your hands to mix, but **DO NOT SHAKE IT.**



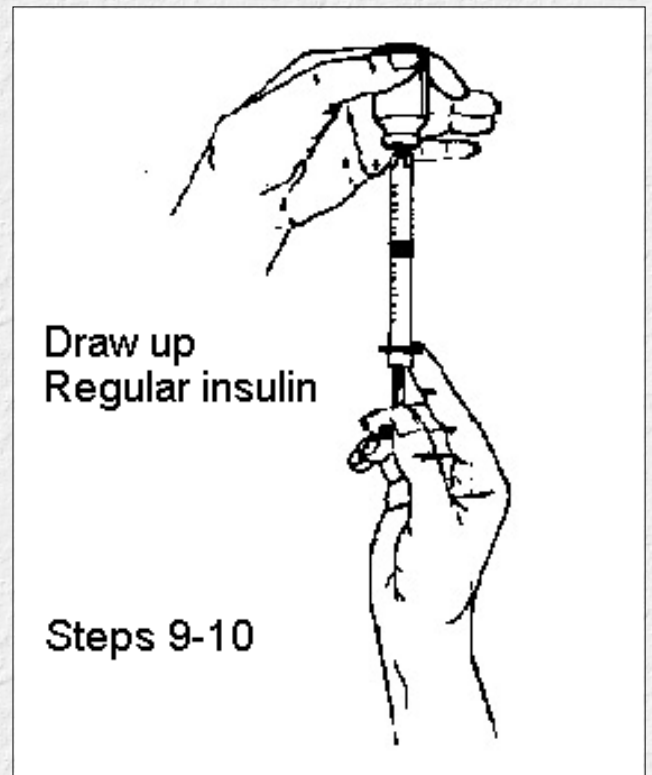
4. Pull plunger to draw in enough air to **equal** your NPH or Lente insulin dose: _____ units.
5. Push the needle through the top of the NPH or Lente insulin bottle and inject air into the bottle.
Remove **empty** syringe and needle from bottle.
- 6.



7. Pull plunger to draw in enough air to **equal** your Regular insulin dose: _____ units.
8. Push the needle through the top of the Regular insulin bottle and inject air into the bottle.

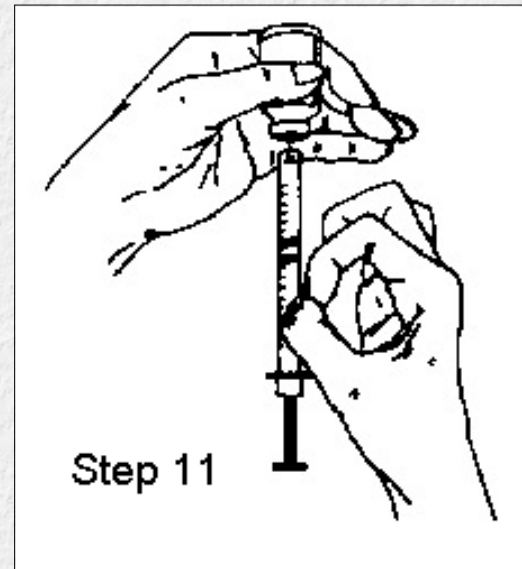


9. With the needle in the bottle, turn it upside and pull to fill the syringe **past** your dose of Regular insulin.
10. Push slowly to the line of your correct dose of insulin: _____ units.



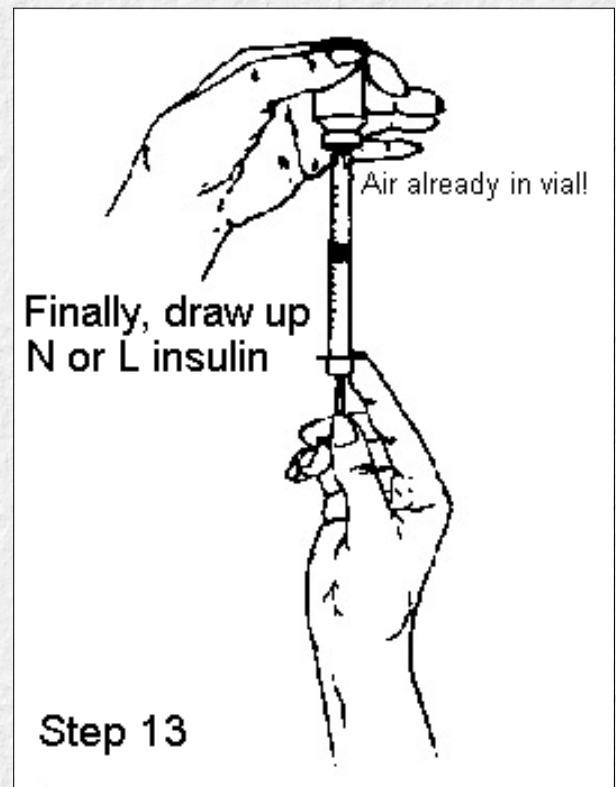
11. Check for air bubbles. If bubbles are present, tap the syringe to make them rise. Then repeat steps 9 and 10 and check for bubbles again.

Continue repeating steps 9 and 10 until no air bubbles are present.



12. Remove the needle from the bottle with Regular insulin in the syringe.

13. Push the needle through the top of the NPH or Lente insulin bottle and carefully pull plunger back to your total dose of insulin: _____ units units NPH or Lente + _____ units Regular).



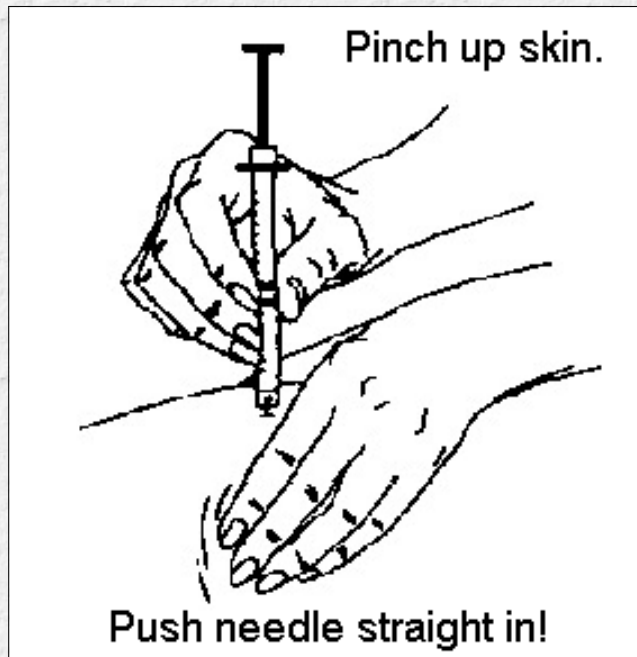
14. Remove the needle from the bottle, and carefully rest the syringe so that the needle touches nothing.

GIVING THE INJECTION

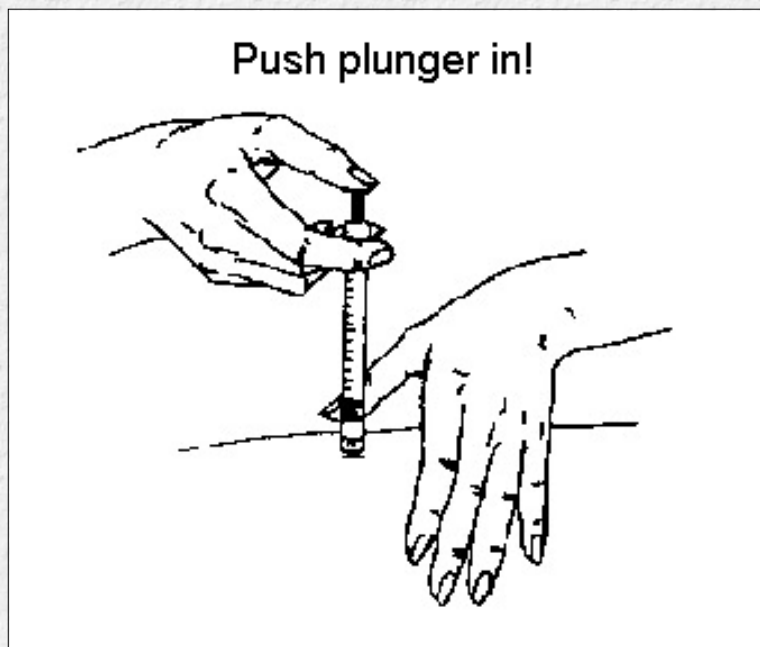
1. Choose your injection site.
2. Wipe the area with alcohol to clean it.



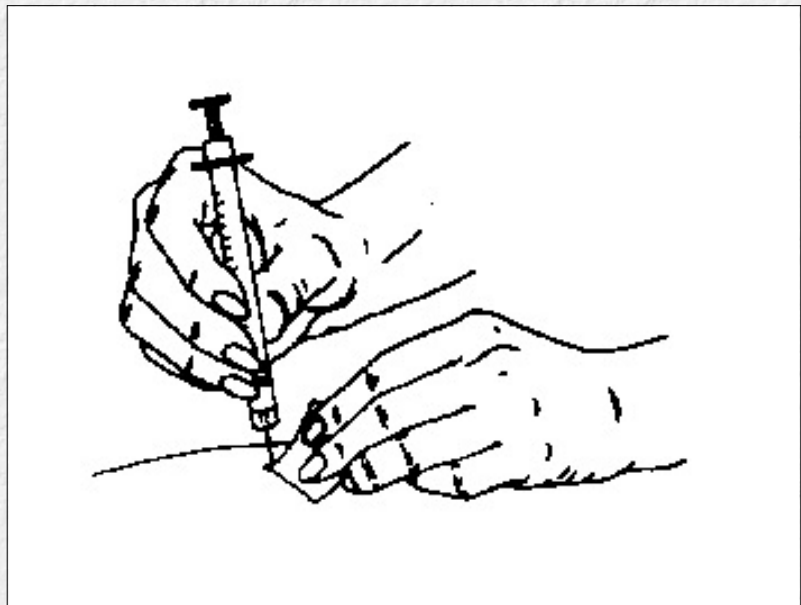
3. Grasp a large pinch of skin between your thumb and fingers.
4. Push the needle straight into the skin.



5. Press the plunger in.



6. Holding the alcohol wipe next to the injection, pull out the needle. Wipe the area with the alcohol wipe.



Allergic Reactions and Other Mild Reactions

Occasionally, you may notice a small, hard red area at the injection site. It may also itch. This is a mild allergic reaction that will go away in a day or so. A more generalized allergy to insulin causes hives and itchy skin over other parts of the body. Usually, this disappears by itself. If the itching continues, consult your doctor.

- **Insulin Edema** (swelling) may develop when you start insulin therapy. It is usually not severe. You may notice swelling in your legs, ankles, feet, hands, or face. This will go away in a few weeks.
- **Lipohypertrophy** is the formation of scar tissue in an area that has been used repeatedly for injection. A firm, lumpy area develops. Insulin absorption is changed in this area. This condition is seldom seen with the use of human insulins and pure pork insulins.
- **Lipoatrophy** is the term used to describe the "pitted" areas that may form at injection sites. This condition, now rare, resulted from loss of fat in the area due to repeated injections with impure insulins.

Syringes and Needles

Disposable insulin syringes with needles are convenient. You can use them more than once **If You Take Care To Keep The Needle Clean**. With repeated use, however, the needle becomes dull, the unit lines may wear off, and you may have trouble drawing an accurate dose.

The newest needles are lubricated and very small (1/2 inch to 5/8 inch long and 28 to 29 gauge) to minimize discomfort. All syringes are U100 and intended for use with U100 insulin. Syringes hold 25 units, 30 units, 50 units, or 100 units.

Some Brand-Name Syringes

| Brand | 100 Units | 50 Units | 30 Units | 25 Units |
|------------|-----------|--------------|----------|----------|
| B-D | 1 cc | Lo-Dose | | 1/4 cc |
| Monoinject | 1 cc | Mini-Syringe | 3/10 cc | |
| Turemo | 1 cc | 1/2 cc | | 1/4 cc |

Novolin Pen Injector

This pen-shaped device holds prefilled cartridges of NPH, Regular, or 70/30 insulin. The pen is convenient and easy to use: you screw a needle onto one end, dial the dose, and then inject. This highly portable injection device is ideal for people on intensive insulin therapy, or those who are away from home at meal times. Prices for the Novolin Pen Injector vary greatly, so watch for sales.

Disposing of Needles and Syringes

The improper disposal of syringes and needles is illegal and hazardous. You must obtain a sharps container specifically designed for the containment of syringes and needles. When filled, the container can be returned to the medical supply center where you purchased it. You may also use a mail back system which supplies sharps containers. Call 1-800-723-3863 for this service.

The Insulin Pump

This sophisticated device uses computer chip technology, a syringe reservoir, and battery power to deliver insulin to your body automatically. The syringe is filled with buffered Regular insulin, Velosulin or Humulin BR, and is connected to a thin plastic tube called an infusion set. At the end of the infusion set is either a needle or a catheter (a 1/2-inch plastic tube inserted with a needle; the needle is removed after insertion, leaving the catheter in place).

The pump is worn 24 hours a day, on a belt, in a pocket, attached to a bra, or in a special leg pouch. During bathing and swimming, the syringe is removed from the pump, or the tubing may be disconnected from the syringe and capped. The size is approximately 2" by 3" by 5/8".

The object of pump therapy is to mimic the action of normal beta cells. The pump delivers both a **basal rate** and **bolus doses**. Basal rate refers to the preprogrammed continuous delivery of 0.1 unit increments of insulin. Bolus doses are larger doses programmed in before meals and snacks. Insulin doses are based on blood glucose test results, but the pump does not have a glucose sensor, so the wearer must test blood glucose levels 4 to 8 times daily -- and sometimes at 3 am. He or she must interpret blood glucose levels, taking into consideration everything that may affect blood glucose, and then decide on an

appropriate insulin dosage.

This is a great responsibility. Pump wearers must be highly motivated, able to operate the pump, willing to test blood glucose frequently, and astute enough to know when a problem is developing. They must also have access to a health-care team familiar with pump therapy.

How do I know if the insulin pump might be right for me?

Consider the advantages and disadvantages:

Advantages

- Greater flexibility of meals, exercise, and daily schedule
- Improved physical and psychological well being
- Smoother control of blood glucose level
- Lower glycosylated hemoglobin

Disadvantages

- Risk of infection
- More frequent hypoglycemia
- Constant reminder of diabetes

Additional Information

- Additional information is available from your physician and the diabetes education staff where you receive your medical care.
- Additional online information is available from the manufacturers of pumps, including [MiniMed Technologies](#) and Disetronic Medical Systems.

Insulin Reactions

Normal blood glucose levels fall between 60 and 120 mg/dl. When you have an insulin reaction, your blood sugar may fall below 60 mg/dl, or fall rapidly from a high level to a lower level, or simply fall below your usual level. This is called **low blood sugar** or **hypoglycemia** (hypo = too little, glyc = sugar, emia = blood). An insulin reaction can occur if you:

- Inject too much insulin
- Skip a meal, eat too little, or wait too long between meals
- Exercise or work more than usual

Symptoms of an Insulin Reaction

When you have an insulin reaction, the symptoms come on suddenly:

- Cold sweat and a clammy feeling
- Dizziness, weakness, or shakiness
- Irritability or impatience
- Pounding heart or increased heart rate
- Nervousness or confusion

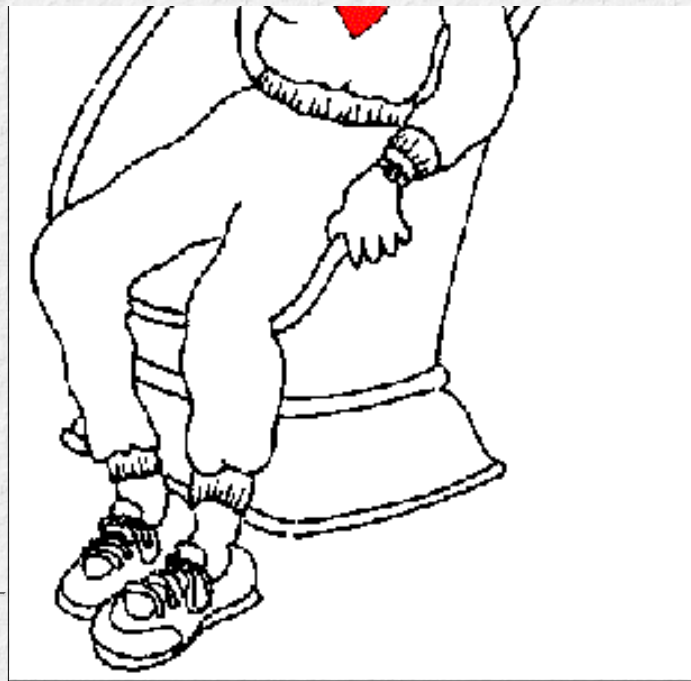


- Headache
- Blurred or double vision
- Hunger
- Numbness or tingling in lips or fingertips
- Paleness and slurred speech
- Convulsions

An insulin reaction is your body's response to low blood sugar. When your brain senses low blood sugar, it signals the release of hormones called catecholamines. One such "catecholamine" is adrenaline!

Catecholamines produce the effects of pallor, sweating, shaking, pounding heart beat, nervousness, and irritability.

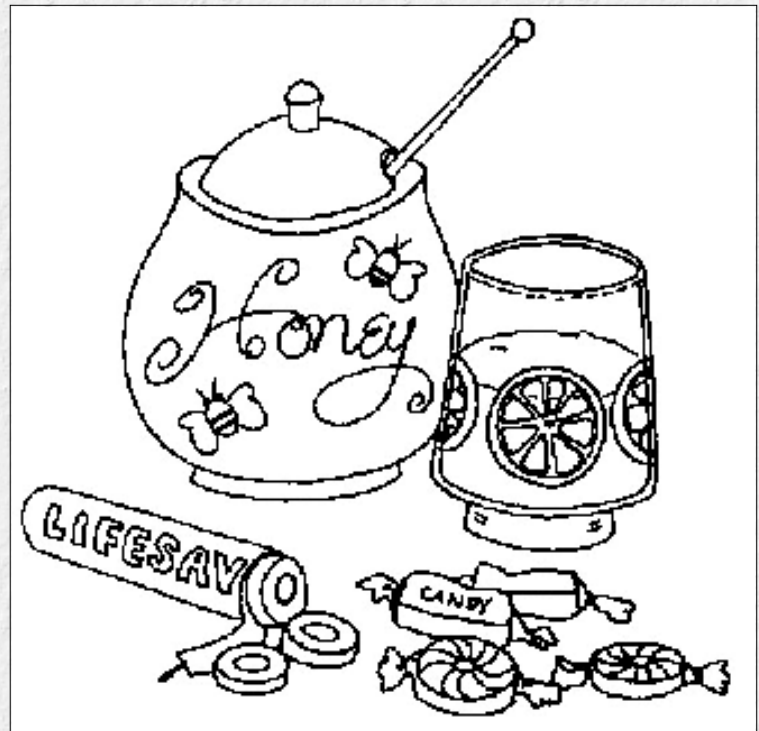
Catecholamines also cause the release of stores of sugar in the liver (glycogen), which raises your blood sugar.



TREATING AN INSULIN REACTION YOURSELF

⚠ DO NOT WAIT TO SEE IF SYMPTOMS WILL GO AWAY.

1. Take some kind of **FAST SUGAR FOOD** to raise your blood sugar quickly.



FAST SUGAR FOODS

⚠ ALWAYS CARRY A FAST SUGAR WITH YOU.

Here are some that are easy to find:

From the Drug Store:

Insta-Glucose (1 tube)

Glucose (1/3 bottle)

Glucose tablets (2-3)

Destrasols (4-6)

Monoject Insulin Reaction Gel (1 packet)

From the Grocery Store:

Life-Saver Candies (4-6)

Cola or other soda (6 oz.)

Chuckles Candy (2)

Honey or corn syrup (2 tbsp)

Orange Juice (4 oz.)

Jelly beans (6)

Sugar (2 lumps)

2. Stop what you are doing and sit or lie down.

3. Wait 10 to 15 minutes. If you do not feel better, repeat the food taken.

DO NOT OVER-TREAT A REACTION by continuing to eat until it goes away, or by eating anything and everything in sight.

4. When you feel better, eat a snack. If it is close to a meal time, have your next meal.

Sample Snacks for After a Reaction

- Packaged peanut butter cracker sandwiches (4)
- A piece of fruit and a glass of milk (8 oz)
- 4 crackers and a glass of milk (8 oz)
- 1/2 cheese sandwich

After a reaction, you may feel tired and have a high blood sugar. **DO NOT MAKE A PERMANENT CHANGE IN YOUR INSULIN DOSE AT THIS TIME.** If you have frequent insulin reactions at the same time of day, you may need to adjust food or insulin. See your diabetes educator or doctor. Keeping a record of blood sugar tests, insulin doses, insulin reactions, and how you feel will help your diabetes educator or doctor make adjustments.

Preventing Insulin Reactions

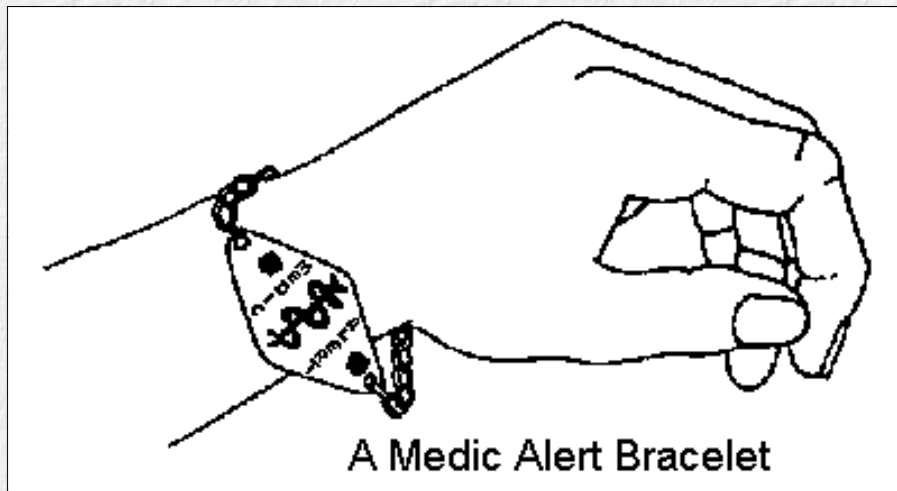
To prevent insulin reactions:

- Eat regular meals on schedule
- Avoid sudden changes in diet, exercise, or insulin
- Eat a snack before exercising

To prevent additional problems when you have a reaction:

- Always carry a fast-acting sugar food
- Treat reactions immediately
- Wear diabetes identification to inform others of your condition in case of an accident or loss of consciousness due to a

reaction



Teach your family, friends, teachers, and coworkers how to spot a reaction and how to help if you have one. If you ignore reaction warning symptoms and do not take sugar, you could become unconscious. While this is unlikely, you can protect yourself by teaching family and friends how to give a [glucagon](#) injection in an emergency (see [instructions](#) below).

INSULIN REACTIONS -- TREATMENT INSTRUCTIONS FOR FRIENDS AND FAMILY MEMBERS

When a friend or family member has an insulin reaction, don't panic. If you keep a clear head and act quickly to give them sugar, you can stop the reaction before more serious problems develop.

Warning Signs of an Insulin Reaction

An insulin reaction occurs when the blood sugar level falls too low (usually below 60 mg/dl). The medical term for a reaction is **hypoglycemia**. Insulin reactions are more likely when a person with diabetes:

- Injects too much insulin
- Skips a meal, eats too little, or waits too long between meals
- Exercises or works more than usual

Hypoglycemia symptoms come on suddenly, and may progress from mild to severe.

Symptoms of Mild Hypoglycemia

When **ONLY** the following symptoms are present, give juice or sugar. Assistance is usually not needed.

- Hunger
- Cold sweat and a clammy feeling
- Dizziness, weakness, or shakiness
- Pounding heart or increase heart rate


Symptoms of More Serious Hypoglycemia

When the following symptoms are present, give juice or sugar. Assistance may be needed.

- Nervousness or confusion

- Headache
 - Blurred or double vision
 - Numbness or tingling in lips or fingers
-

Symptoms of Severe Hypoglycemia

 When the following symptoms are present, assistance is **ALWAYS** required. Give glucose gel.

- Paleness and slurred speech
- Bizarre behavior

If **convulsions** occur, give [glucagon](#).

Different people experience different symptoms. Ask your family member with diabetes to describe what happens and how he or she feels during an insulin reaction so that you will be able to recognize his or her unique symptoms.

Treating an Insulin Reaction

 **DO NOT WAIT TO SEE IF THE SYMPTOMS WILL GO AWAY.**

If the person is conscious and able to swallow, feed him or her some kind of **FAST SUGAR FOOD**:

- Fruit juice (4 oz)
- Candy (4-6 Life-Savers, 6 jelly beans, 2 "Chuckles")
- Cola or other soda (not diet or sugar free)
- Sugar, honey, or corn syrup (2 tbsp)

Never force fluids or foods if the person is unconscious or **unable to swallow**. Give [glucagon](#) if it is available and you've been instructed in technique. If glucagon is not available, rush the unconscious person to the hospital.

Glucagon Injection Kit (solution in syringe)

1. Inject all solution into ampule
2. Mix
3. Draw into syringe
4. Inject into upper arm, thigh, or buttocks

   **IF THERE IS NO RESPONSE IN 5 TO 10 MINUTES CALL FOR AN AMBULANCE OR RUSH THE PERSON TO THE NEAREST HOSPITAL.**

Usually the person responds in 5 to 10 minutes. Have him or her eat a snack:

- Packaged peanut butter cracker sandwiches
- Fruit or a cracker and milk
- 1/2 cheese sandwich

Talk to the person about what might have caused the reaction, so that future reactions can be avoided. If the reaction was so severe that you had to administer glucagon, encourage the person to report it to his or her doctor.

Questions and Answers

Your diabetes educator and physician will help you set your own goals. For some people, a blood sugar level below 80 mg is too low, while for others a level under 100 mg is too low. A level over 120 before a meal is too high for some, while for others anything up to 150 mg is all right.

How serious is hypoglycemia?

- You can easily treat hypoglycemia (insulin reaction) with fast-acting sugar. Even before you take sugar, your body begins to correct the sugar imbalance. The catecholamines (see above) released during a hypoglycemia episode cause the liver to release stored glycogen, which converts to glucose and raises your blood sugar. Prolonged, severe hypoglycemia (less than 20 mg for over 1/2 hour) can result in damage to the brain or the heart.

What is a Somogyi effect?

- When your liver releases a lot of stored glycogen in response to a reaction, high blood sugar results. This over-correction is called a rebound or Somogyi effect. High blood sugar with urine ketones and a feeling of exhaustion for a day following a reaction indicate a Somogyi effect.

How can I tell if I have slept through a night-time insulin reaction?

- Symptoms include a headache when you awake, cold sweats, bad dreams, high blood sugar, and exhaustion.

⚠️ REMEMBER: The care of diabetes is a team effort involving you, your physician, and the diabetes education staff where you receive your medical care. This handbook cannot - and was not meant to - replace this team effort.

This handbook embodies the approach of the diabetes care team at the University of Massachusetts Medical Center. Different diabetes care teams may approach some aspects of diabetes care in ways that differ from those in this handbook. While most teams are in close agreement regarding the **GENERAL PRINCIPLES** of diabetes care, they may differ in the **DETAILS**. There can be more than one "right" way to approach a specific issue in diabetes management.

Always remain in touch with your diabetes care team, and bring any questions you may have about the materials in this handbook to their attention!

Copyright 1995, 1996, 1997, 1998 Ruth E. Lundstrom, R.N., John P. Mordes, M.D., Aldo A. Rossini, M.D. All rights reserved.

Feedback: send e-mail to Dr. Aldo Rossini

This page was last revised on January 2, 1997.

[[Table of contents](#) | [Glossary](#) | [Previous chapter](#) | [Next chapter](#)]

The Healing Handbook *for* Persons with Diabetes

[[Table of contents](#) | [Previous chapter](#) | [Next chapter](#)]

Chapter 9

Oral Medications

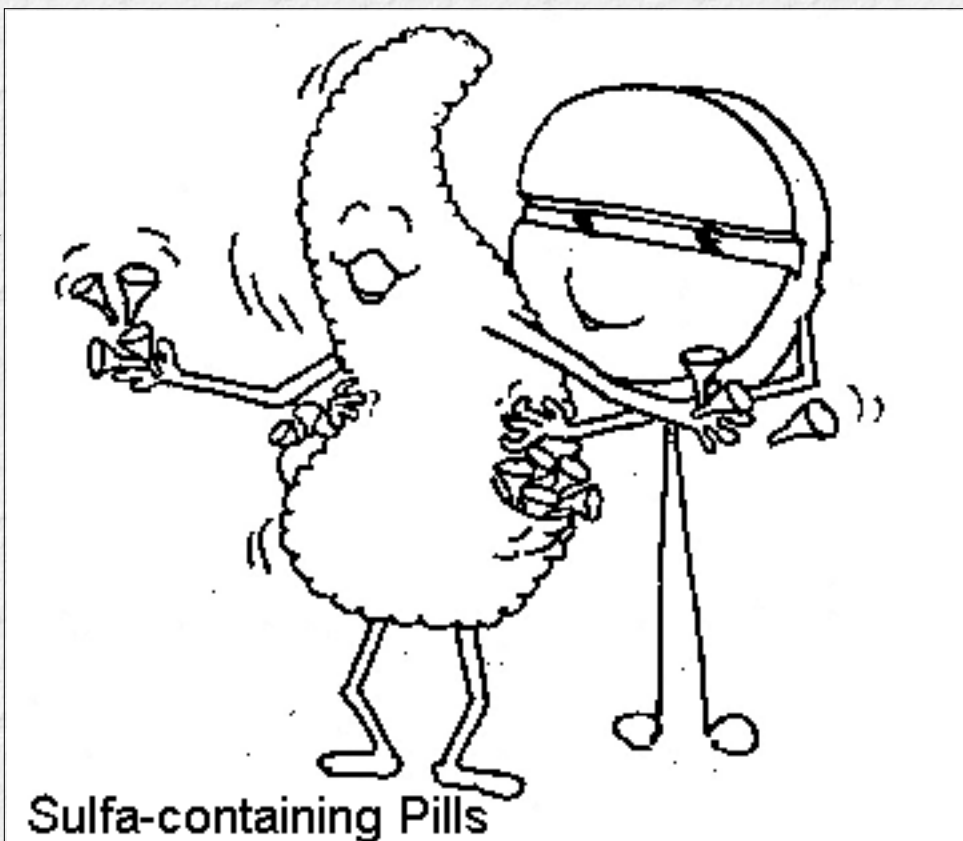
[Oral Medications for Type II Diabetes](#)

[Questions and Answers](#)

Sometimes diet alone is not enough to control Type II diabetes. Your doctor may prescribe oral hypoglycemic agents (pills) as a supplement to diet and exercise for controlling your diabetes. There are several kinds of pills for helping to lower blood sugar. ***None of these pills is insulin!*** If diet, exercise, and oral hypoglycemic agents are not enough to control your blood sugar, then insulin may be needed.

- One kind of pills uses a sulfa-containing compound that helps you stay in balance by 1) squeezing more insulin out of your beta cells and 2) improving insulin's ability to move glucose into your body's cells. These pills are called "sulfonylurea" pills. They can often be taken once or twice a day.
- Another new kind of pill also helps squeeze more insulin out of your beta cells, but it is short-acting and is meant to be taken before meals. It is called "Prandin."
- Another kind of pill helps you stay in balance mostly by decreasing the amount of sugar (glucose) that your liver makes. This is called a "biguanide" type pill.
- Another kind of pill improves insulin's ability to move glucose into your cells. This kind of pill is relatively new and is called a "thiazolidinedione" type pill. (Isn't that a mouthful!)
- There is also a kind of pill that works in a different way. These act by interfering with the absorption of sugar after meals. There is only one such pill, acarbose, available at this time.

The different kinds of pills can be given alone or together. They are sometimes also used together with insulin to improve your control and reduce the amount of insulin you must take. A list of the various pills



is given below.

Pills **ALONE** are **NEVER** used to treat type I (juvenile) diabetes, and their use during pregnancy is **STRONGLY** discouraged because they might be harmful to the baby.

- My first oral medication: _____
Dosage: _____
When I take it: _____
 - My second oral medication: _____
Dosage: _____
When I take it: _____
-

Oral hypoglycemic pills **do not** cure diabetes, they only help to control it. When taking pills, you must still follow your meal and exercise plans, monitor your blood glucose daily, and if you are overweight, follow your weight reduction plan.

Oral hypoglycemic agents may help until you lose weight, but maintaining your ideal weight is the best way to stay in balance.

IF DIET AND EXERCISE CONTROL YOUR DIABETES, YOU DO NOT NEED ORAL MEDICATION.

Oral Medications for Type II Diabetes

Since their introduction in the late 1950s, oral hypoglycemic agents have helped millions of people with Type II diabetes maintain control of their blood glucose levels. There are now several different kinds of oral medications for diabetes that act in very different ways. Follow the hyperlinks for more detailed information.

1. Pills that help put more insulin in the bloodstream: the Sulfonylurea (sulfa containing) Type Pills

- **First-generation** (original) oral hypoglycemics include Diabinese, Orinase, and Tolinase. These are being used less and less.
- Glucotrol, DiaBeta, Micronase, and Amaryl are **second-generation** (that is, newer) oral hypoglycemics. Advantages of second-generation agents include reduced side effects, 100-200 times greater potency, and a wider range of treatment options. They are also longer acting than most of the first generation pills and can be taken just once or twice a day.

You can only take a sulfa-containing pill for your diabetes if your liver and kidney function are good.

2. A new pill that helps put more insulin in the bloodstream:

Prandin

The newest pill for persons with Type 2 diabetes, released in the spring of 1998, is called Prandin. It is meant to be used either alone or in combination with the Glucophage pill (see below).

It is taken just before a meal and helps put more insulin in the bloodstream.

It's not yet clear who would get the most benefit from it, but it may be useful if you are taking Glucophage but still do not have good diabetes control. Possible side effects from long-term use are not yet known. The generic or chemical name for Prandin is repaglinide.

3. Pills that help insulin work better

A relatively new development in pills for treating diabetes is a pill that helps insulin work better. One kind of pill lowers the amount of sugar that is made in the liver. Another kind makes the body more sensitive to insulin; it actually makes the insulin "work better."

When a person takes either kind of pill, less insulin is needed to reduce blood sugar.


- **The Biguanide Type Pills (Glucophage)**

This kind of pill has been available in the United States for several years, and there is currently only one brand available. It is called [Glucophage](#). This is the kind of pill that works by keeping the liver from making too much sugar. (Remember that the sugar in the blood comes not just from what you eat, but also from your liver! See [Chapter 1](#) for more information.)

You can only take a biguanide pill if your kidney and liver function are normal. Some people experience stomach upset from these pills.

- **Troglitazone (Rezulin)**

This is a relatively new type of pill for diabetes, released by the Food and Drug Administration at the beginning of 1997. Troglitazone will be sold under the trade name of [Rezulin](#), and it will be available in pharmacies in the United States in March, 1997. This medicine makes the body more sensitive to its insulin. It is sometimes called an "insulin resistance reducer." It does not belong to the "biguanide" family of chemicals. This is the only available "thiazolidinedione" type pill in the United States at this time. It is currently intended for use principally by persons who are already taking insulin injections. It can greatly reduce the amount of insulin needed.

 Recently (December 1997) reports have come to light that Rezulin can cause liver damage in some people who take it. Because of this tendency to cause liver damage that can be fatal, the National Institutes have discontinued testing Rezulin in a large trial that was hoping to show that it could actually prevent diabetes (June, 1998).

The American Food and Drug Administration (FDA) has so far decided not to withdraw it from the market, but recommends that all persons taking it have regular tests of their liver. These tests should be done regularly for at least a year.

If your doctor/diabetologist has prescribed or suggested Rezulin for your diabetes, you should discuss this possible side effect with him or her. .

4. Acarbose

This kind of pill is also fairly new. It interferes with the absorption of sugar from the intestines after a meal. For some patients, this can mean better overall control of diabetes. There is currently one brand available. It is called [Precose](#).

Questions and Answers

1. Are there any side effects associated with oral hypoglycemic agents?

Side effects of most of the diabetes pills, the sulfonylureas, biguanides, Prandin, and Rezulin, are rare, but they can occur. Call your doctor if you experience:

- Upset stomach or loss of appetite
- A skin rash or itchiness
- Headache
- Flushing (if you have had an alcoholic beverage)
- Acarbose (Precose) can cause stomach discomfort, "gas," and diarrhea, and for that reason it must be started at a low dose. Even then, many people cannot take advantage of it.

2. Can the different types of oral hypoglycemic agents be taken together?

- Yes, because the different kinds of medicine work in different ways. All of them can be taken together with insulin.
- A sulfonylurea or Prandin and metformin (Glucophage) can be used together to treat diabetes that is not controlled by either medication alone, and acarbose can be added, too.
- Rezulin is principally intended for use together with insulin, but it can also be used in combination with a sulfonylurea, Glucophage, and Precose.
- Not a lot is known yet about some of these combinations of pills, or which ones might be best. Everything depends on your particular kind of diabetes, what you tend to eat, how much you weigh, and how much you exercise.

3. What about hypoglycemia?

- It is possible to have a hypoglycemic reaction (low blood sugar) while taking oral medication. This is particularly true of the pills that act by squeezing more insulin out of your beta cells (the sulfa-containing or "sulfonylurea" type pills). Rezulin by itself does not cause low blood sugar, but taking it in addition to insulin can lead to low blood sugar. Glucophage by itself only rarely causes low blood sugar.
- See [Chapter 8](#) for hypoglycemia symptoms and actions you should take if a hypoglycemic reaction

occurs. Report hypoglycemia to your doctor. To avoid problems, follow your diet, monitor blood glucose, take your pills as directed , and see your health-care providers regularly.



DRUG INTERACTION WARNING

- Other drugs may alter the effect of your oral medication. Check with your diabetes educator or doctor before taking **any** other medication.
-



REMEMBER: The care of diabetes is a team effort involving you, your physician, and the diabetes education staff where you receive your medical care. This handbook cannot-and was not meant to-replace this team effort.

This handbook embodies the approach of the diabetes care team at the University of Massachusetts Medical Center. Different diabetes care teams may approach some aspects of diabetes care in ways that differ from those in this handbook. While most teams are in close agreement regarding the GENERAL PRINCIPLES of diabetes care, they may differ in the DETAILS. There can be more than one "right" way to approach a specific issue in diabetes management.

Always remain in touch with your diabetes care team, and bring any questions you may have about the materials in this handbook to their attention!

Copyright 1995, 1996, 1997, 1998 Ruth E. Lundstrom, R.N., John P. Mordes, M.D., Aldo A. Rossini, M.D. All rights reserved.

Feedback: send e-mail to Dr. Aldo Rossini

This page was last revised on August 17, 1998.

[[Table of contents](#) | [Glossary](#) | [Previous chapter](#) | [Next chapter](#)]

The Healing Handbook *for* Persons with Diabetes

[[Table of contents](#) | [Previous chapter](#) | [Next chapter](#)]

Chapter 11 Skin and Foot Care

- [Protecting your feet](#)
- [Dryness and Other Common Skin](#)

[Problems](#)

- [Skin Infections](#)
 - [Yeast Infections](#)
 - [Foot Care](#)
 - [Foot Care DO's and DON'Ts](#)
 - [First Aid for Foot Injuries](#)
 - [Foot care supplies](#)
 - [Athlete's Foot](#)
-



Protecting your feet

PEOPLE with diabetes may be prone to skin and foot problems. Here are a few simple things you can do every day to protect your skin and feet:

- Plan! Get plenty of rest. Sleep 7 to 8 hours each night. Children need even more sleep.
- Bathe daily. Clean skin reduces the likelihood of skin infections.
- Wear comfortable clothes. Clean socks and comfortable shoes are especially important.
- for rest and relaxation during the day. Space activities wisely.

Dryness and Other Common Skin Problems

Dry skin can be caused by dehydration, which occurs in poorly controlled diabetes. Remember that excessive urination and thirst are symptoms of diabetes. For dry, itchy skin, try Alpha Keri bath oil. A capful in bath water softens and lubricates your skin. But be careful -- bath oil makes your tub slippery.

Use a lanolin base cream to hold moisture in your skin. Keri-Lotion, Nivea Cream, and Eucerine cream all contain lanolin and moisturize the skin well. Udder cream has no added perfume. It is inexpensive and easy to apply.

Skin Infections

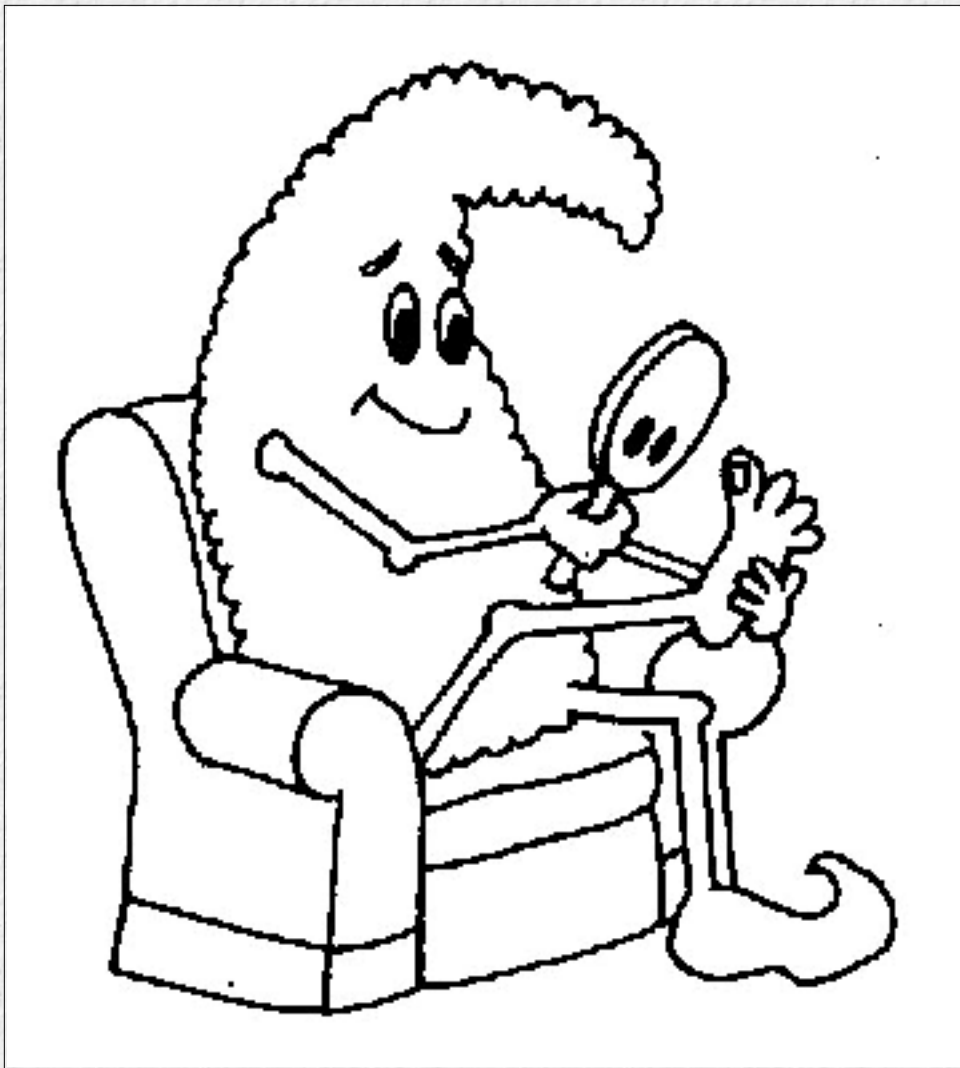
People with poorly controlled diabetes are prone to skin infections because elevated blood sugar reduces the effectiveness of bacteria-fighting cells. Carbuncles, boils, and other skin infections may be hazardous if not properly treated. Even a small cut may progress to a deep, open sore, called an ulcer, if not treated promptly. In most cases, good hygiene (clean skin) and good diabetic control will improve your body's ability to resist infection. Sometimes, however, antibiotics are necessary.

Yeast Infections

People with poorly controlled diabetes may experience yeast infections in the underarms and especially in the genital-anal area. Women sometimes suffer from severe vaginal itch or a rash under the breasts. The most common yeast infection, **candidiasis** (moniliasis) produces an intense itch and a cheesy-white discharge. The first treatment is to control blood sugar, which often stops the infection. Powders, creams, and suppositories may also be recommended.

Foot Care

In long-term diabetes, blood circulation to and from the feet decreases, slowing the healing process for foot injuries. Because nerves in the feet may not work well, you may not feel small foot injuries and therefore you may fail to treat them promptly. Untreated foot injuries can become infected or ulcerated.



To avoid foot problems, keep your feet clean and wear comfortable shoes and socks at all times. Keep your feet warm, and take care of toenails and calluses.

See a podiatrist (foot specialist) and when you visit your doctor, make sure he or she checks your feet (socks off) during the examination.

If you notice any change in sensation in your feet, contact your doctor or diabetes educator at once.



Foot Care DO's and DON'Ts

Do:

- Check your feet daily for red spots, bruises, cuts, blisters, and dryness or cracks in the skin. Don't forget under and between toes. Press gently and feel for tenderness or hot spots -- this may indicate injury.
- Every day, wash your feet with mild soap and dry them thoroughly, especially between the toes.
- If the skin on your feet is dry, apply a lanolin base cream (but not between the toes). If your feet perspire a lot, use talcum powder.
- Wear good-fitting, soft shoes and clean socks. Smooth out wrinkles in socks. Choose new shoes carefully (comfort is more important than style) and break them in slowly.
- Avoid foot injuries by wearing shoes or slippers around the house and swim slippers at the beach or pool.
- Wear insulated boots to keep feet warm on cold days.
- Trim toenails to the contour of your toe. If you can't see them well or reach them easily, have someone do this for you.
- Buff calluses with pumice stone.

Don't:

- Put hot water bottles or heating pads on your feet.
- Soak your feet (this dries out natural oils).
- Cut corns or calluses or use corn pads or corn medication.
- Wear shoes that are too tight or worn out, or round garters or tight socks that cut off circulation.

Call your Podiatrist if you have:

- A puncture wound, any foot injury that does not heal, or any pus from cuts
- Red spots (even if there is no pain) under corns and calluses
- Ingrown toenails, or thick toenails, corns, or calluses that are difficult to care for

First Aid for Foot Injuries

You may feel no pain when you injure your foot, but that doesn't mean you can ignore the injury.

- Wash the injury with mild soap and dry thoroughly.
- Then apply a mild antiseptic (for example, Polysporin ointment).
- Do not use iodine, Epsom salts, or boric acid.

- If a bandage is necessary, use a small gauze pad and non-allergic tape (regular tape can irritate your skin).
 - Rest with the injured foot up for 20 minutes several times a day.
-


Foot Care Supplies

Always keep these foot care supplies on hand:

- Emery boards or a buff kit for calluses
 - Keri, Nivea, or another lanolin-base lotion for dry skin
 - Non-allergic tape and small gauze pads
 - Foot powder
 - Polysporin (or a similar ointment)
-

Athlete's Foot

- Athlete's foot is a fungus infection that causes itchiness and broken skin, often between toes. It may look like tiny blisters or scaly, dry skin. Athlete's foot is contagious; you can catch it from contact with bathroom floors and the floors of public locker rooms. Because broken skin may lead to other infections, you must try to prevent athlete's foot and treat it when it occurs.
 - To prevent athlete's foot, wear bath slippers in public bath houses and showers.
 - If you experience symptoms of athlete's foot, apply an antifungal ointment (Tinactin or Desinex). Treat your shoes with an anti-fungal powder.
-

 **REMEMBER: The care of diabetes is a team effort involving you, your physician, and the diabetes education staff where you receive your medical care. This handbook cannot-and was not meant to-replace this team effort.**

This handbook embodies the approach of the diabetes care team at the University of Massachusetts Medical Center. Different diabetes care teams may approach some aspects of diabetes care in ways that differ from those in this handbook. While most teams are in close agreement regarding the GENERAL PRINCIPLES of diabetes care, they may differ in the DETAILS. There can be more than one "right" way to approach a specific issue in diabetes management.

Always remain in touch with your diabetes care team, and bring any questions you may have about the materials in this handbook to their attention!

Copyright 1995, 1996, 1997, 1998 Ruth E. Lundstrom, R.N., John P. Mordes, M.D., Aldo A. Rossini, M.D. All rights reserved.

Feedback: send e-mail to Dr. Aldo Rossini

This page was last revised on January 2, 1998.

[[Table of contents](#) | [Glossary](#) | [Previous chapter](#) | [Next chapter](#)]

The Healing Handbook *for* Persons with Diabetes

[[Table of contents](#) | [Previous chapter](#) | [Next chapter](#)]

Chapter 12 Complications

- [Diabetes Complications](#)
- [Eyes](#)
- [The Kidneys](#)
- [Nerves](#)
- [Blood Vessels](#)
- [Foot Problems](#)
- [Dental Care](#)

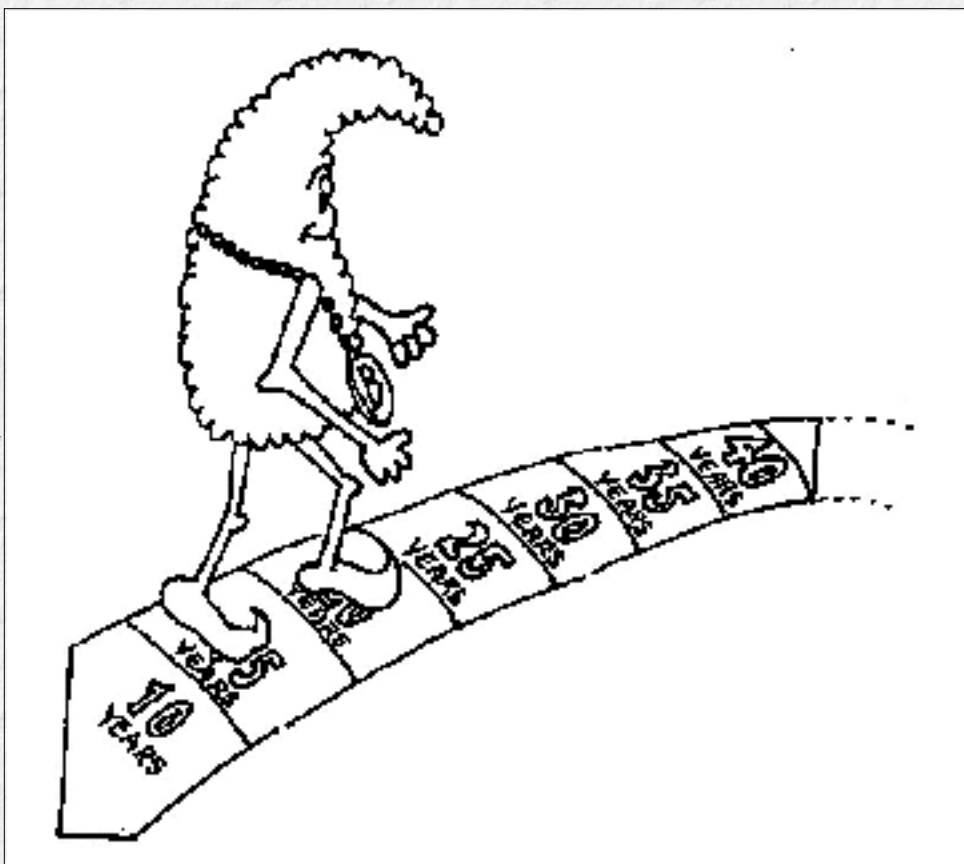
Diabetes Complications

People with diabetes are vulnerable to a variety of complications over time. Health-care providers all agree that strict control of blood sugar makes complications less likely. This was shown clearly by the [Diabetes Control and Complications Trial](#). Control of blood sugar is the best way to minimize the risk of complications.

Even the very best control may not be able to eliminate all complications, and the risk of increases with the length of time you have diabetes. Diabetes complications affect the eyes, kidneys, nerves, and large and small blood vessels. Here is a list.

Complication

Organ Affected



| | |
|-----------------------------|--------------------------------|
| Coronary artery disease | Heart |
| Dermopathy | Skin |
| Macroangiopathy | Large blood vessels |
| Microangiopathy | Small blood vessels |
| Nephropathy | Kidney |
| Neuropathy | Nerves |
| Peripheral vascular disease | Blood vessels of legs and feet |
| Retinopathy | Eyes |

EYES

Diabetes can affect the **lens**, which focuses light reflected from objects, the **vitreous**, a clear jelly-like substance through which light passes from the lens to the retina, and the **retina**, where images are formed and translated into electric impulses for interpretation by the brain.

Diabetic Retinopathy

Diabetic Retinopathy is a deterioration of the small blood vessels that nourish the retina. Although diabetic retinopathy is a serious cause of blindness, only a small percentage of persons with diabetic retinopathy lose their sight. There are two forms of diabetic retinopathy:

- **Background retinopathy** is an early stage of retinopathy that usually involves no apparent symptoms. Blood vessels within the retina develop tiny bulges (**microaneurysms**), which leak fluid, causing swelling and forming deposits (**exudates**). In some cases, the **macula** (part of the retina where central vision occurs) becomes swollen, resulting in distorted vision. Mild background retinopathy is normally not treated.
- **Proliferative retinopathy** develops from background retinopathy when fragile, new blood vessels on the retina rupture, bleeding into the vitreous and blocking light from the retina. Ruptured blood vessels in the vitreous form scar tissue which may tighten and pull on the retina, eventually detaching it from the back of the eye. Proliferative retinopathy is treated with laser surgery (**photocoagulation**).

Vitrectomy

When massive bleeding into the vitreous has occurred, a vitrectomy may be performed. In this surgical procedure, the bloody vitreous is removed and replaced with clear, sterile fluids, restoring vision.

To minimize the risk of diabetic retinopathy:

- Keep your blood sugar level in good control. The Diabetes Control and Complications Trial has proven beyond doubt that good blood sugar control reduces the risk of diabetic retinopathy.
- Maintain normal blood pressure. If you take medication for high blood pressure, don't forget it.
- See an ophthalmologist for a complete eye exam at least once a year.

Cataracts

Cataracts are clouding of the normally clear lens. A cataract develops over years and causes blurred vision when a large part of the lens becomes cloudy. Causes of cataracts include aging, eye injuries, disease, heredity, and birth defects. **Senile cataracts** are a common eye problem among the elderly. Poor diabetes control can hasten the formation of senile cataracts. **Metabolic cataracts** are sometimes found in younger people with diabetes. Both types are treated by surgical removal of the lens. Eyeglasses, contact lenses, or intraocular lens implants restore vision following surgery.

To minimize the risk of cataracts, see your ophthalmologist for a complete eye exam at least once a year.

The Kidneys

The kidneys filter waste products from the blood, rid the body of excess water, and eliminate certain chemicals. Needed chemicals, proteins, and red and white blood cells remain in the blood stream. The kidneys produce about a quart of urine every day to maintain the body's fluid balance.

Diabetic Nephropathy

Diabetic nephropathy is a complication of long-term diabetes that results in damage to the bundles of capillaries that form the kidneys' filtering system. Diabetic nephropathy develops in stages over many years. Kidney filtering becomes less efficient, and certain proteins leak out. Protein in the urine may be the first sign of nephropathy. Other signs include high blood pressure, weight gain from fluid retention, fatigue, and just feeling ill. Kidney function tests help determine the degree of kidney damage.

Treatments for kidney failure include hemodialysis (done at the hospital 3 times a week), peritoneal dialysis (done 3 to 4 times a day at home), and kidney transplants.

To minimize the risk of diabetic nephropathy:

- Keep your blood sugar level in good control.
- 2. Maintain normal blood pressure. If you take medication for high blood pressure, don't forget it.
- Follow the specific diet recommended by your health-care provider.

Diabetic bladder dysfunction

Diabetic bladder dysfunction occurs when damage to the nerves of the bladder results in incomplete emptying of the bladder. Urine that remains in the bladder is stagnant, and bacteria grow in it. The bacteria travel up to the kidney and cause infection. Surgery may be required, but sometimes medication helps.

Urinary tract infections

Urinary tract infections may develop in persons with uncontrolled diabetes. Symptoms include excessive urination, a burning sensation with urination, and low back pain. If untreated, the infection travels up the ureters to the kidney, possibly causing permanent damage. Women are more likely to develop urinary tract infections. Prompt treatment with antibiotics prescribed by your doctor is essential. Remember to take the pills for the period prescribed, even if your symptoms go away.

NERVES

Nearly 70% of persons with diabetes experience some degree of nerve damage or **neuropathy**. Neuropathy occurs in people with Type I and Type II diabetes, due to metabolic changes associated with diabetes. Constant high blood sugar destroys both nerve fiber (**axon**) and the fatty insulation that surrounds it (**myelin**). Damaged nerves do not transmit proper signals, resulting in a loss of sensation, hypersensation, or pain.

Peripheral neuropathy is the most common form. Varying from mild to severe, it causes changes in sensation that begin in the toes and move up to the feet and legs. One may experience numbness, tingling, burning, dull ache, or stabbing pain and cramping, which is worse at night. The skin can become so sensitive that pressure from clothes is painful. Severe neuropathy may cause weakness and unbalanced walking. The greatest danger is foot ulcers, which result when lack of sensation causes people to continue walking on injured feet.

Many treatments are available for peripheral neuropathy, including medications and topical creams. Not all are effective for everyone. Better diabetic control helps some patients. A painful neuropathy may change to a numb feeling after a while. And neuropathies sometimes disappear on their own. Autonomic neuropathy involves the nerve supply to small blood vessels and sweat glands of the skin, the stomach, the bowels, the bladder, the heart, and the nervous system. It is most often associated with long-term diabetes, poor control, and elevated blood sugar. Symptoms vary, depending on the affected area, and may include:

- Abnormal sweating after eating
- Inappropriate response to temperature changes, such as constricting blood vessels in warm temperatures
- Nausea and early fullness when eating, delayed emptying stomach, or vomiting
- Watery diarrhea, often at night and without warning
- Incomplete emptying of bladder, leading to urinary tract infections
- Sexual dysfunction, including impotence and delayed vaginal lubrication
- Drop in blood pressure upon sitting or standing
- Rapid heart beat
- Loss of warning signs of hypoglycemia

Various medications may be prescribed to control nausea, vomiting, diarrhea, sudden drops in blood pressure, and recurrent urinary tract infections. Penile implants and vacuum systems are useful in treating impotence.

BLOOD VESSELS

- **Macrovascular disease** refers to changes in the medium to large-size blood vessels. The blood vessel walls thicken and become hard and non-elastic (**arteriosclerosis**). Blood vessels also become clogged with mounds of plaque (**atherosclerosis**). Eventually, the flow of blood may be blocked. Three types of this disease are:
 - **Peripheral vascular disease** refers to diseased blood vessels that supply the legs and feet. If blood flow is only partially interrupted, cramps, weakness, "charley horse," or pain in the legs when walking (claudication) may result. A completely blocked artery will cause severe pain and the leg will become cold and pale. Treatments include replacing the diseased artery surgically or opening the blood vessel by compressing plaque against the artery wall (angioplasty).
 - **Coronary artery disease** refers to diseased heart arteries. Cramping and angina may occur when blood flow is decreased. Complete blockage of an artery results in myocardial infarction (heart attack). Symptoms of angina and heart attack include chest pressure, cramping, heavy feeling in the chest, shortness of breath, and extreme fatigue. Treatments include coronary bypass surgery and angioplasty.
 - **Cerebral vascular disease** refers to diseased arteries in the brain. Partial blockage may result in temporary reductions of blood supply to a part of the brain (transient ischemic attacks). A complete loss of blood supply to an area of the brain due to clogging or breaking of a blood vessel results in a cerebral vascular accident (stroke). Symptoms include lightheadedness, dizziness, loss of ability to speak, slurred speech, confusion, and inappropriate behavior. If you experience symptoms of any form of macrovascular disease, go to a hospital emergency room at once.

To minimize the risk of macrovascular disease:

- Keep your blood sugar level in good control.
- Maintain normal blood pressure. If you take medication for high blood pressure, don't forget it.
- If overweight, try to reduce your weight.
- Reduce fats and cholesterol in your diet.
- Exercise in moderation, after consulting with your doctor or diabetes educator.
- Do not smoke.
- See your doctor regularly.


FOOT PROBLEMS

Ulcers of the legs and feet occur in people with diabetes due to the combination neuropathy and peripheral vascular disease. Neuropathy causes a loss of sensation, so that foot injuries may go untreated and become infected. Decreased circulation to the feet and legs slows healing. Proper nourishment does not reach damaged tissue, and infected material is not destroyed. Even a small injury may progress to an

ulcer. To prevent foot problems, follow the foot care instructions in [Chapter 11](#).

DENTAL CARE

An increase in cavities and infectious periodontal disease has been found in people with poor diabetes control. To prevent tooth decay, brush your teeth after every meal, floss daily, and see your dentist every six months. Mouthwashes, baking soda, and hydrogen peroxide may provide additional protection against bacteria growth.

 **REMEMBER:** The care of diabetes is a team effort involving you, your physician, and the diabetes education staff where you receive your medical care. This handbook cannot-and was not meant to-replace this team effort.

This handbook embodies the approach of the diabetes care team at the University of Massachusetts Medical Center. Different diabetes care teams may approach some aspects of diabetes care in ways that differ from those in this handbook. While most teams are in close agreement regarding the GENERAL PRINCIPLES of diabetes care, they may differ in the DETAILS. There can be more than one "right" way to approach a specific issue in diabetes management.

Always remain in touch with your diabetes care team, and bring any questions you may have about the materials in this handbook to their attention!

Copyright 1995, 1996, 1997, 1998 Ruth E. Lundstrom, R.N., John P. Mordes, M.D., Aldo A. Rossini, M.D. All rights reserved.

Feedback: send e-mail to [Dr. Aldo Rossini](#)

This chapter last modified January 2, 1998

[[Table of contents](#) | [Glossary](#) | [Previous chapter](#) | [Next chapter](#)]

The Healing Handbook *for* Persons with Diabetes

[[Table of contents](#) | [Previous chapter](#) | [Next chapter](#)]

Chapter 13

Diabetes and the Family

[Part I: Pregnancy](#)

- [Before You Become Pregnant](#)
- [During Pregnancy](#)
- [Delivery](#)
- [Gestational Diabetes](#)

[Part II: Advice for Parents of Children with Diabetes](#)

- [Pitfalls for Parents](#)
- [The Parent's Role](#)
- [Baby Sitters](#)

[Part III: What School Personnel Should Know About the Student with Diabetes](#)

- [General Information](#)
- [Insulin Reactions](#)
- [General Advice](#)
- [Teacher Information](#)



This chapter addresses special concerns of families coping with diabetes. Part I focuses on the special needs of women with diabetes during pregnancy. Part II provides advice for parents of children with diabetes. Part III provides information for school personnel who have contact with students who have diabetes.

Part I: Pregnancy

For women with insulin dependent diabetes, pregnancy requires special care and attention. You and your husband need to understand the effects of diabetes on pregnancy and the effects of pregnancy on diabetes. You will both need to know about insulin doses, diet, exercise, and how to recognize and treat hypoglycemia. Attaining excellent control of blood sugar levels prior to pregnancy and maintaining good control during pregnancy greatly increases your chance of delivering a healthy baby. If you still have questions about pregnancy after you read this section, see your diabetes nurse educator or your doctor, and get a copy of *Diabetes and Pregnancy: What to Expect* or *Gestational Diabetes: What to Expect*, from the American Diabetes Association 1970 Chain Bridge Road, McLean, VA 22109-0592.

Before You Become Pregnant

As you plan your pregnancy, you and husband should both be aware that it will be more expensive for you than for women without diabetes. You will need special care during pregnancy and special precautions during delivery, and your child may require special attention at birth. Choose your medical team before you become pregnant. Your obstetrician, pediatrician, diabetologist, and diabetes educator will work together to provide you with the best care and advice. They will help you choose a hospital that has the latest monitoring and testing equipment and a high-risk nursery.

Statistics indicate that 5-7% of babies born to women with insulin dependent diabetes have abnormalities. The good news is that, with excellent blood sugar control prior to and during the first three months of pregnancy, the risk of abnormalities is reduced to that of women without diabetes: 2-3 % . Your level of control can be measured by blood glucose monitoring records and by a blood test called a **glycosylated hemoglobin**. This test provides information on your blood sugar control over the past 8-12 weeks. The result should be in the normal range before you become pregnant.

During Pregnancy

During the first trimester, hypoglycemia may be a problem, due to morning sickness or nausea that causes you to eat less. Hypoglycemia may also occur because your baby takes sugar from your blood to support its own rapid growth. During the second and third trimesters, your insulin requirements double and triple. Frequent blood glucose monitoring, insulin adjustments, exercise, proper rest, and a good meal plan will help you stay in good control.

Care during pregnancy

To maximize your chances of delivering a healthy, normal baby, follow these simple rules during pregnancy:

- See your doctor every 1 to 2 weeks.
- Stick to your prescribed diet and exercise program
- Check your blood glucose 4 to 8 times daily, and record the results.

Inject insulin as prescribed by your doctor. You may need 3 to 4 shots per day, and you may have to make frequent insulin adjustments.

Remember that hospitalization may be necessary during your pregnancy if your diabetes is out of control.

Hypoglycemia occurs more frequently during pregnancy, so you must **always carry a fast-acting sugar** and you must **never skip meals or snacks**. Ketosis may develop more rapidly during pregnancy when you are ill. Be sure to check your urine for ketones on sick days and any time your blood sugar is over 250 mg. Other, less common problems that may also affect women without diabetes include:

- **Polyhydramnios** or excessive amniotic fluid
- **Toxemia**, characterized by elevated blood pressure, protein in the urine, and swelling of the hands and feet
- **Edema** or generalized swelling

Women in poor diabetic control have a higher rate of miscarriages, but in healthy women with diabetes the risk is no higher than for women without diabetes.

As a direct result of elevated blood sugar, babies born to women with diabetes may be larger than average. If your blood sugar is very high, especially during the last trimester, your baby may be over 10 pounds. Your baby's growth will be measured several times during pregnancy by a technique using sound waves (**sonography**).

For another test (the **LS ratio**), your doctor will insert a fine needle into your uterus and obtain a small amount of amniotic fluid. The LS ratio provides information about your baby's ability to breath on its own after birth. Standard classifications of diabetes have been developed to help predict the outcome of pregnancy. Based on your classification and test results, your doctor will decide on the best delivery date.

Delivery

Most women with diabetes can deliver close to their due date in uncomplicated cases. To be safe, obstetricians usually deliver their patients slightly before the due date by inducing labor or by Cesarean section. Most babies born to women with diabetes are cared for in a high-risk or intensive-care nursery. This is done to ensure a close watch and quick treatment for any problems that may develop. Your baby may have low blood sugar and require extra glucose in feedings or by IV. Special care may also be required if your baby is premature.

After your baby is born, you will experience a tremendous decrease in your insulin requirements. If you have a planned induced delivery date, you will need only half of your pre-pregnancy insulin dose. This may last several weeks. Keep a careful record of your blood sugar levels; your medical team will need this information to determine appropriate insulin adjustments. If you decide to breast feed your baby, you will need less insulin, more calories, and lots of fluids. Hypoglycemia can occur rapidly in breast-feeding mothers, so keep sugar close by.

GESTATIONAL DIABETES

Gestational diabetes is diabetes that is diagnosed during pregnancy. It occurs more frequently in women who are overweight or have a family history of diabetes. After delivery, 98% of these women no longer have diabetes, but they are at greater risk of developing diabetes in the future. Treatment of gestational diabetes always begins with diet and exercise; insulin is introduced only if diet and exercise fail to keep blood sugars in a normal range. The goal is to normalize pre-meal blood sugars and keep after-meal blood sugars below 140 mg (120 mg at some clinics). If you are diagnosed with gestational diabetes, your obstetrician may expand your health-care team to include a diabetes educator, diabetologist, dietician, and neonatologist.

Part II: Advice for Parents of Children with Diabetes

When you learned that your child has diabetes, you may have experienced disbelief, grief, and guilt. Maybe you asked, "Why did this happen to my child?" Maybe you cried out, "It's not fair! " You must come to grips with these feelings so that you can learn the tasks and techniques of diabetes control. Your whole family needs to make adjustments to your child's condition. How you deal with and accept diabetes affects the way your child deals with and accept diabetes. The more you know about diabetes, the better equipped you are to help your child. Read this section, and get a copy of *Children With Diabetes* by Linda Siminerios and Jean Betchart, available from your American Diabetes Association state or national affiliate, or from Diabetes Supplies, 8181 North Stadium Drive, Houston, Texas 77054.

As a parent, you are naturally anxious, but it's up to you to help your child accept his or her diabetes with a minimum of stress. The American Diabetes Association and the Juvenile Diabetes Foundation can be of great help. Other parents who have faced the same problem and learned to cope with it are more than willing to share ideas and advice. You must learn to protect without dominating, to supervise while encouraging self-care. Work with your child for the best control, but remember that "ideal" control isn't always possible.

Your child's self image and self esteem are threatened by diabetes. Be understanding and supportive. Try to avoid unnecessary anxiety about "cheating." You don't want to cause guilt feelings, or make your child think he or she is "bad." Children who think are bad may act accordingly. Help your child plan ahead. No child can should be expected to assume complete responsibility for diabetes control at too early an age. But, ultimately, responsibility for eating properly, injecting insulin, testing blood sugar, and planning exercise will be the child's. Maturity, independence, self control, and self esteem will grow as your child learns self-care.

A child with diabetes is a child first, and a person with diabetes second. Like all children, yours needs to grow physically, socially, and emotionally. Alert parents who are relaxed, knowledgeable, tolerant, and accepting help in the growing process. Feelings of guilt and resentment lead to problems between spouses and between parents and children. Your child's diabetes is a challenge your whole family must face together. It is not a punishment for anything any of you did.

Pitfalls for Parents

An **overanxious** parent creates an overanxious child who is overdependent. By doing everything for your child, you deny him or her the self-control and self-confidence necessary for an independent life.

An **overindulgent** parent feels dietary restrictions and daily injections are too much for a child to handle. He or she offers special treats while providing little discipline. Children of overindulgent parents may grow up under the impression that they are incompetent -- incapable of coping with their own problems -- which reinforces feelings of inadequacy.

A **perfectionist** parent may achieve good diabetes management in early childhood through discipline, but there are risks. The child may feel guilty about poor blood sugar test results, and may even alter a result to obtain parental approval. During adolescence, children of perfectionist parents may rebel -- against both their parents and their diabetes care programs.

An **indifferent** parent may force his or her child to seek attention through rebellion, by "cheating" on the diet, or by skipping insulin injections. Children of indifferent parents may become depressed because of the lack of

discipline, support, and supervision in their lives. They also have a higher frequency of hospitalization.

The Parent's Role

Your role as the parent of a child with diabetes will change as your child grows. Every child is different, of course, but there are some general guidelines you can follow at each stage. And there are some things you can keep in mind no matter what your child's age: Accept your child. Love, teach, guide, and discipline just as you would if diabetes were not a factor. Do not overprotect or overindulge. Accept your child's diabetes without guilt. Learning all you can about diabetes will help you overcome your fears and anxieties. And remember, you cannot control your child's diabetes by overcontrolling your child.

Years 0 through 7

During early childhood, the parent has full responsibility for all aspects of diabetes care. It's important to involve the child at an early age, however. Offer some choices, such as picking a spot to inject or selecting which finger to get the drop of blood from. Remember that parental approval is important at this age: be sure you describe blood test results as high, low, or normal, not good or bad.

Years 7 through 12

Although the parent continues to take major responsibility, during this period the child can take over blood glucose testing and insulin injections some of the time. By age 12, most children can manage their own injections, but parents must be vigilant and remind them if they forget. Children who are away at school or off playing with friends most of the day must assume partial responsibility for dietary control. Participation in self-care at an early age encourages the child to become independent and self-reliant

Try not to be rigid. Children need to learn that a reasonable compromise is all right for parties and special occasions. There is no reason for them to feel "different." A serving of birthday cake and ice cream may elevate blood sugar, but the emotional value of participating with other children is also important. Cover extra food with a few units of regular insulin, if your doctor approves.

- **Camps for Children with Diabetes in Massachusetts**

Eliot P. Joslin Camp for Boys
Charlton, MA

Clara Barton Camp for Girls
North Oxford, MA 01537

Contact the Joslin Diabetes Foundation, 1 Joslin Place, Boston, MA 02215, (617) 732-2646
(508) 757-1211 (winter)
(508) 987-2056 (summer)

- Information on other camps may be obtained from the local chapters of the American Diabetes Association or the Juvenile Diabetes Foundation.
-

Years 12 through 17

At adolescence, your child will greatly resent dependence on you. Once you **and** your child are educated about diabetes, he or she must be permitted to participate in treatment decisions. Adolescents may act as if they did not have diabetes, ignoring their treatments (especially diet) and falsifying blood sugar tests. Or they may need to see for themselves just how awful they can feel before accepting the importance of control. Depression in adolescents with diabetes is not uncommon. They are aware of diabetic complications and death. They wish to be carefree and refuse to adhere to their regimen because they assume they will die young. Make sure your child understands the importance of good control -- significant improvements in diabetes treatment are likely during his or her lifetime (see Chapter 15)-- and make sure your child is aware of the many people with diabetes who lead full, rich lives. Don't hesitate to contact a professional counselor. Psychologists specializing in children with diabetes are available to help you.

Sports and Gym Class

Diabetes is no reason for missing out on sports or skipping gym class. In fact, exercise is an important factor in diabetes control. If your child has gym class before lunch, increase the morning snack of carbohydrate and protein. If your child participates in after school sports, increase the afternoon snack. Make sure your child understands that he or she must always carry fast acting sugar. It won't do any good in a gym locker. And make sure the coach and a few friends know how to help in case of a reaction.

Groups and camps for teens with diabetes can help by offering them a chance to share their troubles and concerns with peers. Teenagers need someone to talk with besides their parents. Let your teenager meet with his or her doctor or diabetes educator alone.

Teens and Parties

Your teenager can enjoy social occasions with friends as long as he or she remembers the following rules:

- Bring diet soda.
- Save some food exchanges from dinner.
- Choose foods carefully. Exchange hamburgers, pizza, tacos, subs, crackers, and popcorn for regular at-home meals.
- Replace calories for dancing. Test blood sugar, and estimate how long and how hard you will dance. Through trial and error you will learn how many calories you need to replace.

At the end of adolescence, around 19 to 20 years, your child will begin to mature in attitude and responsibility. Democratic guidance is the best approach as children progress from dependence to independence. Set realistic limits and goals, and use positive reinforcement. Praise is more helpful than punishments and threats.

School

Teachers, school nurses, and other school personnel need to understand your child's condition. Section 3 just ahead contains a concise overview of diabetes that will help school personnel cope with your child's special needs.

- Make a printout of Section 3 and bring these pages to your child's school nurse or teacher at the beginning of each school year. Your child's teacher will also benefit from specific information about your child's particular diabetes control requirements.

- Fill in a copy of the form following the information pages and give it to your child's teacher at the beginning of each school year.
- Be prepared to answer any other questions the teacher may have about your child's special needs.
- Use copies of the next form to communicate your child's daily blood glucose testing and dietary requirements.
- It's also a good idea to visit or call the school about once a month to see how things are going.

Baby Sitters

Like any parent, you deserve a night out once in a while. Don't let your fear of leaving your child with someone who does not understand diabetes keep you from enjoying life. For your own piece of mind, instruct your trusted baby sitter or relative in basics of diabetes care. Include the following:

- A brief overview of diabetes
- Blood glucose testing instructions
- Insulin injection instructions
- Appropriate snacks and meals
- Warning signs and treatment of low blood sugar

Keep supplies, equipment, snacks, and quick sugar food all together in a special location. Prepare a checklist that specifies what needs to be done at what time, and written instructions for emergency procedures.

Make sure the baby sitter knows how to reach you and your child's doctor at all times. Make printouts of the forms in the following section, or design your own.

TO THE BABY SITTER:

_____ has diabetes.

- Diabetes means that this child's pancreas does not make enough insulin. Without insulin, food cannot be used properly. A child with diabetes must take daily injections of insulin and must balance his or her food and exercise.
- An insulin reaction may occur if the blood sugar gets too low -- especially before meals or after exercise.

WARNING SIGNS OF INSULIN REACTIONS

- Paleness
- Perspiration
- Shaky, nervous
- Headache, nausea, stomach ache
- Changes of mood
- Confusion
- Irritability

- Our child usually behaves as follows when having a reaction:

- If this happens, immediately give the child sugar in the form of:

- Glucose Gel or Tablets **or**
- Sugar or honey, 2 teaspoons **or**
- Fruit juice, 1/2 to 2/3 Cup or
- Soft drink (NOT diet or sugar free), 1/2 to 2/3 Cup or
- Candy, 2-3 "Chuckles" or 10 jelly beans **or**
- You will find this supply of sugar: _____

- Repeat the above feeding if the child does not improve in 10-15 minutes.
- Follow with a milk and cookie or sandwich snack.
- If the child does not improve after eating the snack, call the parents or physician.

Part III: What School Personnel Should Know About the Student with Diabetes

Prepared by the American Diabetes Association Committee on Diabetes in Youth
Endorsed by the National Education Association Department of School Nurses

We encourage you to print out these pages and bring them to your child's teacher every year.

GENERAL INFORMATION

All school personnel (teachers, nurses, principals, lunchroom workers, playground and hall supervisors, bus drivers, counselors, etc.) must be informed that a student has diabetes. It is imperative that all personnel understand the fundamentals of the disease and its care.

Diabetes is NOT an infectious disease. It results from failure of the pancreas to make a sufficient amount of insulin. Without insulin food cannot be used properly. Diabetes currently cannot be cured but it can be controlled. Treatment consists of daily injections of insulin and prescribed food plan. Children with diabetes can participate in all school activities and should not be considered different from other students. It is essential school personnel have conferences with parents early in each school year to obtain more specific information about the individual child and his/her specific needs. Communication and cooperation between parents and school personnel can help the diabetic child have a happy and well adjusted school experience.

INSULIN REACTIONS

Insulin reactions occur when the amount of sugar in the blood is too low. This is caused by an imbalance of insulin, too much exercise, or too little food. Under these circumstances the body sends out numerous warning signs. If these signs are recognized early, reactions may be promptly terminated by giving some form of sugar. If a reaction is not treated, unconsciousness and convulsions may result. The child may recognize some of the following warning signs of low blood sugar and should be encouraged to report them.

WARNING SIGNS OF AN INSULIN REACTION

- Excessive hunger
- Blurred vision
- Poor coordination
- Perspiration
- Irritability
- Abdominal pain or nausea
- Pallor
- Crying
- Dizziness
- Inability to concentrate
- Inappropriate actions/responses
- Nervousness or trembling
- Drowsiness or fatigue

TREATMENT

- At the first sign of any of the above warning signs, give sugar immediately in one of the following forms:
 - Glucose tablets or gel
 - Fruit juice, ½ to 2/3 Cup
 - Carbonated beverage (not diet or sugarless soda), 6 oz
 - Candy, *i.e.*, 2-3 "Chuckles", 10 jelly beans
 - A sugar the parent has provided.

The student experiencing a reaction may need coaxing to eat. If improvement does not occur within 15-20 minutes, repeat the feeding. If the child does not improve after administration of the second feeding containing sugar, the parents or a physician should be called. When the child improves, he should be given a small feeding of 1/2 sandwich and a glass of milk. He should then resume normal school activities and the parents advised of the incident.

Children with diabetes follow a prescribed diet and may select their foods from the school lunch menu or bring their own lunch. Lunchroom managers should be made aware of the child's dietary needs, which may include midmorning and midafternoon snacks to help avoid insulin reactions. Adequate time should be provided for finishing meals.

Blood sugar testing may need to be done during the school day. This information is needed to determine an appropriate diet/ insulin/exercise plan. It may also be helpful to get a blood sugar test if the child becomes ill during the day.

GENERAL ADVICE

The child with diabetes should be carefully observed in class, particularly before lunch. It is best not to schedule physical education just before lunch; and if possible the child should not be assigned to a late lunch period. Many children require nourishment before strenuous exercise. Teachers and nurses should have sugar available at all times. The child with diabetes should also carry a sugar supply and be permitted to treat a reaction when it occurs.

Diabetic coma, a serious complication of the disease, results from uncontrolled diabetes. This does **NOT** come on suddenly and generally need not be a concern to school personnel.

TEACHER INFORMATION

- Child's Name _____ Date _____
- Parent's Name _____
Address _____
Phone (home) _____ (work) _____
- Alternate person to call in emergency _____
Relationship _____ Daytime Phone _____
- Physician's Name _____
Address _____
Phone _____
- Signs and symptoms the child usually exhibits preceding insulin reaction:

Time of day reaction most likely to occur: _____
Most effective treatment (sweets most readily accepted): _____

Morning or afternoon snack: _____

Suggested "treats" for in-school parties: _____

Note: A child with diabetes may need to check his/her blood sugar during the day to find out about his/her blood sugar level. The parents will show you the method they use and give you guidelines about when to notify them. Children usually are able to do their own blood glucose testing.

NOTES FOR TODAY

- Child's Name _____
- Teacher _____
- Test blood sugar at:

And record below:

- Serve: _____

_____ at _____ o'clock
- Serve: _____

_____ at _____ o'clock
- Serve: _____

_____ at _____ o'clock
- Parents are at:
_____ Phone: _____
- Physician:
_____ Phone: _____

⚠️ REMEMBER: The care of diabetes is a team effort involving you, your physician, and the diabetes education staff where you receive your medical care. This handbook cannot-and was not meant to-replace this team effort.

This handbook embodies the approach of the diabetes care team at the University of Massachusetts Medical Center. Different diabetes care teams may approach some aspects of diabetes care in ways that differ from those in this handbook. While most teams are in close agreement regarding the GENERAL PRINCIPLES of diabetes care, they may differ in the DETAILS. There can be more than one "right" way to approach a specific issue in diabetes management.

Always remain in touch with your diabetes care team, and bring any questions you may have about the materials in this handbook to their attention!

Copyright 1995, 1996, 1997, 1998 Ruth E. Lundstrom, R.N., John P. Mordes, M.D., Aldo A. Rossini, M.D. All rights reserved.

Feedback: send e-mail to Dr. Aldo Rossini

This page was last revised on January 3, 1998.

[[Table of contents](#) | [Glossary](#) | [Previous chapter](#) | [Next chapter](#)]

The Healing Handbook *for* Persons with Diabetes

[[Table of contents](#) | [Previous chapter](#) | [Next chapter](#)]



Chapter 14 Traveling

- [For All People with Diabetes](#)
- [For People with Insulin Dependent Diabetes](#)
- [For People with Insulin Dependent Diabetes Traveling Across Time Zones](#)

Whether you travel for business or pleasure, diabetes travels with you. You can't ignore your diet, exercise, and insulin regimen just because you're away from home. But there is no need to feel trapped by your diabetes—You can go anywhere a person without diabetes can. Just remember these simple tips to make getting there a lot easier. And, happy traveling!

For All People with Diabetes

Before you leave:

-  Have a medical checkup. If you are going to an area where diarrhea might be a problem, ask your doctor to prescribe an anti-diarrhea medication. You may also want to take along something to prevent or treat nausea.
-  Have required vaccinations weeks ahead of your departure time to avoid reactions that might disturb your blood sugar balance while away from home.
- When planning a trip to areas where English is not the principal language, try to learn how to say: "I have diabetes; please get me to a doctor." and "Sugar or juice, please," in the language of each country you plan to visit.
- Choose hotels carefully. Know what facilities are offered what services are available.
- Always wear or carry some form of medical identification. A tag, bracelet, or necklace with the medical emblem is best.
- If you take oral medications for diabetes, carry enough for the entire trip. You may have trouble getting



your prescription filled in a foreign country.

- Take along familiar blood glucose and urine monitoring equipment. Remember, many changes take place during travel, and the only way to assess your control is by monitoring frequently.

While traveling:

- If you are traveling by plane, notify the airline 24 hours in advance for a special diet order. Tell the flight attendant that you have diabetes. **CARRY ALL MEDICATIONS WITH YOU ON THE PLANE.**
- Keep active while in transit. If you are traveling by car, stop every so often and take a walk for at least five minutes. On a train, walk through the cars now and then. On a bus, take advantage of stopovers by getting out and walking around to stretch cramped muscles.
- On car trips, carry food in case of an emergency. A flat tire or mechanical failure may leave you stranded far from a restaurant at your scheduled meal time.

When you get there:

- Keep copies of the address and telephone number of your doctor near your hotel-room phone and in your wallet or purse. That way, if you need medical attention you won't have to waste time searching for this information.
 - You can eat anywhere, but full-service restaurants are usually more compatible with your need for a balanced diet. Don't wait until the last minute to order from room service. Order at least 30 minutes before your scheduled meal time.
 - In South or Central America, Asia, and Africa, avoid the following foods: raw meats, milk, ice cream, cream sauces, soft cheese, water or ice cubes, peeled fruits, and lettuce and other leafy vegetables.
 - Always carry small cans of juice, dried fruit, peanut butter, crackers, or packaged cheese and crackers. These snacks can be a substitute meal if necessary.
 - Don't overexpose your skin the first few days you spend in the sun. Apply #15 sun screen to protect against burning.
 - Remember your basic rules of foot care (see [Chapter 11](#)). Don't wear new shoes on vacation. Check your feet daily. If you get blisters from walking, apply a mild antiseptic and a small gauze pad held in place with non-allergic tape. Don't break blisters!
 - Don't walk barefoot on hot beach sand or in areas where sea shells may cut your skin. Always wear beach or swim slippers, sandals, or some other foot covering.
 - If you are ill during a trip, remember your rules for sick day management (see [Chapter 10](#)). Check blood sugar frequently and test urine for ketones. Ice chips or sips of regular (not diet) cola or ginger ale are good for nausea. Try to take some every hour. You may also try cereal, milk, ice cream, tea, toast, broth, and soups to replace full meals. If you take oral medications for diabetes and you are too sick to eat, try to drink plenty of liquids. If your urine tests are all positive for sugar, or your blood sugars remain high, call for help.
-

For People with Insulin Dependent Diabetes

- Carry insulin with you, along with your syringes. U-100 insulin is now available in most countries, but you can never be sure. **Insulin need not be refrigerated**, but you must protect it from extreme heat or cold. Do not leave your insulin on the dashboard of a hot car. If traveling by plane, have insulin in your carry-on luggage.
- Carry a letter stating you have diabetes and must carry with your insulin syringes and monitoring equipment. This will protect you in case of any questions about your syringes, or in case you lose them and need replacements.
- **Always carry fast-acting sugar.**
- You may need to adjust insulin or food according to your activity level. Bike riding, hiking, and walking tours burn up a lot of calories. To be safe, check your blood sugar frequently.
- Make sure that traveling companions know the signs of an insulin reaction and how to help your with fast-acting sugars.

For People with Insulin Dependent Diabetes Traveling Across Time Zones

- When planning a trip that will take you across time zones, consult your doctor or diabetes educator about adjusting your meal and insulin schedules. On a long plane trip across time zones, keep your watch at point-of-departure (POD) time and take snacks and meals accordingly. Resume normal doses the next day at point-of-arrival (POA) time.

Guidelines for Crossing Time Zones

Heading East (Shorter Day)

| <i>West</i> ----- > | ----- > | ----- > <i>East</i> |
|--|---------|--|
| 8 a.m. | | 6-8 p.m. Point of Departure time |
| 2/3 dose intermediate or long-acting insulin | | 2/3 dose intermediate or long-acting insulin |

Maintain usual doses of Regular Insulin before meals.

Heading West (Longer Day)

| <i>East</i> ----- > | ----- > ----- > | ----- > <i>West</i> |
|---------------------|----------------------------------|----------------------------------|
| 8 a.m. | 6-8 p.m. Point of Departure time | 6-8 p.m. Point of Departure time |

| | | |
|---|---|--|
| Usual dose intermediate or long-acting insulin plus usual dose of regular insulin | Extra dose of regular _____ units if indicated by blood sugar of _____ mg | Usual dose intermediate or long-acting insulin |
|---|---|--|

⚠ REMEMBER: The care of diabetes is a team effort involving you, your physician, and the diabetes education staff where you receive your medical care. This handbook cannot-and was not meant to-replace this team effort.

This handbook embodies the approach of the diabetes care team at the University of Massachusetts Medical Center. Different diabetes care teams may approach some aspects of diabetes care in ways that differ from those in this handbook. While most teams are in close agreement regarding the GENERAL PRINCIPLES of diabetes care, they may differ in the DETAILS. There can be more than one "right" way to approach a specific issue in diabetes management.

Always remain in touch with your diabetes care team, and bring any questions you may have about the materials in this handbook to their attention!

Copyright 1995, 1996, 1997, 1998 Ruth E. Lundstrom, R.N., John P. Mordes, M.D., Aldo A. Rossini, M.D. All rights reserved.

Feedback: send e-mail to [Dr. Aldo Rossini](#)

This page was last revised on January 2, 1998.

[[Table of contents](#) | [Glossary](#) | [Previous chapter](#) | [Next chapter](#)]

The Healing Handbook *for* Persons with Diabetes

[[Table of contents](#) | [Previous chapter](#)]

Chapter 15 Research

- [Prevention](#)
- [The Implantable Insulin Pump](#)
- [Transplants](#)
- [Genetic Manipulation](#)
- [Complications](#)
- [Hope for the Future](#)

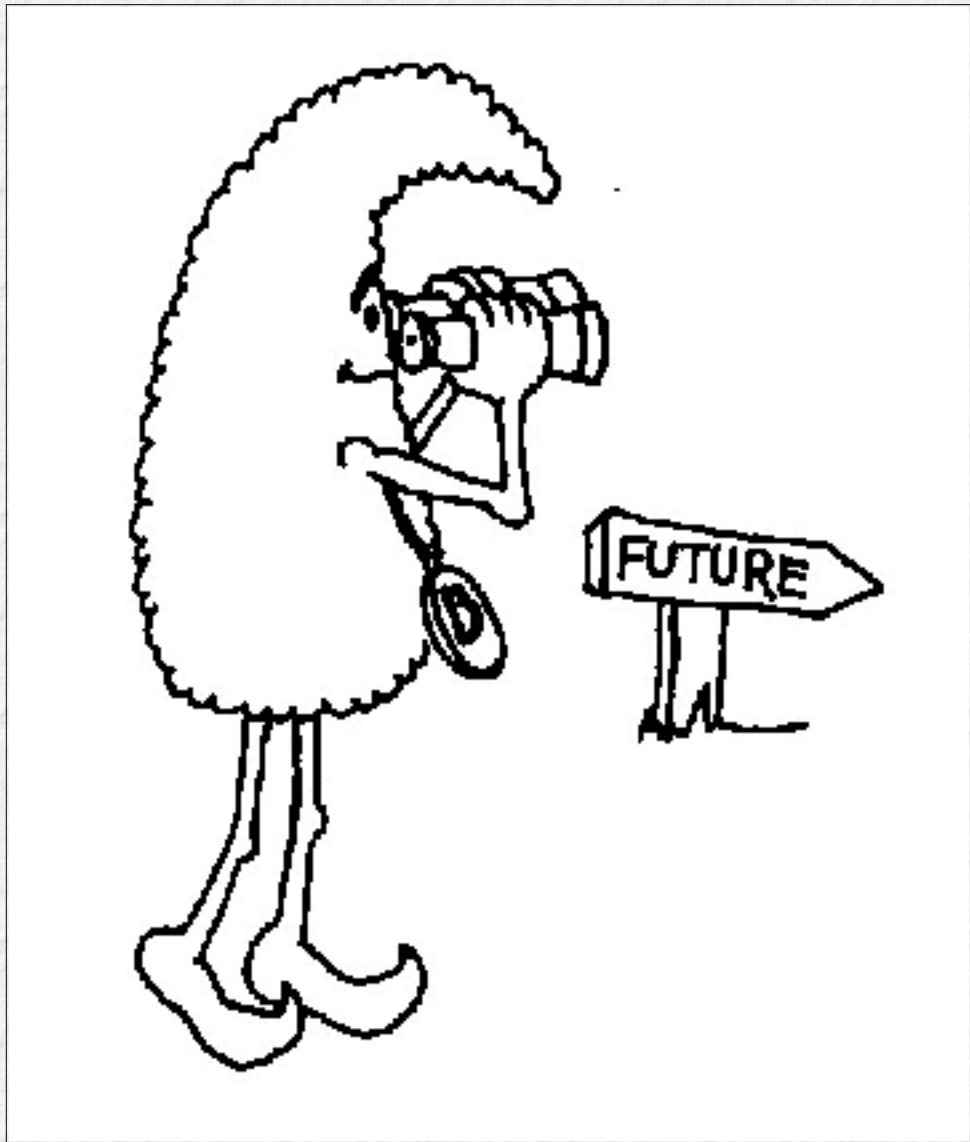
At the present time, there is no cure for diabetes. In the past ten years, however, researchers have undertaken promising and exciting studies into possible means of preventing, treating, and curing diabetes.

Prevention

Prevention of diabetes would be the ultimate achievement. Researchers can now identify diabetes in its earliest stages and even predict who may be susceptible.

Immunosuppression-type drugs have been tried to prevent the body from destroying its own beta cells. Although the drugs do halt beta cell destruction, their long-term use is impossible because of severe side effects. Once the drugs are stopped, beta cell destruction resumes. Researchers are now working to understand the mechanisms that produce diabetes. Once all the pieces of this puzzle are identified, it may be possible to develop strategies for preventing diabetes.

One major study now underway is the [Diabetes Prevention Trial - Type 1](#). The online information we have linked to regarding this trial is provided by the American Diabetes Association's Texas Affiliate.



The Implantable Insulin Pump

Researchers have developed an implantable insulin pump that can measure blood glucose levels and then deliver the exact amount of insulin required by the body. This "closed-loop" system thus mimics the action of natural beta cells. Unfortunately, in prototypes, the blood glucose sensor may become clogged, or may react to the presence of other body chemicals. Until these bugs can be worked out, the implantable closed-loop pump will remain an experimental device.

Home Glucose Monitors without the Fingertick

Many companies are now working hard to develop a method that will let persons with diabetes check their blood sugar without having to prick their skin to get a drop of blood. Most methods rely on shining a special kind of light through the skin. Research in this area has been going on for many years, but the problem is a difficult one.

No one wants to put out a meter that gives wrong information that would lead to the wrong dose of insulin. At the moment there is no alternative to the kinds of meters we now have, but the new devices are currently being tested in volunteers.

Transplants

Pancreas transplants have received considerable attention. This difficult procedure is most often done in conjunction with a necessary kidney transplant. Following the transplant, the patient receives powerful immunosuppression drugs to prevent rejection, the process by which the body destroys foreign materials -- such as the new kidney and pancreas.

Doctors are now also transplanting beta cells. Some approaches involve injecting beta cells so that they lodge in the liver. Other researchers have attempted to encase beta cells in a porous tube or bubble to protect them from rejection. The goal is to design a tube or bubble that does not allow white blood cells to enter and destroy the beta cells, but does allow insulin produced by the beta cells to pass out.

In other ongoing experiments, researchers are attempting to alter the code on the outside of beta cells so that the immune system will not recognize them as foreign material. If this work is successful, immunosuppression drugs will no longer be necessary when transplanting beta cells from one person to another.

Genetic Manipulation

Genetic manipulation is part of the RNA and DNA research you may have read about. Simply put, genetic manipulation involves reprogramming a body cell to become a beta cell and produce insulin. Every single cell in the body contains the genetic information of all cells. If this information could be used to reprogram individual cells, it might be possible to "train" a skin cell or other tissue to be a beta cell. This way, a person's own cells could be used to produce insulin, eliminating the rejection problems associated with beta cell transplants. This research is still in its early phases, however.

One of the first things researchers must do is learn what the genetic codes are that determine whether or not a person will have diabetes. An example of such a study that is underway is the [GENNID study](#). It is described in the online pages of the American Diabetes Association's Texas Affiliate.

Complications

Much work is being done in the areas of prevention and treatment of diabetic complications. Research has demonstrated clearly that excellent control of blood sugar greatly reduces the risk of diabetic complications. This important research was obtained through the [Diabetes Control and Complications Trial](#). Online information on this study is available through the American Diabetes Association's Texas Affiliate.

Other research has demonstrated that a low-fat diet greatly reduces the risks of heart and large blood vessel diseases. The kind of diet that helps reduce complications is explained in our [chapter on diet](#).


New treatments for retinopathy and new procedures for clearing vitreous hemorrhages are being studied. New drugs for treatment of neuropathy are now available. New medications that prevent the progression of kidney disease are being researched.

Hope for the Future

Laboratories throughout the world are attempting to develop methods to control blood sugar without insulin injections. Agents that can act like insulin may be taken orally in the future. Other areas of research include techniques to reverse the severe atherosclerosis associated with diabetes, which eventually could prevent heart attacks, strokes, and blockage of blood vessels in the legs.

Preliminary studies have been conducted to identify people at risk of becoming diabetic. The next step will be to develop treatments to prevent diabetes.

While some of the ideas in this chapter may seem remote or improbable, a diabetes cure is certainly not impossible. No one knows what the future may bring. Research offers hope.

 **REMEMBER: The care of diabetes is a team effort involving you, your physician, and the diabetes education staff where you receive your medical care. This handbook cannot-and was not meant to-replace this team effort.**

This handbook embodies the approach of the diabetes care team at the University of Massachusetts Medical Center. Different diabetes care teams may approach some aspects of diabetes care in ways that differ from those in this handbook. While most teams are in close agreement regarding the GENERAL PRINCIPLES of diabetes care, they may differ in the DETAILS. There can be more than one "right" way to approach a specific issue in diabetes management.

Always remain in touch with your diabetes care team, and bring any questions you may have about the materials in this handbook to their attention!

Copyright 1995, 1996, 1997 Ruth E. Lundstrom, R.N., John P. Mordes, M.D., Aldo A. Rossini, M.D. All

rights reserved.

Feedback: send e-mail to [Dr. Aldo Rossini](#)

This page was last revised on April 9, 1997.

[[Table of contents](#) | [Glossary](#) | [Previous chapter](#)]

The Healing Handbook *for* Persons with Diabetes

[[Table of contents](#)]

GLOSSARY

Acetone:

Chemical substance produced during breakdown of body fat (see also [ketones](#)).

Acidosis:

Abnormal state; too much acid in the blood. Can be a serious complication of [insulin dependent diabetes](#).

Albumin:

Blood protein that may appear in urine when kidneys are damaged.

Alpha cells:

Glucagon-producing cells of the [Islets of Langerhans](#).

Amino acids:

Individual food units that combine to make [Arteriosclerosis or Atherosclerosis](#):

Thickening and rigidification of artery walls. See [Chapter 12](#).

Athlete's foot:

Fungus infection of feet.

Beta cells:

Insulin-producing cells of the [Islets of Langerhans](#). Details are in [Chapter 1](#).

Biguanide:

A kind of oral hypoglycemic drug. Details are in [Chapter 9](#).

Callus:

Hard skin thickening due to friction or pressure. Calluses on the feet are discussed in [Chapter 11](#).

Calorie:

Unit used to express heat or energy value of food. Calories are discussed in [Chapter 6](#).

Carbohydrate:

One of three major food substances (examples: sugar, starch). Carbohydrates in the diet are discussed in [Chapter 6](#). Carbohydrates are the major component of the diabetic [Starch/Bread List](#).

Cataract:

Clouding of lens of eye. See [Chapter 12](#).

Cell:

Unit of body structure.

Cholesterol:

Fatty substance normally present in blood. See [Chapter 6](#).

Claudication:

Pains in calf muscles due to decrease in blood supply. See [Chapter 12](#).

Coma:

Loss of consciousness.

Coronary insufficiency:

Impaired blood supply to heart. See [Chapter 12](#).

Crystalline insulin:

Regular insulin. See [Chapter 8](#).

Cystitis:

Inflammation of the urinary bladder.

Diabetologist:

A physician who specializes in treating people with diabetes.

Diastix:

Test for sugar in urine.

Dietitian:

A professional who advises people with special health needs on the types and amounts of foods to eat.

Fat:

One of three major food substances (examples: butter, cream). Fats in the diet are discussed in [Chapter 6](#). Fats are the major component of the diabetic [Fat List](#).

Fiber:

Indigestible part of fruit, vegetables, cereals, and grains.

Food exchange:

Foods grouped together due to similarities in nutritional value. Food exchanges are discussed in detail in [Chapter 6](#).

Fructose:

Carbohydrate sugar found in fruits and candy. Fruit exchanges are listed in [Chapter 6](#).

Gangrene:

Death of tissue, usually due to loss of blood supply.

Glomerulus:

Microscopic part of kidney that filters blood.

Glucagon:

Hormone produced by alpha cells to release glycogen stored in liver and muscles. [Glucagon](#)

[injections](#) are used to treat serious [insulin reactions](#) in persons with diabetes.

Glucose:

Basic sugar used to fuel body cells. Details are in [Chapter 1](#).

Glucose tolerance test:

Test for detecting diabetes.

Glycogen:

Form in which most [carbohydrate](#) is stored in the body.

Glycosuria:

Sugar in urine.

Glycosylated Hemoglobin Test:

A blood test that measures a person's average blood glucose over the past 2-3 months.

Gram:

Metric unit of weight.

Heredity:

Inheritance of traits from ancestors; major cause of diabetes. See [Chapter 1](#).

Hormone:

Chemical substance produced in body glands and circulated in blood.

Hyperglycemia:

High concentration of sugar in blood (hyper = high).

Hypoglycemia:

Low concentration of sugar in blood (hypo = low). See [Chapter 8](#) for how to avoid and how to treat hypoglycemia.

Impotence:

Inability to sustain an erection.

Insulin:

Hormone produced by [beta cells](#) to facilitate entry of glucose into body cells. Details are in [Chapter 8](#).

Insulin reaction:

Release of certain hormones (catecholamines) in response to hypoglycemia. Treating and avoiding reactions is discussed in [Chapter 8](#).

Islets of Langerhans:

Clusters of alpha, beta, delta, and polypeptide cells throughout the [pancreas](#).

Ketonuria:

Ketone in urine.

Keto-Stix:

Test for ketone (acetone) in urine.

KetoDiastix:

Test for both ketone and sugar in urine.

Kidney threshold:

Level at which sugar "spills" over into urine. Explained in [Chapter 1](#).

Kussmaul breathing:

Deep, rapid breathing seen in diabetic [acidosis](#).

Lactose:

Milk sugar.

Lente Insulin:

Intermediate-acting insulin. See [Meal plan](#):

Guide to [food exchanges](#) allowed for each meal and snack. Details are in [Chapter 6](#).

Metabolism:

Conversion of food substances to energy.

Monilia:

Fungus infection (candida) common in diabetes, frequently in the vagina.

Nephropathy:

Degenerative kidney disease that may occur in long-term diabetes. See [Chapter 12](#).

Neuropathy:

Disorder of nerves causing loss of sensation and reflexes and/or burning or stabbing pain, especially at night. See [Chapter 12](#).

NPH insulin:

Intermediate-acting insulin. See [Chapter 8](#).

Oral hypoglycemia agents:

Oral drugs that lower blood sugar by increasing insulin and/or increasing insulin effectiveness. Details are in [Chapter 9](#).

Pancreas:

Gland deep in abdomen, behind stomach, that produces hormones ([glucagon](#)) and digestive enzymes.

Polydipsia:

Excessive thirst.

Polyphagia:

Excessive hunger.

Polyuria:

Excessive urination.

Post-prandial:

After a meal.

Protein:

One of the three major food substances; food used to build body tissues.

Pruritus:

Itching.

Regular insulin:

Fast-acting insulin. See [Chapter 8](#).

Retinopathy:

Disorders of retina (nerve tissue in the eye) seen in diabetes. See [Chapter 12](#).

Saccharin:

Artificial sweetener.

Semi-lente insulin:

Rapid-acting insulin. See [Chapter 8](#).

Sorbitol:

Artificial sweetener.

Sucrose:

Ordinary table sugar; breaks down to [glucose](#) and [fructose](#).

Sulfonylureas:

Oral hypoglycemic drug. Details are in [Chapter 9](#).

Tes-Tape:

Test for sugar in urine.

Ultralente insulin:

Long-acting insulin. See [Chapter 8](#).

Feedback: [Dr. Aldo Rossini](#)

This page last modified January 1, 1998

[[Table of contents](#)]

THE HEALING HANDBOOK for PERSONS WITH DIABETES

Aldo A. Rossini, M.D.
Ruth Lundstrom, R.N./NP
C.D.E.,M.S.
John P. Mordes, M.D.

UNIVERSITY OF
MASSACHUSETTS
MEDICAL CENTER
Worcester, MA 01655
USA

Quick Links:

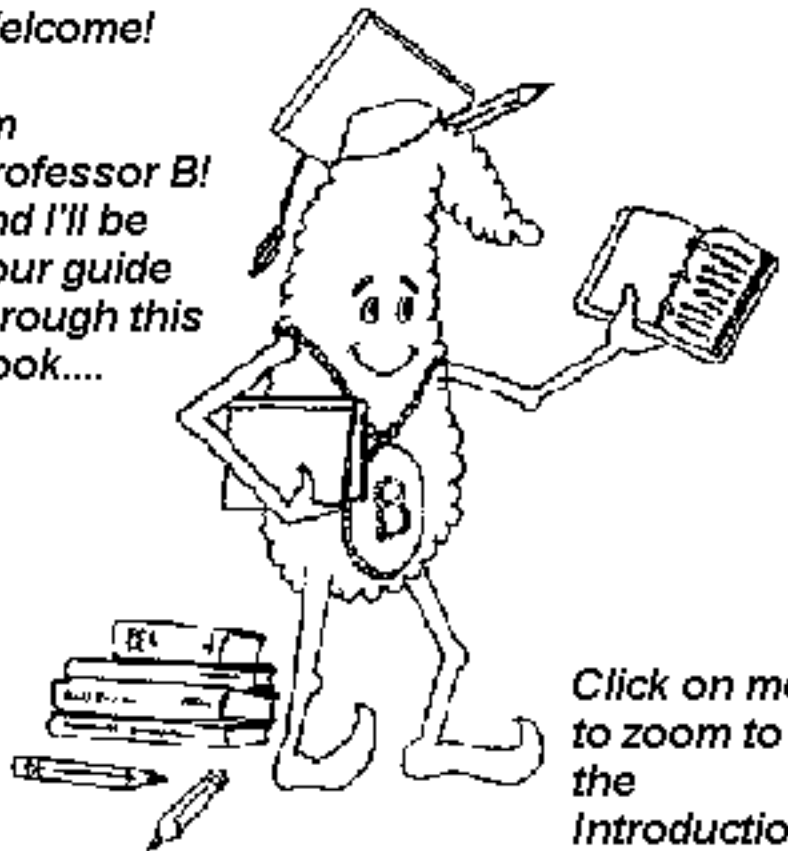
- [Introduction](#)
- [Table of Contents](#)

What's New?

- There is news about the diabetes pill called **Rezulin**. It may cause liver damage in some persons, and persons who take it should check with their physician. See [Chapter 9](#).
- There is a another new pill for persons with Type 2 diabetes. Its trade name is **Prandin**, and it is designed to be taken before meals. See [chapter 9](#).
- Our translation into [Spanish](#) is now complete!
¡Novedad! Traducción al Español !
- **NOTICE:** July 29,1998: The Food and Drug Administration has recalled a SureStep Blood

Welcome!

I'm
Professor B!
and I'll be
your guide
through this
book....



Click on me
to zoom to
the
Introduction!

Glucose Meter. [Click here](#) for information.

This is the third edition of a full length book created for persons with diabetes and their families. It aims to provide trustworthy information in a useful, easy-to-read form. We offer it on line as a service to all persons with diabetes.

This first and second editions of this Handbook were prepared by Ruth E. Lundstrom, R.N./NP C.D.E., M.S. and Aldo A. Rossini, M.D., Professor Medicine and Director of the [Division of Diabetes](#) at the University of Massachusetts Medical School. Editorial assistance was provided by Paul Carlson.

Printed copies of the second edition are provided free of charge to all patients cared for in the Diabetes Center of Excellence at the [University of Massachusetts Medical Center](#) in Worcester. Spiral bound copies of the second edition of *The Healing Handbook for Persons with Diabetes* are also available from the University of Massachusetts Medical Center Bookstore, 55 Lake Avenue, Worcester, MA 01655. The cost is \$14.95 per copy plus \$5.00 for shipping. (Tel. 508-856-3213)

Revision of the Handbook and preparation of this electronic edition in 1995 was undertaken by John P. Mordes, M.D., Professor of Medicine at the University of Massachusetts Medical Center, with the invaluable collaboration of Will Manis, Vice-President of [Spyglass, Inc.](#) The Spanish translation is being overseen by Jessie A. Block-Galarza, M.D.

Feedback: send e-mail to [Dr. Aldo Rossini](#)

University of Massachusetts Medical Center
Diabetes Division
55 Lake Avenue North
Worcester, MA 01655

Copyright 1995-1999 Ruth E. Lundstrom, R.N., John P. Mordes, M.D., Aldo A. Rossini, M.D. All rights reserved.

The Healing Handbook for Persons with Diabetes has been online since July 1, 1995.

The Diabetes Handbook Title Page has been accessed  times since 9:30am on August 13, 1996

This page was last revised on January 6, 1999.

[[Introduction](#) | [Table of Contents](#)]

Some Additional Online Resources for Persons with Diabetes

- The number of online resources for persons with Diabetes has grown phenomenally since this Handbook first appeared in 1995. Here are a few of them:
- [The Juvenile Diabetes Foundation International](#) is among the premier organizations dedicated to finding a cure for Type I diabetes through research.
- [The American Diabetes Association](#) provides comprehensive support to patients, educators, and researchers in all matters relating to diabetes. Many ADA [affiliates](#) are now online.
- [The Canadian Diabetes Association](#) provides educational and support programs for Canadians with diabetes. Call (416) 363-3373 for additional information.
- [The Diabetes Monitor](#) provides a broad range of information and references concerning diabetes. It is offered by Midwest Diabetes Care Centers, Inc.
- The [children with DIABETES](#) online magazine. Not really a multi-issue magazine, but another source of non-technical information aimed at children with juvenile diabetes. The exceptional effort of a concerned parent.
- [National Institute of Diabetes and Digestive and Kidney Diseases](#) is the major American funding agency that supports research directed and the treatment, prevention, and cure of diabetes.
- [Diabetes.com](#) is a commercial site offering a broad range of information for persons with diabetes. It is published by Matthew Naythons, M.D., and the staff of NetHealth, publisher of the Internet Health, Fitness, and Medicine Yellow Pages (Osborne McGraw Hill). NetHealth is a division of Epicenter Communications, Inc.

