



Sick Day Issues

Diabetes needs some special consideration on days when you are ill with a cold, flu, stomach upset or times when you can't eat right like after a dental visit.

Basically, your numbers rise when you are under stress. Being sick is a stress on you. So, keep your meter close. You may find checking your glucose every four hours helps you manage better.

You need to contact the doctor if you have Type 1 diabetes and find

- Rising ketone levels in your urine
- Ketones in your urine for more than 12 hours and are moderate or large
- Blood glucose levels greater than 240 mg/dl for 12 hours
- Vomiting and unable to hold food down for 2-4 hours
- Fever of 101.5F or rising fever, or fever for more than 24 hours

When you call the doctor, have your numbers ready- What is your blood glucose? Are you spilling ketones in your urine? What is your temp? What insulins have you taken and when? Call the emergency

room at the hospital if the clinic is closed. There is always someone there to take your call. Have someone take you to the hospital if you can not care for yourself. Do not omit your insulin when ill. You may need more when ill. Call to get individual advice, but general rules are,

1. Monitor blood glucose every 2-4 hours while it is elevated and monitor serum or urinary ketones
2. Continue medications including insulin unless otherwise instructed
3. Drink 8 oz of fluid an hour while awake
4. Consume 10-15 grams of carbohydrate per hour
5. Call if vomiting more than once, have diarrhea for over 6 hours, blood sugars over 300 twice in a row and not responsive to fluids and insulin. If urinary ketones are moderate or large, or blood ketones over 0.6 mmol/L.

If you have Type 2 diabetes, the more frequent glucose testing applies to you also. You do not need to measure ketones. In Type 2 you *may* spill ketone, but it is not the enemy that it is in Type 1 diabetes. You generally need to keep taking your diabetes medication also to control glucose.

There is one exception. Do not take your Glucophage (Metformin) when ill. If there is a risk of becoming dehydrated, you do not take Glucophage. Glucophage (metformin) is in Avandamet, Metaglip, Glucovance, Kazano, Riomet or any combination drug made with Glucophage.

Also, if unable to stay hydrated, the SGLT-2i drugs (Jardiance, Farxiga or Invokanna) need to be stopped until you are hydrated. That means able to drink large amounts of fluids, glassfuls, rather than sips.

Also, you should not take any pill with Glucophage in it on the day you have a study that requires a dye injection (think angiograms, kidney studies). If you have more than a minor surgery, glucophage should be held. The general rule is hold glucophage the day of, and for 2 days after a dye study. A good idea is to add it back once you are able to take fluids well and your kidney function has proven to be ok (doctor checks this).

When you are ill, it is important to eat the same amount of carbohydrate that you normally would. If possible, the normal meal plan works great. But if you have a hard time chewing or swallowing, or can't eat as much, use soft foods with same carbohydrate content. Check out the attached list with carbohydrate content for some ideas. If you are sick to your stomach and vomiting, take enough liquids to equal the

carbohydrate amount you would normally have. Sipping small amounts of regular (not diet) liquid that contains carbohydrate every 10-30 min can help.

Even after you start to feel better, you will still need to test blood glucose (and ketone if Type 1) every 4 hours until you are back on your usual track. If you've been very sick, you generally start out with clear liquids like broth, tea, regular soft drinks, Jell-o, apple or grape juice, or popsicles. When these stay down, the full liquids are orange or tomato juice, ice cream, and soup. If this goes well, you probably waste no time getting to soft foods like oatmeal, toast, plain cooked vegetables, applesauce, rice, noodles, and crackers.

There is no easy way to be sick. But your meter will show impending trouble before you feel sick. Planning ahead is your best bet. A good rule to begin with is frequent glucose testing, so always keep metering supplies on hand. A sick day box could be set up. A thermometer, tissues, plastic bags, hand sanitizer, alarm clock or timer, an 8 ounce measure cup, fever reducers (acetaminophen-Tylenol, ibuprofen-Motrin, aspirin), sugar free cough drops/liquids, anti-diarrheal and anti-vomiting liquid or suppositories), and glucose tablets or gel are all good considerations. Keeping spare insulin that is fresh on hand is good. Bottled water may be added. If you are Type 1, ketone strips in foil wrap is mandatory. Also a pen and paper to chart those important numbers on so all your data is together.

Always call the doctor/nurse if you are uncomfortable during an illness. Minor illness is a nuisance, but can usually be managed at home. With more serious illness, signs of dehydration (in Type 2) or ketoacidosis (in Type 1) hospitalization is usually needed. The symptoms to watch for are nausea, sunken eyes, skin that remains tented up after being pinched, abdominal pain, difficulty breathing, fruity nail polish odor to the breath, dry cracked lips, mouth, or tongue or difficulty concentrating. A significant other can help be objective and get you to the doctor quickly if these occur.

Another consideration for a sick day may be the products you have at home for cough. Look for sugar free cough syrups or lozenges. Medications that have alcohol in them are to be avoided. They can raise glucose. Decongestants (even if sugar free) can raise blood glucose. Nasal sprays have less blood glucose raising ability than pills usually. Ask the pharmacist if having trouble finding dry up pills that protect blood sugar.

practical diabetology

PATIENT INFORMATION GUIDE

DIABETIC KETOACIDOSIS

Ketones are made by the body when it uses fat as its energy source. Ketones are not normally eliminated from your body in your urine. However, if blood glucose levels are high and your body doesn't have enough insulin available, body fat can become the only fuel source, leading to an extreme breakdown of fats. If ketones build up in the body to very high levels, they can cause a serious condition called diabetic ketoacidosis, or DKA. It's important to know how to recognize and treat problems that can lead to DKA.

WHEN TO CHECK

Checking for ketones is important in the following situations:

- With any infection or illness.
- If the blood glucose level is high (>300 mg/dl [16.7 mmol/liter]).
- If the following symptoms are present: vomiting, deep breathing, stomachache, dry mouth or tongue, frequent urination, and a "fruity" odor to the breath.
- If an insulin shot is missed or the insulin has spoiled (from exposure to heat or cold or if it has expired).
- With a blockage of an insulin pump catheter or a pump failure.

HOW TO CHECK

Blood sample. The ketone called beta-hydroxybutyrate can be measured with the Precision Xtra meter. The blood ketone test result is given as a number and is

the most accurate method to use.

Urine sample. A urine sample can be checked using a urine dipstick test such as Ketostix, which measures a different ke-

tone (called acetoacetic acid). The color of the pad on the stick is compared with a color chart. The test result is read as negative, trace, small, moderate, large, or very large.

WHAT TO DO

BLOOD KETONES (mmol/liter)	URINE KETONES		ACTION TO TAKE
	STRIP COLOR	LEVEL	
<0.6	Slight change	Trace	Normal; no action needed
0.6–1.0 ^a	Purple	Small to moderate ^a	Extra insulin and fluids ^b
1.1–3.0	Dark purple	Usually large	Call your physician or nurse
>3.0	Very dark purple	Very large	Go directly to the emergency room

^aIt is usually advised to call a health-care provider for a blood ketone level greater than 1.0 mmol/liter or with urine ketone readings of moderate or large.

^bIf the blood glucose level is less than 150 mg/dl (8.3 mmol/liter), a liquid with glucose should be taken.

**BLOOD KETONE
LEADING INDICATIONS**

Readings above 1.5 mmol/l indicate you may be at risk of developing diabetic ketoacidosis (DKA). Contact your healthcare provider immediately for advice.

0.6 to 1.5 mmol/l

Readings between 0.6 and 1.5 mmol/l may indicate the development of a problem that may require medical assistance. Follow your healthcare provider's instructions.

Below 0.6 mmol/l

Readings below 0.6 mmol/l are in the normal range.

Important healthcare provider phone numbers:

Have the following items available for sick-day use:

- Phone numbers for your doctor, diabetes educator, and dietitian
- Easy-to-eat foods such as pudding, gelatin, applesauce, or soup
- Carbohydrate-containing liquids, such as non-diet soft drinks

Do not stop taking your insulin

Try to eat as you normally do; substitute easy-to-eat foods as necessary

Drink plenty of fluids-about 8 ounces of liquid every 1/2 to 1 hour

Monitor your blood glucose every 2 to 4 hours

Monitor your blood ketone levels every 4 hours

- Refer to blood ketone reading indications at the left

Call your doctor or other healthcare professional when you experience:

- an illness that lasts longer than a day
- nausea and/or vomiting
- stomach pain
- persistent diarrhea
- high blood glucose or blood ketone levels
- fever over 100°F

ABBOTT Prec1™10™ Xtra, a trademark of Abbott Laboratories ©2008 Abbott

Precision

Xtra™ Advanced Diabetes

High blood sugar (Hyperglycemia)

Cornerstones4Care™

Causes

High blood sugar (also called hyperglycemia) is when there is too much sugar in your blood. Over time, it can cause serious health problems. High blood sugar can happen if you:

- Skip a dose of insulin or diabetes pills
- Eat more than usual
- Are less active than usual
- Are under stress or sick

What to do about high blood sugar

The best way to avoid high blood sugar is to follow your diabetes care plan. Call your diabetes care team if your blood sugar has been higher than your goal for 3 days and you don't know why.

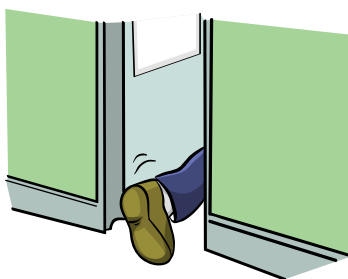
Of course, the best way to know if you have high blood sugar is to check your blood sugar regularly, as directed by your doctor.

Signs & Symptoms

Here's what may happen when your blood sugar is high:



Very thirsty



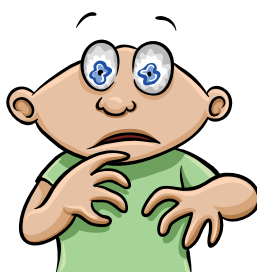
Needing to pass urine more than usual



Very hungry



Sleepy



Blurry vision



Infections or injuries heal more slowly than usual

For more information, visit Cornerstones4Care.com

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DKA (Ketoacidosis) & Ketones

Diabetic ketoacidosis (DKA) is a serious condition that can lead to diabetic coma (passing out for a long time) or even death.

When your cells don't get the glucose they need for energy, your body begins to burn fat for energy, which produces ketones. Ketones are acids that build up in the blood and appear in the urine when your body doesn't have enough insulin. They are a warning sign that your diabetes is out of control or that you are getting sick.

High levels of ketones can poison the body. When levels get too high, you can develop DKA. DKA may happen to anyone with diabetes, though it is rare in people with type 2.

Treatment for DKA usually takes place in the hospital. But you can help prevent it by learning the warning signs and checking your urine and blood regularly.

What are the Warning Signs of DKA?

DKA usually develops slowly. But when vomiting occurs, this life-threatening condition can develop in a few hours. Early symptoms include the following:

- Thirst or a very dry mouth
- Frequent urination
- High blood glucose (blood sugar) levels
- High levels of ketones in the urine

Then, other symptoms appear:

- Constantly feeling tired
- Dry or flushed skin
- Nausea, vomiting, or abdominal pain

(Vomiting can be caused by many illnesses, not just ketoacidosis. If vomiting continues for more than 2 hours, contact your health care provider.)

- Difficulty breathing
- Fruity odor on breath
- A hard time paying attention, or confusion



Ketoacidosis (DKA) is dangerous and serious. If you have any of the above symptoms, contact your health care provider IMMEDIATELY, or go to the nearest emergency room of your local hospital.

How Do I Check for Ketones?

You can detect ketones with a simple urine test using a test strip, similar to a blood testing strip. Ask your health care provider when and how you should test for ketones. Many experts advise to check your urine for ketones when your blood glucose is more than 240 mg/dl.

When you are ill (when you have a cold or the flu, for example), check for ketones every 4 to 6 hours. And check every 4 to 6 hours when your blood glucose is more than 240 mg/dl.

Also, check for ketones when you have any symptoms of DKA.

What If I Find Higher-than-normal Levels of Ketones?

If your health care provider has not told you what levels of ketones are dangerous, then call when you find moderate amounts after more than one test. Often, your health care provider can tell you what to do over the phone.

Call your health care provider at once if you experience the following conditions:

- Your urine tests show high levels of ketones.
- Your urine tests show high levels of ketones and your blood glucose level is high.
- Your urine tests show high levels of ketones and you have vomited more than twice in four hours.

Do **NOT** exercise when your urine tests show ketones and your blood glucose is high. High levels of ketones and high blood glucose levels can mean your diabetes is out of control. Check with your health care provider about how to handle this situation.

What Causes DKA?

Here are three basic reasons for moderate or large amounts of ketones:

- **Not enough insulin**

Maybe you did not inject enough insulin. Or your body could need more insulin than usual because of illness.

- **Not enough food**

When you're sick, you often don't feel like eating, sometimes resulting in high ketone levels. High levels may also occur when you miss a meal.

- **Insulin reaction (low blood glucose)**

If testing shows high ketone levels in the morning, you may have had an insulin reaction while asleep.

- Last Reviewed: August 21, 2013

- Last Edited: March 12, 2014

How DKA Happens and What to Do About it

Certified Diabetes Educator Gary Scheiner offers an overview of diabetic ketoacidosis.



Gary Scheiner | August 30th 2016

(excerpted from Think Like A Pancreas: A Practical Guide to Managing Diabetes With Insulin by Gary Scheiner MS, CDE, DaCapo Press, 2011)

Diabetic Ketoacidosis (DKA) is a condition in which the blood becomes highly acidic as a result of dehydration and excessive ketone (acid) production. When bodily fluids become acidic, some of the body's systems stop functioning properly. It is a serious condition that will make you violently ill and it can kill you.

The primary cause of DKA is a lack of working insulin in the body. Most of the body's cells burn primarily sugar (glucose) for energy. Many cells also burn fat, but in much smaller amounts. Glucose happens to be a very "clean" form of energy—there are virtually no waste products left over when you burn it up. Fat, on the other hand, is a "dirty" source of energy. When fat is burned, there are waste products produced. These waste products are called "ketones." Ketones are acid molecules that can pollute the bloodstream and affect the body's delicate pH balance if produced in large quantities. Luckily, we don't tend to burn huge amounts of fat at one time, and the ketones that are produced can be broken down during the process of glucose metabolism. Glucose and ketones can "jump into the fire" together.

It is important to have an ample supply of glucose in the body's cells. That requires two things: sugar (glucose) in the bloodstream, and insulin to shuttle the sugar into the cells. A number of things would start to go wrong if you have no insulin in the bloodstream:

1. Without insulin, glucose cannot get into the body's cells.
2. As a result, the cells begin burning large amounts of fat for energy.
3. This, of course, leads to the production of large amounts of ketones.
4. Although some of the ketones eventually spill over into the urine, the body is unable to eliminate sufficient amounts to restore a healthy pH balance in the bloodstream.

The problem is further complicated by dehydration. Without sufficient insulin to inhibit the liver's secretion of sugar, large amounts of glucose are released into the bloodstream. Because high blood sugar causes excessive urination, dehydration ensues. Without glucose metabolism to help break down the ketones, and without ample fluids to help neutralize the ketones, the bloodstream and tissues of the body become very acidic. This is a state of ketoacidosis.

What can cause a sudden lack of insulin in the body? There are a number of potential culprits:

- Illness, infection, and dehydration can cause the production of large quantities of stress hormones, which counteract insulin. You could have insulin in your body, but it is rendered almost useless because stress hormones are blocking its action.
- Ketone production can also be induced by a lack of carbohydrates in the diet. During periods of starvation, prolonged fasting, or restricted carbohydrate intake, the body's cells must resort to burning alternative sources of fuel: namely fat and protein. With increased fat metabolism and limited carbohydrate metabolism, ketone production may exceed the body's ability to eliminate them.
- Using spoiled insulin can lead to high blood sugar and ketone production. Insulin that has been frozen or exposed to extreme heat can "denature," or break down so that the insulin molecules no longer work. Using the same vial or cartridge of insulin for many months, or using it past its expiration date, can also cause problems.
- Poor absorption at the injection or infusion site can also cause an insulin deficiency.
- Missed or omitted injections are another potential cause of an insulin deficiency. Missing an occasional meal bolus will not typically cause the body to become totally devoid of insulin, but missed basal insulin injections or repeated missed boluses can have serious consequences.
- Insulin pump therapy opens the door to ketoacidosis in the event of a problem with insulin delivery, absorption, or action. Any interruption in insulin delivery can result in a sharp rise in blood sugar and ketone production starting as soon as three hours after the last bit of insulin was infused.

Everyone with diabetes who uses insulin should have a way to test for ketones. Ketone testing can be done by way of a urine dipstick or a fingerstick blood sample. Be sure to have fresh

ketone testing supplies on hand at all times—including when you travel. The presence of ketones is accompanied by elevated blood sugar, thirst, and excessive urination. This is a precursor to the more severe state of DKA.

Symptoms of DKA are more pronounced. With DKA, you are likely to be nauseous or vomiting. Your breathing may be very deep, and you could have a fruity odor on your breath as your lungs try to eliminate ketones when you exhale. You will likely be dehydrated due to all the urination. This will give you dry skin, intense thirst, and a dry mouth. Your vision may also be blurry. Headache and muscle aches are common. Call your healthcare team immediately if you are experiencing these types of symptoms. Although fluids and insulin are the preferred form of treatment, DKA is not something that you can treat on your own. The severe dehydration that accompanies DKA usually keeps insulin from absorbing properly from below the skin. Nausea/vomiting may also limit the amount of water you can consume. Treatment of DKA almost always requires a visit to an emergency room for intravenous administration of insulin, water, and electrolytes. The acidity of your blood will have to be monitored very carefully at the hospital to prevent coma or death. The length of your hospital stay will vary depending on the severity of the DKA, but expect to be there for at least a day or two.

There are a few things that you can do on your own prior to hospitalization. Try to eat light, easy-to-digest carbohydrates and drink at least eight ounces of liquid per hour. Diluted orange juice is a good choice, because it replaces fluids as well as potassium that is lost with excess urination. Check your blood sugar and ketones every couple of hours, and report the information to your doctor.

(Editor's Note – With the right illness or pump error, DKA can happen to anyone with Type 1 diabetes, so don't be ashamed if it happens to you. No one likes to think about DKA, but it's best to be prepared. Seek medical help, get well, and then figure out how to prevent DKA from happening the next time.)

This article has been edited for length.

Gary Scheiner and his team of clinicians at Integrated Diabetes Services are available for individual consultations via phone and the internet. Visit www.integrateddiabetes.com call 1-610-642-6055 for more information.

*If you would like to purchase a signed copy of *Think Like a Pancreas*, call Integrated Diabetes Services directly at (877) 735-3648; (outside the US 1-610-642-6055), or order it through the IDS store [here](#).*

Diabetes Sick Days Plan

GREEN ZONE

Green Zone—All Clear

Check ketones

- Blood glucose within goal range of 80 to 140 mg/dl
- Taking usual pills and/or insulin
- Eating and drinking normally
- No fever
- Diabetes is under control
- Test blood glucose 4 times a day while sick
- Continue to take your diabetes medication
- Keep on hand: fluids with sugar (such as apple juice), fluids with salt (such as broth)

YELLOW ZONE

Yellow Zone—Caution

Check ketones

- Glucose tests greater than 140 mg/dl more than once in 6 hours
- Symptoms of high blood glucose are present: thirst, dry mouth, blurred vision, frequent urination
- Nausea, vomiting or diarrhea interfere with eating and drinking
- Fever
- Glucose tests lower than 70 mg/dl more than once in 6 hours
- Test blood glucose at least every 4 hours and record results
- Continue to take your diabetes pills and/or insulin
- Drink at least 4 oz (1/2 cup) of fluids every 30 minutes
- Fluids should be sugar-free unless blood glucose is low or you are replacing a meal with the liquids. Treat low glucose with 15 gm of carbohydrate (see other side) and retest in 15 minutes; repeat treatment every 15 minutes until glucose is between 80–140 mg/dl

RED ZONE

Red Zone—Call Your Doctor

Check ketones

- Glucose remains above 300 mg/dl for more than 6 hours or below 70 mg/dl after repeated treatment
- Vomiting and diarrhea for more than 6 hours
- You are dehydrated: very dry mouth, can't urinate after 4 hours, rapid weight loss since becoming ill
- Confusion, sleepiness, seizures
- Call your doctor _____
- Information to have ready:
 - Blood glucose test results
 - Symptoms you have had, including fever, nausea, diarrhea and vomiting
 - Medication you have taken, including times and doses of insulin
 - What you have had to eat and drink

Diabetes Sick Days Plan

Soft foods may be an option during illness. They are usually easy to eat and require little preparation. Below is a **sample menu** to consider during periods of illness.

BREAKFAST

- 1 cup of skim milk
- ½ cup of cooked cream of wheat and 1 slice of toast
- ½ cup of fruit canned in juice or fruit juice

LUNCH

- 2 oz. American cheese
- 1 cup of tomato juice
- 6 saltine crackers and ¼ cup of sherbet
- ½ cup of fruit juice

DINNER

- 1 cup of cottage cheese or tuna
- 1 cup of vegetable juice
- 1 English muffin or 1 cup of mashed potatoes
- ½ cup of fruit canned in juice or fruit juice

BEDTIME SNACK

- ½ cup of sugar-free pudding
- ¼ cup of cottage cheese or 1 oz. of American cheese
- ½ cup of fruit canned in juice or fruit juice

If your blood glucose is in the normal range (80-140 mg/dL) and you cannot tolerate soft foods, try sipping clear liquids. The following items are **examples** of clear liquids containing 15 grams of carbohydrates.

CLEAR LIQUIDS	SERVING/ CARBOHYDRATE AMOUNT	CLEAR LIQUIDS	SERVING/ CARBOHYDRATE AMOUNT
■ Apple Juice	→ ½ – ¾ cup/15 grams	■ Gatorade	→ 1 cup/15 grams
■ Cranberry Juice	→ ½ – ¾ cup/15 grams	■ Pedialyte	→ 2 ½ cups/15 grams
■ Regular Soda	→ ½ cup/15 grams	■ Soup (broth based)	→ 1 cup/15 grams
■ Regular Jell-O	→ ½ cup/15 grams	■ Popsicles	→ 1 Popsicle/15 grams

OVER-THE-COUNTER (OTC) DRUGS

Over-the-counter drugs are those you can buy over the counter, without a prescription from your healthcare provider. If you have diabetes, it is a good idea to check with your healthcare team about choices that are best for you. Check with your pharmacist before you buy any over-the-counter product. The more you know about drugs and how they affect you, the better you can manage your blood sugar. A lot of things can affect the way medicine works in your body:

- Age
- Allergies to specific drugs
- Two or more drugs taken at the same time (this is called drug interaction)
- Other diseases or conditions
- Smoking or alcohol use



HOW DO OVER-THE-COUNTER DRUGS AFFECT ME OR MY BLOOD SUGAR?

Many over-the-counter products are made with sugar. The sugar can raise your blood sugar, so **sugar-free** is better. Sometimes you have to ask the pharmacist for the sugar-free products.

Alcohol - alcohol affects people differently, but the effects of alcohol tend to be stronger in people who use insulin or pills for diabetes.

Aspirin - an aspirin a day, taken under a doctor's care, can have life-saving benefits. Aspirin is not appropriate for everyone so be sure to talk to your doctor before you begin an aspirin regimen.

Caffeine - large amounts can raise your blood sugar — moderation is always a good idea.

Cold medicines - some of these may raise your blood sugar.

Tobacco - may raise blood sugar and will increase your risk for complications.

When you take over-the-counter drugs, it is a good idea to check your blood sugar to see if there is a change in your blood sugar level (see Ascensia® Health Facts brochure — **Blood Sugar Testing**). Remember that just being sick can cause a rise in blood sugar, so testing more often when you're sick is a good idea. Drink plenty of water and follow your sick-day plan.

HOW DO I CHOOSE A OVER-THE-COUNTER DRUG?

There are many choices for cough, cold, sore throat, or stomach upset. Your pharmacist can give you good advice on choosing the one that will be safe and work best for you.

Here are some tips:

- Read the label carefully.
- Check what is in the medicine.



- Read the warnings. If it says, "Individuals with high blood pressure, heart disease, or diabetes should use only as directed by physician," talk to your doctor before taking it.
- It is best to use products that contain very little carbohydrates (sugar, less than 5 gm per dose).
- Pick products that have little or no alcohol in them.
- Use a pill, tablet, or capsule instead of a liquid. These choices usually do not have sugar or alcohol in them.

WHAT ABOUT HERBALS, SUPPLEMENTS OR SELF-TREATMENT ITEMS?

When you have diabetes, it is important to read the label on any product you use. Discuss the product with your healthcare team. Some creams, lotions, herbals, supplements, or self-treatment products can be helpful. If the product has a warning label that reads "Not to be used by people with diabetes", follow the warning. Remember, all your medicines, prescription or over-the-counter products should be taken or used the right way. Here are some tips:

- Follow your doctor's instructions.
- Read the label and package insert.
- Be sure your healthcare team knows what drugs you are taking, and which over-the-counter products you are using.
- Use one pharmacy since they have your records and are aware of all medications you are taking.
- Know the names of all your medicines, their doses, and when you should be taking them.

- Learn about possible side effects.
- Check your blood sugar often.
- Discuss any concerns with your healthcare team.

WHICH OVER-THE-COUNTER DRUGS CONTAIN LITTLE OR NO ALCOHOL AND/OR SUGAR?

The following adult and pediatric products are unlikely to affect your blood sugar control because they contain little or no alcohol or sugar. It is still a good idea to discuss these and other nonprescription products with your healthcare team before taking them. Also, remember to read the label on these products, and talk with your doctor as indicated. Formulations may change.

Pain/Fever Relievers

- **BAYER® ASPIRIN** (Regular Strength 325mg, Extra Strength, PM, Aspirin Regimen, Childrens 81mg Chewable, 81mg Low Strength Regimen)

If you are taking diabetes medication, talk with your doctor before starting aspirin therapy since aspirin may interact with some medications;

- **ADVIL®**
- **ALEVE®**
- **MOTRIN IB®**
- **ST. JOSEPHS®** Aspirin-free Drops, Elixir, Liquid
- **TYLENOL®** Extra Strength, Caplets, Gels, Tablets
- **TYLENOL®** Regular Strength, Caplets, Tablets
- **TYLENOL®** Childrens Fruit, Childrens Grape, Infants, Infants Suspension Drops, Junior Strength Fruit, Junior Strength Grape



Cough Medicines

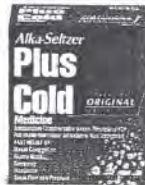
Products called expectorants loosen a cough. Products called suppressants quiet a cough. Avoid cough drops since most contain sugar. Its best to choose a cough medicine that contains less than 15% alcohol, such as:

NALDECON® Senior EX

- NALDECON® Senior DX
- DIABETIC TUSSIN® EX
- SCOTT-TUSSIN® Expectorant
- SCOTT-TUSSIN® Senior SF Maximum Strength
- SAFE-TUSSIN® 30
- ROBITUSSIN® Pediatric Cough Suppressant

Cough and Cold Medicines

- ALKA-SELTZER® Plus Cold
- ALKA-SELTZER® Plus Cold Liqui-gels
- DIMETAPP® DM Elixir
- NALDECON® DX Children's Syrup
- NALDECON® DX Pediatric Drops
- NALDECON® DX Adult
- ROBITUSSIN® Pediatric Cough and Cold
- ROBITUSSIN® Pediatric Drops
- ROBITUSSIN® CF



Cold/Allergy Medications

- ALKA-SELTZER® Cold Liqui-gels
- DIMETAPP® Elixir
- CHLOR-TRIMETON® 4-hour Allergy Tablets
- CHLOR-TRIMETON® 4-hour Allergy/Decongestant Tablets
- NEO-SYNEPHRINE® Nasal Spray Regular and Extra Strength

Sore Throat Products

Choose lozenges instead of liquids when you can. These are less likely to affect blood sugar levels.

- CEPASTAT® Sore Throat Lozenges Cherry and Extra Strength
- NICE®
- CHLORASEPTIC® Mouthwash and Gargle, Throat Spray
- CHILDREN'S CHLORASEPTIC®
- SUCRETS THROAT SPRAY®

Vitamins

- ONE-A-DAY® Women's, Men's, 50 Plus, Maximum, Essential and Calcium Plus, CarbSmart and WeightSmart
- FLINTSTONES® Complete, Plus Extra C, Plus Iron, Original and Plus Calcium
- BUGS BUNNY® Chewable, Children's with Extra C, Vitamins and Minerals, Plus Iron Chewable



MULTIVITAMIN® Complete

- CALTRATE® 600, 600+D, 600+Iron
- POSTURE® and POSTURE® D
- POLY-VI-SOL® Vitamin Drops, Vitamin Drops with Iron
- TRI-VI-SOL® A, D+C Drops; A, D+C Drops with Iron
- VI-DAYLIN® Drops

Antacids

- ALKA-SELTZER® Original, Extra Strength, Aspirin-Free, Chewable
- DI-GEL® Liquid, Tablets
- MAALOX® Suspension, Tablets
- MYLANTA® Liquid, Tablets
- RIOPAN® SUSPENSION

Anti-diarrheals

- DIASORB® Liquid, Tablets
- PEPTO-BISMOL® Original Liquid, Cherry Tablets, Caplets

Laxatives

- PHILLIPS® Milk of Magnesia
- COLACE® Capsules
- METAMUCIL® Sugar-Free Powder Lemon and Lime, Sugar-Free Powder Orange, Effervescent Powder Lemon and Lime, Effervescent Powder Orange

• FERRALL® Powder Natural, Powder Orange

- CITRUCEL® Sugar-Free Powder
- KONDREMUL® Plain Emulsion
- AGORAL® Emulsion
- HALEYS® MO Liquid



Motion Sickness

- DRAMAMINE® Tablets, Chewable Tablets
- BONINE® Chewable Tablets

Appetite Suppressants

Since diet pills often contain compounds very similar to decongestants, they can raise blood sugar levels. Ask your healthcare team before taking any appetite suppressant.

Adapted from Evenson-St. Amand LM, Campbell RK. Diabetes care products. In: Feldmann EG, ed. Handbook of Nonprescription Drugs. 9th ed. Washington DC: American Pharmaceutical Association; 1990:430-434. The trade name items shown do not necessarily represent all of the items that may be available in any or all of the therapeutic classes. All trade names are the property of their respective manufacturers and are included for identification only. No endorsement is implied. Formulations may change; always check product labels or consult the pharmacist or other healthcare professional for more information.

Certain Antibiotics Tied to Blood Sugar Swings in Diabetics

Drugs such as Cipro, Avelox were most implicated, but experts say other factors may be at play

Diabetes patients who take a certain class of antibiotics are more likely to have severe blood sugar fluctuations than those who take other types of the drugs, a new study finds.

The increased risk was low but doctors should consider it when prescribing the class of antibiotics, known as fluoroquinolones, to people with diabetes, the researchers said. This class of antibiotics, which includes drugs such as **Cipro** (ciprofloxacin), **Levaquin** (levofloxacin) and **Avelox** (moxifloxacin), is commonly used to treat conditions such as urinary tract infections and community-acquired pneumonia.

The study included about 78,000 people with diabetes in Taiwan. The researchers looked at the patients' use of three classes of antibiotics: **fluoroquinolones**; second-generation **cephalosporins** (cefuroxime, cefaclor, or cefprozil); or **macrolides** (clarithromycin or azithromycin).

The investigators also looked for any emergency-room visits or hospitalizations for severe blood sugar swings among the patients in the 30 days after they started taking the antibiotics.

The results showed that patients who took fluoroquinolones were more likely to have severe blood sugar swings than those who took antibiotics in the other classes. The level of risk varied according to the specific fluoroquinolone, according to the study, which was published in the journal *Clinical Infectious Diseases*.

The incidence of hyperglycemia (high blood sugar) per 1,000 people was 6.9 for people taking moxifloxacin, 3.9 for levofloxacin and 4.0 for ciprofloxacin. The incidence of hypoglycemia (low blood sugar) was 10 per 1,000 for moxifloxacin, 9.3 for levofloxacin and 7.9 for ciprofloxacin.

The incidence of hyperglycemia per 1,000 people was 1.6 for those taking the macrolide class of antibiotics and 2.1 for those on cephalosporins. The incidence of hypoglycemia per 1,000 people was 3.7 for macrolides and 3.2 for cephalosporins.

"Our results identified **moxifloxacin** as the drug associated with the highest risk of hypoglycemia, followed by **levofloxacin** and **ciprofloxacin**," wrote Dr. Mei-Shu Lai, at National Taiwan University, and colleagues.

They said doctors should consider other antibiotics if they have concerns patients might experience severe blood sugar swings.

"The study ... does not prove a causal connection between particular fluoroquinolones and blood sugar dysregulation," he said. But he believes

that it provides evidence that people with diabetes may be at special risk from moxifloxacin in particular.

"If moxifloxacin is to be prescribed to diabetic patients, there should be some additional expected benefit that justifies the increase in incurred risk," Ochner said.

But another expert said there could be other explanations for why people on fluoroquinolones had more blood sugar fluctuations.

"It is hard to draw conclusions that fluoroquinolones themselves are the culprit, as all of these patients had infections, and infection can lead to hypo- or hyperglycemia in persons with diabetes," said Dr. Alyson Myers, an endocrinologist at North Shore University Hospital in Manhasset, N.Y.

"In addition, those in the fluoroquinolone group were more likely to have chronic kidney disease or steroid use -- the former can increase rates of hypoglycemia and the latter can increase rates of hyperglycemia," Myers said. "Another confounding factor would be the type of diabetes treatments that patients were receiving, as sulfonylureas and insulin are both associated with greater risks of hypoglycemia than other diabetes medications."

In our experiences here, there have been glucose elevations and glucose drops seen in patients on these medications. The first one in the class, Tequin, has come off the market for this reason. Especially powerful was the patient on Levaquin here and discharged on glyburide to go home. One day after discharge was seen in ER for severe hypoglycemia (low blood sugar). So be aware that in some persons with diabetes and infection, these antibiotics can create havoc, especially if on the older pills for diabetes called sulfonylureas.

ALSO OF INTEREST:

Hypoglycemia a possible adverse reaction to linezolid

Viswanathan P. *Clin Infect Dis.* 2014;doi:10.1093/cid/ciu487.

July 11, 2014

The FDA has found that hypoglycemia may be an adverse effect associated with linezolid, according to a report in *Clinical Infectious Diseases*.

Patients with diabetes who receive insulin or oral hypoglycemic agents appear to be at the highest risk. The FDA updated the Warnings and Precautions section on the linezolid (Zyvox, Pfizer) insert to inform providers of this potential interaction, FDA investigators wrote in the report.

After reviewing a report of symptomatic hypoglycemia related to [linezolid](#) in a 64-year-old man with diabetes, FDA officials launched a broader inquiry. They searched the FDA Adverse Event

Reporting System for incidents of hypoglycemia among people who received linezolid from April 2000 to March 2012.

They identified 41 reports of hypoglycemia among people who received linezolid, and excluded 26 that demonstrated no temporal association between the hypoglycemia and linezolid exposure. Among the remaining 15 studies, the link between hypoglycemia and linezolid was considered “highly probable” in seven cases, “probable” in four cases and “possible” in four cases.

Among the 15 cases, the median age was 77 years and 11 patients were male. Eight patients had received oral linezolid and six received IV linezolid. Information was not available for one patient. The median time to hypoglycemia after starting linezolid was 7 days. Overall, hypoglycemia resolved in ten patients after discontinuing linezolid and the outcomes for the other five are unknown.

Twelve of the patients (80%) had [diabetes](#): nine were taking oral hypoglycemic drugs and two were taking insulin. Treatment information was not available for one patient. In eight of the patients, adjustment to the diabetes drug regimen did not resolve the hypoglycemia, but did resolve after linezolid was discontinued. There was no outcome data for the other four patients.

“Our review suggests that there is a potential relationship between linezolid use and hypoglycemia,” the investigators wrote. “Health care providers should be aware of this possibility when prescribing linezolid, especially in diabetic patients.”

Disclosure: The researchers report no relevant disclosures.

Low blood sugar (Hypoglycemia)

Cornerstones4Care™

Causes

You might get low blood sugar (also called hypoglycemia) if you:

- Take certain medicines and eat too few carbohydrates, or skip or delay a meal
- Take too much insulin or diabetes pills (ask your diabetes care team if this applies to you)
- Are more active than usual

Signs and Symptoms

Here's what may happen when your blood sugar is low:



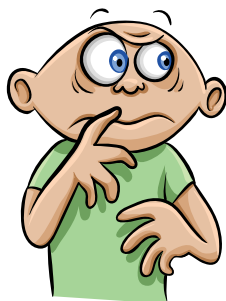
Shaky



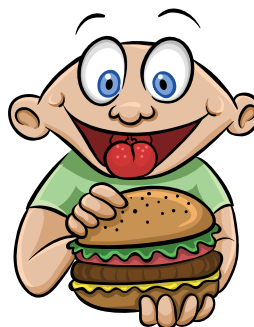
Sweaty



Dizzy



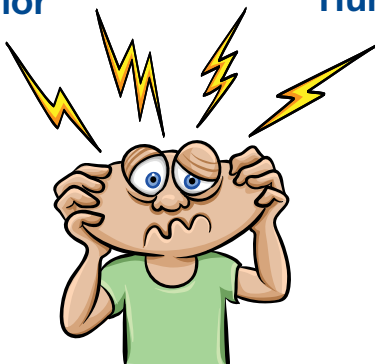
Sudden behavior change



Hungry



Weak or tired



Headache



Nervous or upset

If low blood sugar is not treated, it can become severe and cause you to pass out.
If low blood sugar is a problem for you, talk to your doctor or diabetes care team.

Low blood sugar (Hypoglycemia)

What to do if you think you have low blood sugar

Check your blood sugar right away if you have any symptoms of low blood sugar. If you think your blood sugar is low but cannot check it at that time, treat anyway.



Treat by eating or drinking 15 grams of something high in sugar, such as:

- 4 ounces (½ cup) of regular fruit juice (like orange, apple, or grape juice)
- 4 ounces (½ cup) of regular soda pop (not diet)
- 3 or 4 glucose tablets
- 5 to 6 hard candies that you can chew quickly (such as mints)



Wait 15 minutes and then check your blood sugar again. If it is still low, eat or drink something high in sugar again. Once your blood sugar returns to normal, eat a meal or snack. This can help keep low blood sugar from coming back.



For more information, visit
Cornerstones4Care.com

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Hypoglycemia: The Values

- Hypoglycemia is defined as a blood sugar of <70 mg/dl
- Depending on the person, different lab values will have differing implications and symptoms, so the patient regardless of labs appearing

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Diabetes Care
Volume 34, Number 11, November 2011
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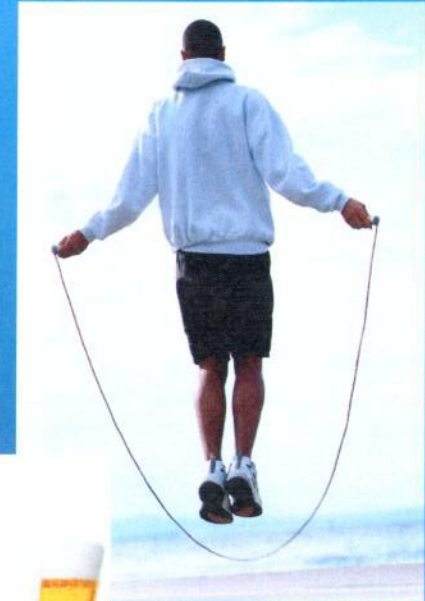
Hypoglycemia: The Values

- Hypoglycemia is defined as a blood sugar of <70 mg/dl
- Depending on the person, different lab values will have differing implications and symptoms, so it is important to treat the patient regardless of labs appearing “low”

Glucose Lab Value	Signs/Symptoms
<65 mg/dl	Begin to see mental deficiencies
<40 mg/dl	Impaired action & judgment; seizure threshold is lowered
<10 mg/dl	Neurons essentially become electrically silent

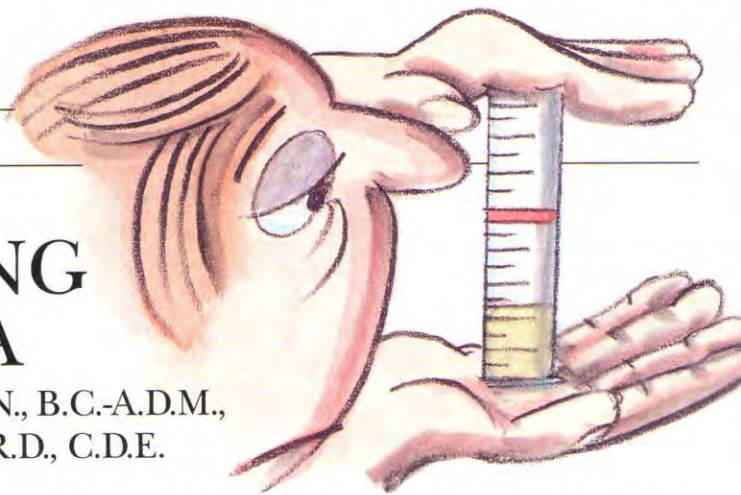
Hypoglycemia: The Causes

- Severe illness
 - Including sepsis
- Prolonged fasting
 - Including diarrheal/gastrointestinal illness
- Exercise
- Alcohol
 - Decreases liver gluconeogenesis
- Growth hormone deficiency
- Hypopituitarism
- Addison's disease
- Adrenal insufficiency
- Other metabolic disorders
- Organ failure



UNDERSTANDING HYPOGLYCEMIA

by Laura Hieronymus, M.S.Ed., A.P.R.N., B.C.-A.D.M., C.D.E., and Belinda O'Connell, M.S., R.D., C.D.E.



When you think about diabetes and blood glucose control, the first thing that comes to mind is probably avoiding high blood glucose levels. After all, the hallmark of diabetes is high blood glucose, or *hyperglycemia*. But controlling blood glucose is more than just managing the “highs”; it also involves preventing and managing “lows,” or *hypoglycemia*.

Most people are aware that keeping blood glucose levels as close to normal as possible helps prevent damage to the blood vessels and nerves in the body. But keeping blood glucose levels near normal can carry some risks as well. People who maintain “tight” blood glucose control are more likely to experience episodes of hypoglycemia, and frequent episodes of hypoglycemia—even mild hypoglycemia and even in people who don’t keep blood glucose levels close to normal—deplete the liver of stored glucose (called *glycogen*), which is what the body normally draws upon to raise blood glucose levels when they are low. Once liver stores of glycogen are low, severe hypoglycemia is more likely to develop, and research shows that severe hypoglycemia can be harmful. In children, frequent severe hypoglycemia can lead to impairment of intellectual function. In children and adults, severe hypoglycemia can lead to accidents. And in adults with cardiovascular disease, it can lead to strokes and heart attacks.

To keep yourself as healthy as

possible, you need to learn how to balance food intake, physical activity, and any diabetes medicines or insulin you use to keep your blood glucose as close to normal as is safe for you without going too low. This article explains how hypoglycemia develops and how to treat and prevent it.

What is hypoglycemia?

Blood glucose levels vary throughout the day depending on what you eat, how active you are, and any diabetes medicines or insulin you take. Other things, such as hormone fluctuations, can affect blood glucose levels as well. In people who don’t have diabetes, blood glucose levels generally range from 65 mg/dl to 140 mg/dl, but in diabetes, the body’s natural control is disrupted, and blood glucose levels can go too high or too low. For people with diabetes, a blood glucose level of 70 mg/dl or less is considered low, and treatment is recommended to prevent it from dropping even lower.

Under normal circumstances, glucose is the brain’s sole energy source, making it particularly sensitive to any decrease in blood glucose level. When blood glucose levels drop too low, the body tries to increase the amount of glucose available in the bloodstream by releasing hormones such as glucagon and epinephrine (also called adrenaline) that stimulate the release of glycogen from the liver.

Some of the symptoms of hypo-

glycemia are caused by the brain’s lack of glucose; other symptoms are caused by the hormones, primarily epinephrine, released to help increase blood glucose levels. Epinephrine can cause feelings of weakness, shakiness, clamminess, and hunger and an increased heart rate. These are often called the “warning signs” of hypoglycemia. Lack of glucose to the brain can cause trouble concentrating, changes in vision, slurred speech, lack of coordination, headaches, dizziness, and drowsiness. Hypoglycemia can also cause changes in emotions and mood. Feelings of nervousness and irritability, becoming argumentative, showing aggression, and crying are common, although some people experience euphoria and giddiness. Recognizing emotional changes that may signal hypoglycemia is especially important in young children, who may not be able to understand or communicate other symptoms of hypoglycemia to adults. If hypoglycemia is not promptly treated with a form of sugar or glucose to bring blood glucose level up, the brain can become dangerously depleted of glucose, potentially causing severe confusion, seizures, and loss of consciousness.

Who is at risk?

Some people are at higher risk of developing hypoglycemia than others. Hypoglycemia is not a concern for people who manage their diabetes with only exercise and a meal plan. People who use insulin or cer-

tain types of oral diabetes medicines have a much greater chance of developing hypoglycemia and therefore need to be more careful to avoid it. Other risk factors for hypoglycemia include the following:

- Maintaining very “tight” (near-normal) blood glucose targets.
- Decreased kidney function. The kidneys help to degrade and remove insulin from the bloodstream. When the kidneys are not functioning well, insulin action can be unpredictable, and low blood glucose levels may result.
- Alcohol use.
- Conditions such as gastropathy (slowed stomach emptying) that cause variable rates of digestion and absorption of food.
- Having autonomic neuropathy, which can decrease symptoms when blood glucose levels drop. (Autonomic neuropathy is damage to nerves that control involuntary functions.)
- Pregnancy in women with preexisting diabetes, especially during the first trimester.

A side effect of diabetes treatment

Hypoglycemia is the most common side effect of insulin use and of some of the oral medicines used to treat Type 2 diabetes. How likely a drug is to cause hypoglycemia and the appropriate treatment for hypoglycemia depends on the type of drug.

Secretagogues. Oral medicines that stimulate the pancreas to release more insulin, which include sulfonylureas and the drugs nateglinide (brand name Starlix) and repaglinide (Prandin), have the potential side effect of hypoglycemia. Sulfonylureas include glimepiride (Amaryl), glipizide (Glucotrol and Glucotrol XL), and glyburide (DiaBeta, Micronase, and Glynase).

Sulfonylureas are taken once or twice a day, in the morning and the

evening, and their blood-glucose-lowering effects last all day. If you miss a meal or snack, the medicine continues to work, and your blood glucose level may drop too low. So-called sulfa antibiotics (those that contain the ingredient sulfamethoxazole) can also increase the risk of hypoglycemia when taken with a sulfonylurea. Anyone who takes a sulfonylurea, therefore, should discuss this potential drug interaction with their health-care provider should antibiotic therapy be necessary.

Nateglinide and repaglinide are taken with meals and act for only a short time. The risk of hypoglycemia is lower than for sulfonylureas, but it is still possible to develop hypoglycemia if a dose of nateglinide or repaglinide is taken without food.

Insulin. All people with Type 1 diabetes and many with Type 2 use insulin for blood glucose control. Since insulin can cause hypoglycemia, it is important for those who use it to understand how it works and when its activity is greatest so they can properly balance food and activity and take precautions to avoid hypoglycemia. This is best discussed with a health-care provider who is knowledgeable about you, your lifestyle, and the particular insulin regimen you are using.

Biguanides and thiazolidinediones. The biguanides, of which metformin is the only one approved in the United States, decrease the amount of glucose manufactured by the liver. The thiazolidinediones, pioglitazone (Actos) and rosiglitazone (Avandia), help body cells become more sensitive to insulin. The risk of hypoglycemia is very low with these medicines. However, if you take metformin, pioglitazone, or rosiglitazone along with either insulin or a secretagogue, hypoglycemia is a possibility.

Alpha-glucosidase inhibitors. Drugs in this class, acarbose (Precose)

and miglitol (Glyset), interfere with the digestion of carbohydrates to glucose and help to lower blood glucose levels after meals. When taken alone, these medicines do not cause hypoglycemia, but if combined with either insulin or a secretagogue, hypoglycemia is possible. Because alpha-glucosidase inhibitors interfere with the digestion of some types of carbohydrate, hypoglycemia can only be treated with pure glucose (also called dextrose or *D*-glucose), which is sold in tablets and tubes of gel. Other carbohydrates will not raise blood glucose levels quickly enough to treat hypoglycemia.

Striking a balance

Although hypoglycemia is called a side effect of some of the drugs used to lower blood glucose levels, it would be more accurate to call it a potential side effect of diabetes treatment—which includes food and activity as well as drug treatment. When there is a disruption in the balance of these different components of diabetes treatment, hypoglycemia can result. The following are some examples of how that balance commonly gets disrupted:

Skipping or delaying a meal. When you take insulin or a drug that increases the amount of insulin in your system, not eating enough food at the times the insulin or drug is working can cause hypoglycemia. Learning to balance food with insulin or oral drugs is key to achieving optimal blood glucose control while avoiding hypoglycemia.

Too much diabetes medicine. If you take more than your prescribed dose of insulin or a secretagogue, there can be too much insulin circulating in your bloodstream, and hypoglycemia can occur. Changes in the timing of insulin or oral medicines can also cause hypoglycemia if your medicine and food plan are no longer properly matched.

Increase in physical activity. Physical activity and exercise lower blood glucose level by increasing insulin sensitivity. This is generally beneficial in blood glucose control, but it can increase the risk of hypoglycemia in people who use insulin or secretagogues if the exercise is very vigorous, carbohydrate intake too low, or the activity takes place at the time when the insulin or secretagogue has the greatest (peak) action. Exercise-related hypoglycemia can occur as much as 24 hours after the activity.

Increase in rate of insulin absorption. This may occur if the temperature of the skin increases due to exposure to hot water or the sun. Also, if insulin is injected into a muscle that is used in exercise soon after (such as injecting your thigh area, then jogging), the rate of absorption may increase.

Alcohol. Consuming alcohol can cause hypoglycemia in people who take insulin or a secretagogue. When the liver is metabolizing alcohol, it is less able to break down glycogen to make glucose when blood glucose levels drop. In addition to causing hypoglycemia, this can increase the severity of hypoglycemia. Alcohol can also contribute to hypoglycemia by reducing appetite and impairing thinking and judgment.

Hypoglycemia unawareness

Being able to recognize hypoglycemia promptly is very important because it allows you to take steps to raise your blood glucose as quickly as possible. However, some people with diabetes don't sense or don't experience the early warning signs of hypoglycemia such as weakness, shakiness, clamminess, hunger, and an increase in heart rate. This is called "hypoglycemia unawareness." Without these early warnings and prompt treatment, hypoglycemia can progress to con-

fusion, which can impair your thinking and ability to treat the hypoglycemia.

If the goals you have set for your personal blood glucose control are "tight" and you are having frequent episodes of hypoglycemia, your brain may feel comfortable with these low levels and not respond with the typical warning signs. Frequent episodes of hypoglycemia can further blunt your body's response to low blood glucose. Some drugs, such as beta-blockers (taken for high blood pressure), can also mask the symptoms of hypoglycemia.

If you have hypoglycemia frequently, you may need to raise your blood glucose targets, and you should monitor your blood glucose level more frequently and avoid alcohol. You may also need to adjust your diabetes medicines or insulin doses. Talk to your diabetes care team if you experience several episodes of hypoglycemia a week, have hypoglycemia during the night, have such low blood glucose that you require help from someone else to treat it, or find you are frequently eating snacks that you don't want simply to avoid low blood glucose.

Treating lows

Anyone at risk for hypoglycemia should know how to treat it and be prepared to do so at any time. Here's what to do: If you recognize symptoms of hypoglycemia, check your blood glucose level with your meter to make sure. While the symptoms are useful, the numbers are facts, and other situations, such as panic attacks or heart problems, can lead to similar symptoms. In some cases, people who have had chronically high blood glucose levels may experience symptoms of hypoglycemia when their blood glucose level drops to a more normal range. The usual recommendation is not to treat normal or goal-range blood glucose

levels, even if symptoms are present.

Treatment is usually recommended for blood glucose levels of 70 mg/dl or less. However, this may vary among individuals. For example, blood glucose goals are lower in women with diabetes who are pregnant, so they may be advised to treat for hypoglycemia at a level below 70 mg/dl. People who have hypoglycemia unawareness, are elderly, or live alone may be advised to treat at a blood glucose level somewhat higher than 70 mg/dl. Young children are often given slightly higher targets for treating hypoglycemia for safety reasons. Work with your diabetes care team to devise a plan for treating hypoglycemia that is right for you.

To treat hypoglycemia, follow the "rule of 15": Check your blood glucose level with your meter, treat a blood glucose level under 70 mg/dl by consuming 15 grams of carbohydrate, wait about 15 minutes, then recheck your blood glucose level with your meter. If your blood glucose is still low (below 80 mg/dl), consume another 15 grams of carbohydrate and recheck 15 minutes later. You may need a small snack if your next planned meal is more than an hour away. Since blood glucose levels may begin to drop again about 40–60 minutes after treatment, it may be a good idea to recheck your blood glucose level approximately an hour after treating a low to determine if additional carbohydrate is needed.

The following items have about 15 grams of carbohydrate:

- 3–4 glucose tablets
- 1 dose of glucose gel (in most cases, 1 small tube is 1 dose)
- ½ cup of orange juice or regular soda (not sugar-free)
- 1 tablespoon of honey or syrup
- 1 tablespoon of sugar or 5 small sugar cubes
- 6–8 LifeSavers
- 8 ounces of skim (nonfat) milk

If these choices are not available, use any carbohydrate that is—for example, bread, crackers, grapes, etc. The form of carbohydrate is not important; treating the low blood glucose is. (However, many people find they are less likely to overtreat low blood glucose if they consistently treat lows with a more “medicinal” form of carbohydrate such as glucose tablets or gel.)

If you take insulin or a secretagogue and are also taking an alpha-glucosidase inhibitor (acarbose or miglitol), carbohydrate digestion and absorption is decreased, and the recommended treatment is glucose tablets or glucose gel.

Other nutrients in food such as fat or resistant starch (which is present in some diabetes snack bars) can delay glucose digestion and absorption, so foods containing these ingredients are not good choices for treating hypoglycemia.

If hypoglycemia becomes severe and a person is confused, convulsing, or unconscious, treatment options include intravenous glucose administered by medical personnel or glucagon by injection given by someone trained in its use and familiar with the recipient’s diabetes history. Glucagon is a hormone that is normally produced by the pancreas and that causes the liver to release glucose into the bloodstream, raising the blood glucose level. It comes in a kit that can be used in an emergency situation (such as when a person is unable to swallow a source of glucose by mouth). The hormone is injected much like an insulin injection, usually in an area of fatty tissue, such as the stomach or back of the arms. Special precautions are necessary to ensure that the injection is given correctly and that the person receiving the injection is positioned properly prior to receiving the drug. People at higher risk of developing hypoglycemia should discuss the use of glucagon with

their diabetes educator, doctor, or pharmacist.

Avoiding hypoglycemia

Avoiding all episodes of hypoglycemia may be impossible for many people, especially since maintaining tight blood glucose control brings with it a higher risk of hypoglycemia. However, the following tips may help to prevent excessive lows:

- Know how your medicines work and when they have their strongest action.

- Work with your diabetes care team to coordinate your medicines or insulin with your eating plan. Meals and snacks should be timed to coordinate with the activity of your medicine or insulin.

- Learn how to count carbohydrates so you can keep your carbohydrate intake consistent at meals and snacks from day to day. Variations in carbohydrate intake can lead to hypoglycemia.

- Have carbohydrate-containing foods available in the places you frequent, such as in your car or at the office, to avoid delays in treatment of hypoglycemia.

- Develop a plan with your diabetes care team to adjust your food, medicine, or insulin for changes in activity or exercise.

- Discuss how to handle sick days and situations where you have trouble eating with your diabetes team.

- Always check your blood glucose level to verify any symptoms of hypoglycemia. Keep your meter with you, especially in situations where risk of hypoglycemia is increased.

- Wear a medical alert identification tag.

- Always treat blood glucose levels of 70 mg/dl or less whether or not you have symptoms.

- If you have symptoms of hypoglycemia and do not have your blood glucose meter available, treatment is recommended.

- If you have hypoglycemia unawareness, you may need to work with your diabetes care team to modify your blood glucose goals or treatment plan.

- Check your blood glucose level frequently during the day and possibly at night, especially if you have hypoglycemia unawareness, are pregnant, or have exercised vigorously within the past 24 hours.

- Check your blood glucose level before driving or operating machinery to avoid any situations that could become dangerous if hypoglycemia occurred.

- Check the expiration date on your glucagon emergency kit once a year and replace it before it expires.

- Discuss alcohol intake with your diabetes care team. You may be advised not to drink on an empty stomach and/or to increase your carbohydrate intake if alcohol is an option for you. If you drink, always check your blood glucose level before bed and eat any snacks that are scheduled in your food plan.

Don't risk your health

Although hypoglycemia can, at times, be unpleasant, don't risk your health by allowing your blood glucose levels to run higher than recommended to avoid it. Meet with your diabetes care team to develop a plan to help you achieve the best possible blood glucose control safely and effectively. Think positive, and learn to be prepared with measures to prevent and promptly treat hypoglycemia should it occur. □

Laura Hieronymus is the program coordinator/nurse educator for Drs. Borders and Associates, PSC, an American Diabetes Association-recognized education service in Lexington, Kentucky. Belinda O'Connell is a Diabetes Nutrition Specialist at the International Diabetes Center in Minneapolis, Minnesota, and a freelance health and science writer.

Pure d-glucose tablets contain only 4 calories per gram, so 15 - 20 grams has 60 - 80 calories. Correcting two lows per week with 15 - 20 grams of carbs amounts to an extra 6,240 - 8,320 calories a year, or the equivalent of 1.8 - 2.4 pounds of body fat (one pound of fat is 3,500 calories). Getting 15 - 20 grams of carbs from other foods usually results in more calories, especially if any of the calories come from fat (which has 9 calories per gram) or protein (also 4 calories per gram), and neither fat nor protein will help you rapidly correct a low blood sugar.

- A 2-ounce bag of Skittles® candy contains almost 60 grams of carbohydrate and four times the calories of 15-grams of pure glucose. Likewise, just one ounce of Smarties contain 25 grams, which if you consumed them all would probably raise your blood sugar too much and cause you to take in extra calories.
- A candy bar like Snickers® contains about 100 extra calories for every 15 grams of carbs. Correcting lows with Snickers® or similar candy bars adds a weight gain of another 3-pounds a year.
- A regular soda that contains high-fructose corn syrup may take longer to correct a low (fructose has to be converted into glucose first), and it's easy to consume more than 15 grams - found in only 4 ounces of a soda (one third of a 12-ounce can).



Even choosing orange juice or a banana to correct a low is less effective because the fructose (fruit sugar) is converted into glucose at a much slower rate. You probably will not be able to stick to only 4 ounces of juice or half of a medium banana (15 grams of



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Having low blood is inconvenient, and

lead to weight acting product to raise your blood sugar that also has the least calories - pure glucose.

carbs) while you wait for your low to be corrected, and end up consuming more calories than necessary.

sugar is not only frustrating, potentially dangerous, it can also gain. Be smart, use the fastest-

If you take any blood glucose-lowering medication (insulin or oral medication), [you are at risk](#) for low blood sugar (less than 70 mg/dl). This is called [hypoglycemia](#). Low blood sugar [signs and symptoms](#) include trembling, sweating, hunger, rapid heart beat, blurred vision, impaired thinking and even seizures and loss of consciousness.

It's important to [correct a low](#) right away. It's also important to remember that what you use to correct a low adds extra calories not accounted for in your meal plan. Using something low in calories can help you avoid weight gain when correcting hypoglycemia.

- **[Physical activity has a blood sugar-lowering effect.](#)** Consume some straight carbohydrates (*without* much fat or protein) during exercise to keep your blood sugars from dropping. Choosing straight carbs helps keep your calorie intake low. To prevent lows after exercise, have a balance of carbs, protein and fat in your next meal or snack.
- **If you become more physically active, particularly on a regular basis, talk to your doctor about reducing the amount of medication you take.** During exercise, your body uses carbohydrates more than any other fuel so you'll either need to eat more of them or take less medicine to avoid a low. Talk with your healthcare professional about lowering your dose of insulin and/or oral medication. This may help prevent lows that you'll otherwise have to correct with extra carbohydrates.
- **If you've had diabetes for longer than 10 years, your glucose-raising hormones may not work as well.** This means that your body will release less of these hormones than it used to and your blood sugars may stay low, or go lower than they used to. So it's important to raise your blood sugar rapidly. Pure glucose gives your blood sugar a rapid rise.
- **One symptom of hypoglycemia can be intense hunger.** This may cause you to eat 30, 45, 60 or more grams of carbohydrate in a short period of time. Consuming 15 - 20 grams of carbohydrate and checking your blood sugar again in 15 minutes is the best way to correct a low without gaining weight.

Be aware of the possible [symptoms](#) of hypoglycemia because if you correct a low early you may not need as much fast-acting carbohydrate and will consume fewer calories.

With a little practice, you can easily determine how many glucose tablets or how much glucose gel or liquid is likely to raise your blood glucose level.

If you do not feel the symptoms of hypoglycemia (called [hypoglycemia unawareness](#)), talk with your healthcare professional about how often to check your blood sugar and how best to prepare, prevent and care for low blood sugar.

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Some persons have gotten relief for nocturnal hypoglycemia by using uncooked cornstarch products that hold the glucose up without increasing it the next morning. Can be found at :
https://extendbar.com/?gclid=EAIaIQobChMI55LQjuKJ4AIVWLnACh0S4QH0EAAYASAAEgliDPD_BwE

Xeris Submits Glucagon Rescue Pen to FDA: A Dramatically Easier and Faster Treatment for Severe Hypoglycemia

8/31/18 -



By

Jimmy McDermott

Xeris' Glucagon Rescue Pen, designed as an auto-injector, features a ready-to-use liquid glucagon – a safer and more convenient treatment option for severe hypoglycemia

Xeris has submitted its Glucagon Rescue Pen – the “G-Pen” – for the emergency treatment of extremely low blood sugar (severe hypoglycemia) to the FDA. Unlike current glucagon kits,

Xeris' glucagon is a room-temperature stable liquid; because it does not require mixing prior to use, it will be "ready to inject" (like an EpiPen for allergies) in two simple steps: (1) remove the cap from the pen; and (2) press the pen against the skin (presumably arm or leg or wherever is available). Upon contact with the skin, the automatic injector will deliver a rescue dose of glucagon. This will make glucagon administration during emergencies easier and faster than current options. Assuming a standard review process, we hope for an approval decision from the FDA in roughly mid-2019.

Glucagon, made in the pancreas, is responsible for increasing blood sugar levels by telling the body to release sugar stored in the liver into the bloodstream. In type 1 diabetes, glucagon is impaired (like insulin), leaving no defense against extreme lows. In situations where someone is unresponsive – e.g., seizure or in a coma – administering glucagon will quickly raise blood sugar levels. Current glucagon kits require mixing glucagon powder and liquid together during an emergency which is prone to error and scary for caregivers.

In contrast to conventional kits, Xeris' G-Pen contains a modified formulation of glucagon that is stable in liquid form and does not require mixing. Recent studies have demonstrated the potential for safer use and improved response time in both adults and children:

- A recent study found that an impressive 99% of participants successfully administered a full glucagon dose with the G-Pen, compared to only 6% - 31% of those using standard glucagon kits.
- In a [study presented at ADA 2018](#), 80 adults with type 1 diabetes were treated for severe hypoglycemia; 100% of individuals treated with the G-Pen recovered within 30 minutes, with no significant negative side effects reported.
- [An additional study at ADA 2018](#) showed that the G-Pen was effective in a group of 31 children (ages 2-17 years old) with type 1 diabetes.

The diaTribe Foundation has written about Xeris' glucagon since their early development announcements in [2012](#). Following the recent [submission of Lilly's nasal glucagon](#) for severe hypoglycemia, this is the second FDA submission for a next-gen improved glucagon. Approval decisions on Lilly's nasal glucagon in both the US and Europe are running on a similar timeline: we should hopefully hear in roughly mid-2019. Another improved glucagon rescue product that is currently under development is Zealand Pharma's autoinjector pen. Zealand's pen also uses a stable liquid glucagon, similarly eliminating the need to mix powder with liquid before injecting. But Zealand plans to submit its glucagon to the FDA in the second half of 2019, putting it about a year behind.

Beyond glucagon rescue pens for severe hypoglycemia, both Zealand and Xeris are working on pumpable glucagon that can be administered alongside insulin as part of an automated dual-hormone closed-loop system (Bionic Pancreas). Zealand and Beta Bionics have begun early studies and expect to start an insulin-glucagon clinical trial in late 2019/early 2020. Xeris' glucagon is also in an [early closed-loop study in Oregon](#).