B

THE BASICS

DIABETES AND CARBOHYDRATE COUNTING

Medtronic

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DIABETES AND CARBOHYDRATE COUNTING

Section 1: Diabetes

The human body has an amazing ability to maintain tight glucose control when someone does not have diabetes. This tight control is possible because the pancreas and the liver work as a team to make sure that the right balance of glucose and insulin is in the body at all times. When you have diabetes, the body is unable to maintain this balance. Your insulin pump is a tool that can help make the task of balancing glucose and insulin easier.

Knowing how your body kept this in balance before you had diabetes will help you use your pump most like the way your pancreas would deliver insulin if it could. The following pages explain how this worked.

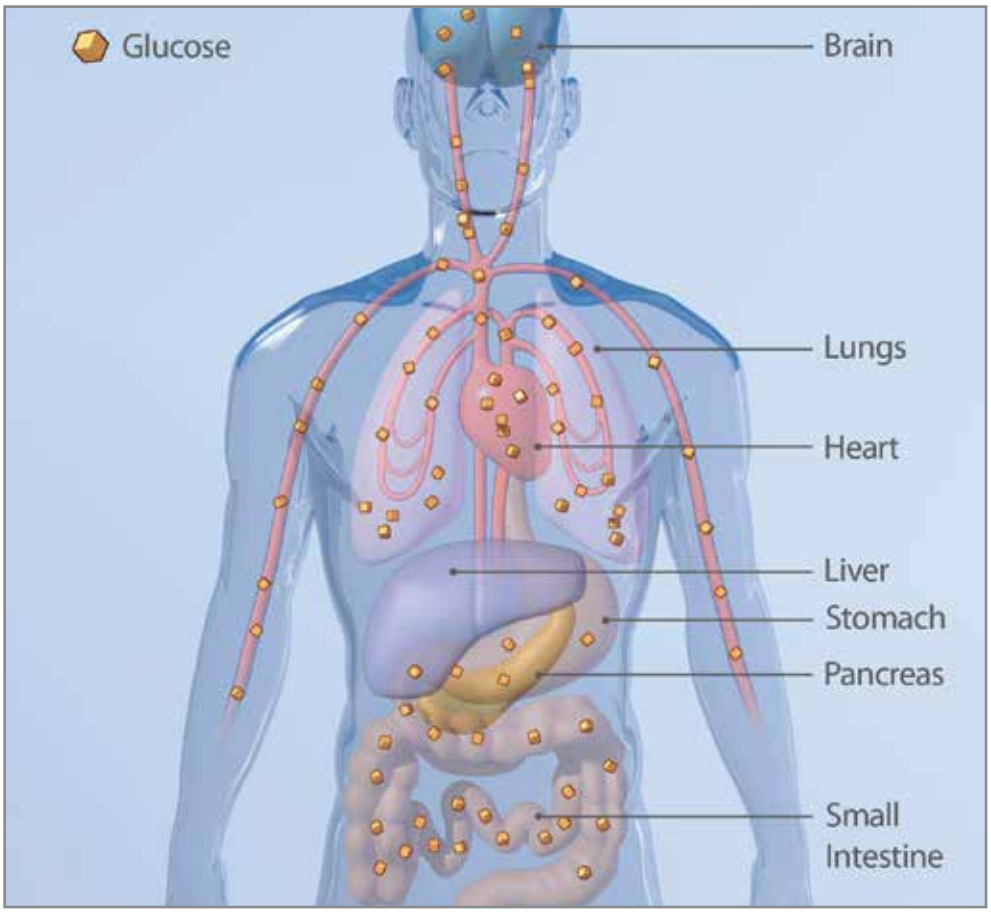
LIFE WITH A PUMP

Using an insulin pump...

When Laura started using an insulin pump, her life changed. She could eat when she wanted to and not when she had to. She could adjust the amount of insulin she was getting at any time to better match the amount of insulin her body actually needed. Managing her diabetes became a whole lot easier.

Glucose – The Body's Fuel

Glucose is a type of sugar your body uses for energy. Energy is needed for every single movement your body makes. In fact, energy is needed for your heart to beat, your lungs to breathe, and your brain to think. Your body is made up of millions of cells, and every cell uses glucose for energy. This is why it is important for you to have a certain amount of glucose in your body at all times, even while sleeping.

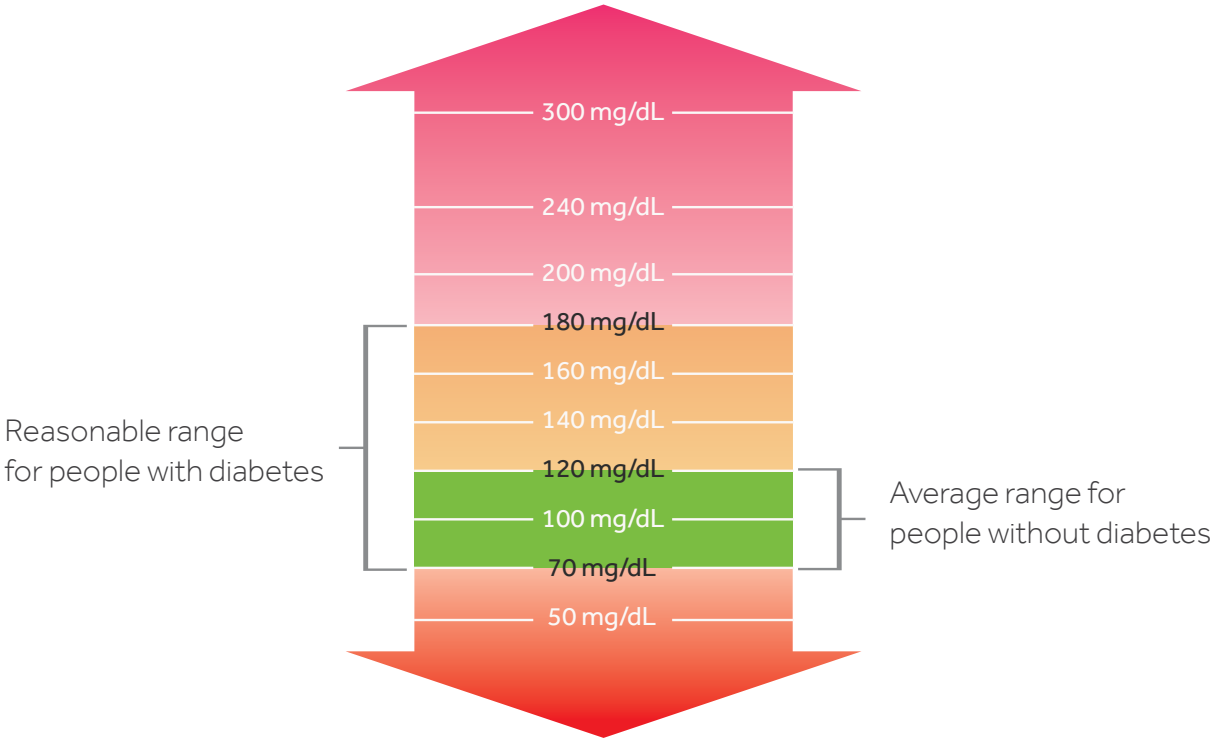


Every cell in the body uses glucose for energy.

Glucose is the fuel your body uses for energy. Just like a car needs gas to run, the body needs glucose to work.

Glucose in the Blood

When a person does not have diabetes, the body's glucose levels are usually between 70 mg/dL to 120 mg/dL. When you have diabetes, it is very difficult to keep glucose levels within such a tight range. It is important, though to keep them within a good range while trying to keep from having a lot of highs and lows. Your healthcare professional will help you decide the best glucose range for you.



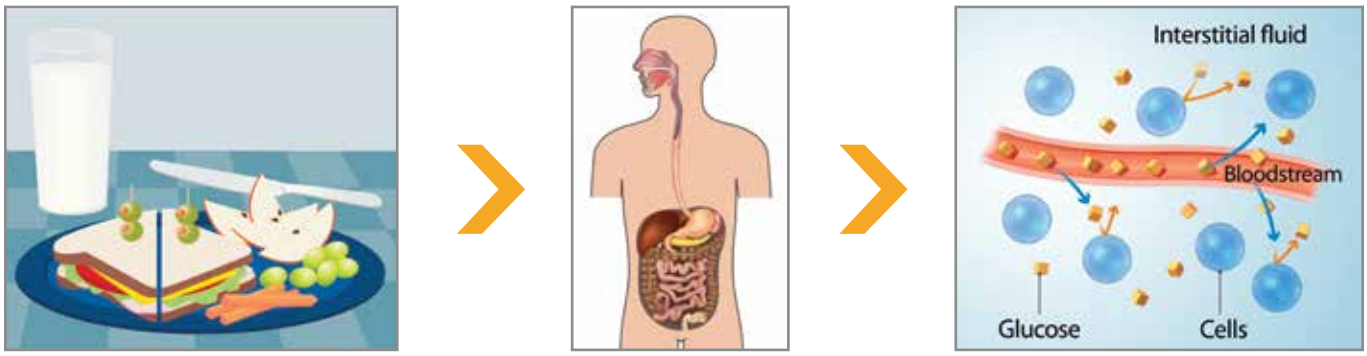
ADA Recommendations:	Pre-Meal	80-130 mg/dL	Post-Meal	<180 mg/dL
AACE Recommendations:	Pre-Meal	<110 mg/dL	Post-Meal	<140 mg/dL

ADA: American Diabetes Association
AACE: American Association of Clinical Endocrinologists

How the Body Gets Glucose

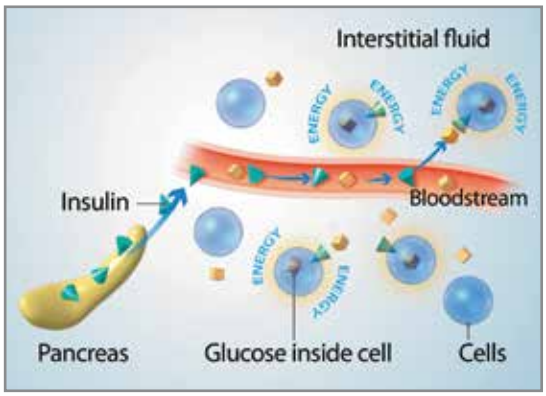
Glucose primarily comes from foods that contain carbohydrate (sugar and starches). When you eat, food is broken down into nutrients such as glucose. Nutrients are absorbed from your stomach and small intestine (digestive tract) into your bloodstream. The bloodstream carries glucose and other nutrients through your body, so you will be healthy and have energy.

Within minutes after eating and while food is digesting, glucose slowly moves from the digestive tract into the bloodstream. Next it passes from the bloodstream into fluid surrounding the cells (called interstitial fluid). From there it's available for cells to use for energy.



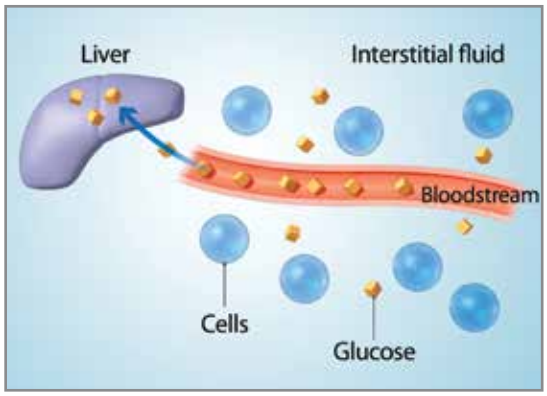
Food › Mouth › Digestive System › Blood › Interstitial Fluid › Cells

However, the cell cannot use the glucose without insulin. Insulin allows glucose to move into the cells by attaching to a special place on the cell wall called the receptor (or binding) site. This is why insulin is said to be the "key" that unlocks the cell.



When insulin attaches to the cell wall, glucose can move into the cell.

Extra glucose that is not needed after eating is stored in the liver. This stored glucose becomes extra fuel that is released back into the bloodstream when it is needed. This might happen when extra energy is needed for exercise, or during the night when you go a long time without eating.



Just like a car stores extra gas in its tank, your body stores extra fuel in your liver.

Key Learning Points

- Glucose (sugar) is your body's main source of energy.
- Your body gets most of the glucose it uses from foods that contain carbohydrate (starches and sugars).
- Glucose cannot provide energy for your body until it moves into the cell.
- Insulin is needed to move the glucose into the cells.
- Glucose that is not needed right away is stored in the liver.

Review Questions (circle the best answer)

1. **The body's main source of fuel or energy is:**

   A protein

   B fat

   C glucose

2. **How does the body get most of the glucose it uses for energy?**

   A from foods that have carbohydrate

   B from fat

   C from water

3. **The body must have insulin in order for glucose to move into the cells.**

   A True

   B False

4. **Some of the glucose that is not used right away after eating is stored in the:**

   A heart

   B liver

   C stomach

5. **Glucose must move inside the cell before it can be used for _____.**

   A water

   B heat

   C energy

6. **Glucose cannot pass into the cell and provide energy for your body without insulin.**

   A True

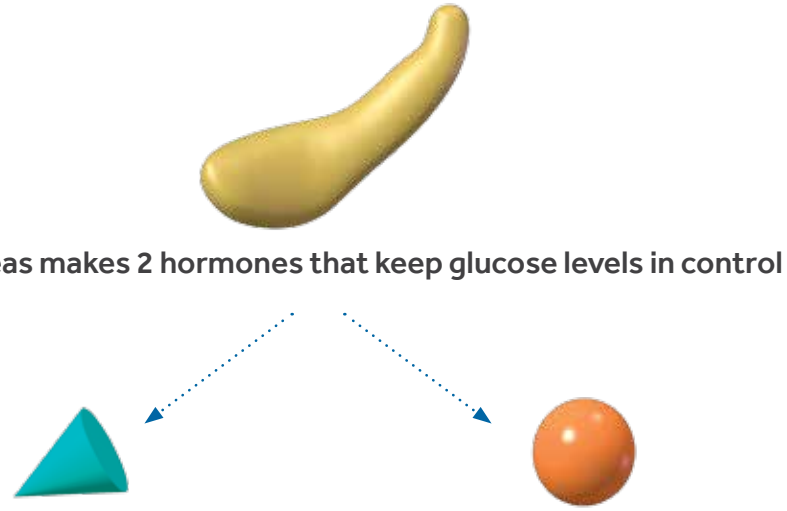
   B False

Answers: 1. C **2.** A **3.** A **4.** B **5.** C **6.** A

Glucose Levels – A Careful Balancing Act

Before you developed diabetes, your body always kept the right amount of glucose in your blood. Your blood sugar rarely moved out of the average range (70 mg/dL to 120 mg/dL). This was done by your pancreas and liver working together to keep your insulin and glucose levels where they needed to be. If there was too much glucose in your blood, your pancreas would tell your liver to store the extra glucose. If there wasn't enough glucose in the blood, your pancreas would tell your liver to release some.

The pancreas communicates with the liver by making two hormones, **insulin** and **glucagon**. Insulin lowers glucose levels and glucagon raises them. Let's take a closer look at each of these.



The pancreas makes 2 hormones that keep glucose levels in control

Insulin:
Helps lower glucose levels

Glucagon:
Helps raise glucose levels

Insulin

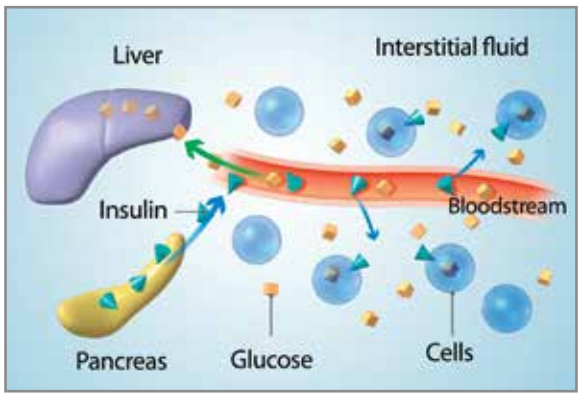
All people, with or without diabetes, must always have some insulin to keep glucose levels from getting too high. When you didn't have diabetes, your pancreas was making insulin almost all the time. The amount of insulin it made depended on how much glucose was in your body. Your pancreas kept a close watch on the amount of glucose in your blood and made exactly the right amount of insulin needed to keep your blood glucose levels in range.

When there were small amounts of glucose, such as between meals or during sleep, your pancreas made small amounts of insulin (called basal insulin). When there were large amounts of glucose, such as after meals, your pancreas made larger amounts of insulin (called bolus insulin).

Insulin lowers blood glucose levels in two ways.

1. It allows glucose to travel from the blood into the cell where it can be used as energy.
2. It sends a signal to the liver to move any extra glucose in the blood into the liver to be stored.

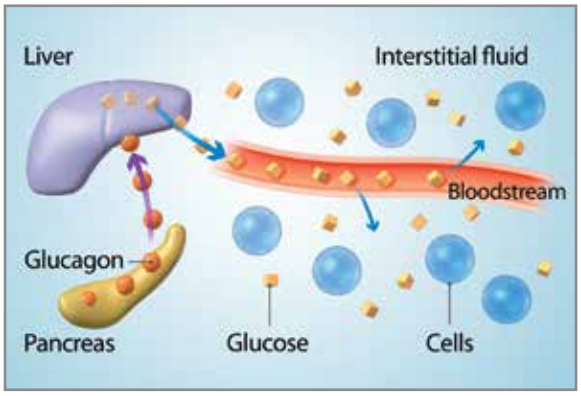
Both of these help keep blood sugar levels from getting too high.



Insulin lowers glucose by moving glucose into the cells and telling the liver to store any extra glucose that isn't needed at that time.

Glucagon

You can think of glucagon as the opposite of insulin. When a healthy pancreas senses that glucose levels are dropping too low, it starts making glucagon. While insulin tells the liver to store extra glucose, glucagon tells the liver to move some of the glucose it has stored into the blood. As the glucose enters the bloodstream, blood glucose levels begin to rise and the pancreas makes less glucagon.

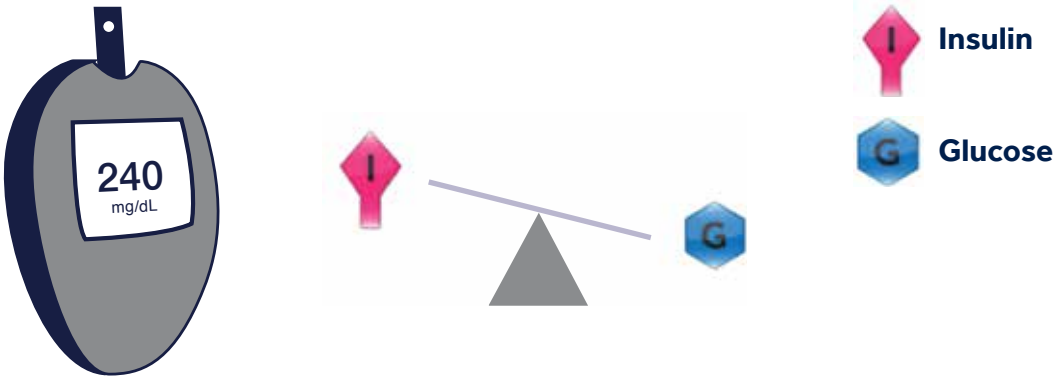


Glucagon alerts the liver to release stored glucose.

When You Have Diabetes

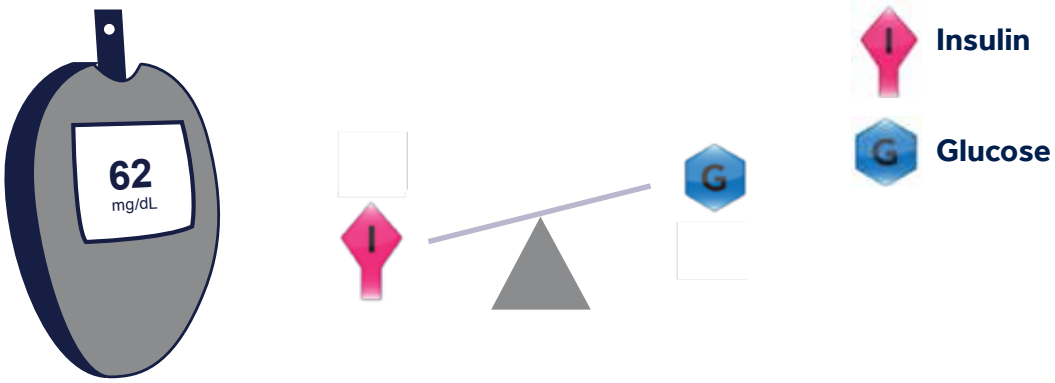
When you have diabetes, your body cannot automatically keep blood glucose and insulin levels in balance. Your pancreas is either not making any insulin (type 1), or it is not making enough (type 2) to keep this in balance. You must take insulin either by injection (shots) or an insulin pump and balance the insulin you take with your food and activity levels.

High glucose: If there is not enough insulin, glucose stays in the blood and interstitial fluid. This causes glucose levels to be high.



Too much glucose not enough insulin → High glucose level → More insulin needed

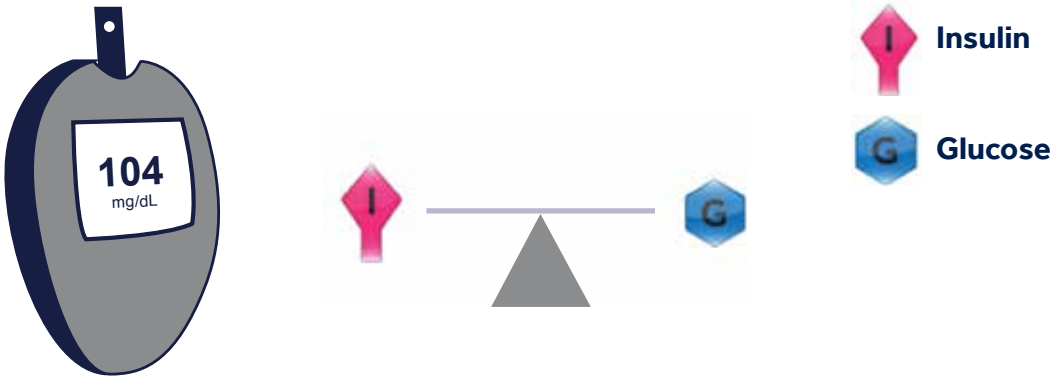
Low glucose: When too much insulin has been taken and there is not enough glucose, glucose levels become too low. The insulin you take through the pump or syringe is not able to tell the liver to move extra stored glucose back into the bloodstream. Therefore, when glucose levels are low, you must take in sugar to increase the amount of glucose in your blood.



Too much insulin not enough glucose → Low glucose level → Need to eat or drink sugar

If glucose is so low that you cannot eat or drink sugar, an injection of glucagon is used. Remember, glucagon is the hormone that causes the liver to move stored glucose into the bloodstream. So with the help of a glucagon injection, glucose levels will increase.

Normal glucose: The goal when you have diabetes is to take the right amount of insulin to balance the amount of glucose in your body. This can be difficult to do sometimes, but your insulin pump will help make it easier for you. The next section will discuss some of the ways the pump can help.



Insulin and glucose in balance → Glucose levels in normal range

Key Learning Points

A healthy pancreas makes two hormones that keep glucose levels in control, insulin and glucagon. It increases and decreases the amount of these hormones based upon the amount of glucose in the blood.

- Insulin:
  - causes glucose to move out of blood and into the cells.
  - tells the liver to store any extra glucose that is not needed at that time.

Glucagon tells the liver to move stored glucose back into the bloodstream to raise glucose levels.

When you have diabetes and your body is not producing insulin, this balancing act does not work properly.

- Insulin cannot be released when glucose levels are high. You must take by injection (shot) or insulin pump.
- There is no way to tell the liver to release stored glucose into the bloodstream so you must eat or drink sugar to increase your glucose levels.

Review Questions (circle the best answer)

1. **The pancreas makes two hormones that help control glucose levels. One hormone is insulin and the other is _____.**

   A estrogen

   B glucagon

   C growth hormone

2. **Insulin helps to _____ glucose levels.**

   A raise

   B lower

3. **Glucagon helps to _____ glucose levels by telling the liver to release stored glucose into the blood.**

   A raise

   B lower

4. **Insulin that is injected or given through a pump is not able to tell the liver to release stored glucose/sugar, so you must always eat or drink something with sugar if your glucose gets low.**

   A True

   B False

5. **When your body does not have enough insulin, glucose cannot move into the cells and stays in the blood and interstitial fluid. This causes glucose levels to become high.**

   A True

   B False

Answers: 1. B **2.** B **3.** A **4.** A **5.** A

Insulin Delivery Using a Pump

As you have learned, your body always needs glucose for energy, even when you sleep. This means that insulin is always needed so that the glucose can be moved into the cell and used for energy. There are times when you don't need a lot of insulin (during the night and between meals), and other times when you need more (when you eat). When a person has diabetes, it is best to take insulin as close as possible to the way the pancreas delivers it. An insulin pump comes closer to delivering insulin the way a pancreas does than any other delivery method. Let's discuss how this is done.

Rapid-acting Insulin

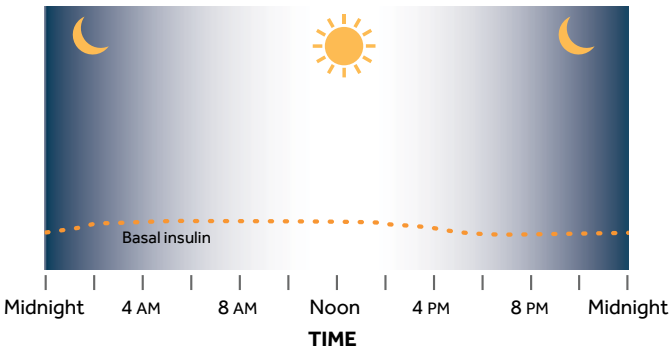
The pump only uses rapid-acting insulin. No long-acting insulin is needed when you are using an insulin pump. Rapid-acting insulin is the fastest acting insulin available, meaning it begins to lower glucose levels shortly after you take it. It also tends to be more consistent in the way that it works in the body. Rapid-acting insulin:

- starts working within 10 to 15 minutes after it is given
- lowers glucose the most 1 to 1½ hours after it is given
- stops lowering glucose levels within 4 to 5 hours after it is given

Rapid-acting insulin is delivered in two ways through the insulin pump – as basal insulin and as bolus insulin. We will discuss each of these now.

Basal Insulin

Basal insulin is often thought of as "background" insulin. You can also think of basal as the base, or baseline amount. As you know, a healthy pancreas releases insulin every few minutes, 24 hours a day so that your body has the energy it needs at all times. Much like that, the pump gives you small amounts of rapid-acting insulin 24 hours a day. This is your basal insulin. It provides the insulin you need between meals and through the night.



The pump delivers small amounts of basal insulin throughout each hour, 24 hours a day.

The amount of basal insulin the pump delivers can be set to match your body's insulin needs during the day and night. For example, you may need less basal insulin during the night than you do during the day. Or you may need more insulin during the early morning hours than the afternoon. In any case, your pump can be set to deliver basal insulin at different rates and times to match your needs. Your healthcare professional will decide how much basal insulin you will need so your pump can be set to give you that amount.

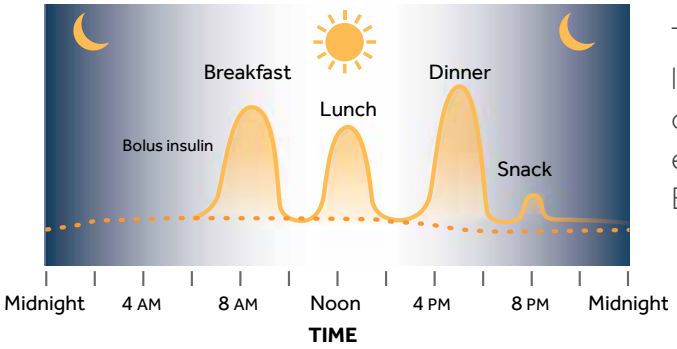
You even have the ability to temporarily adjust the amount of basal insulin you are getting for things like exercise when the amount of insulin you need may change. You will learn more about the flexibility the pump provides during your in-person training.

The pump delivers basal insulin 24 hours a day and can be set to match your body's insulin needs.

Because the rapid-acting insulin you are using doesn't stay in your body for long, your glucose levels can rise quickly if basal insulin is stopped or if your pump becomes disconnected without you knowing it. Therefore, it is important to do regular glucose checks and never ignore a high glucose reading. You will learn more about this in the **Book 1, Before Training**.

Bolus Insulin

A bolus is a large dose of insulin given when you eat food that contains carbohydrate. Some people remember bolus by thinking of a 'bowl' of food since it is taken when they eat. A bolus is also given when you have a high blood glucose (BG) level.



The pump lets you give larger (bolus) amounts of insulin when you are eating or when your BG is high.

While the pump gives you basal insulin on its own throughout the day and night, you will decide when bolus insulin is needed and the amount that is given. You will give boluses each time you eat a meal or have a snack, and between meals if your glucose level is too high.

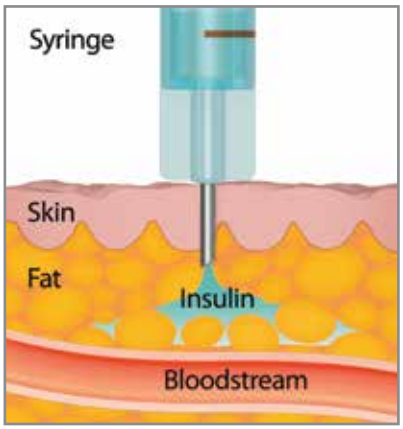
If you use the Bolus Wizard® feature on your pump, you will be able to enter your current BG reading and the grams of carbohydrate you are eating. Your pump will then use the settings that you have entered to calculate the amount of insulin you need. You will learn more about these settings and learn how to give a bolus during your in-person training.

You tell the pump to give a bolus of insulin when you eat or need to correct a high BG.

This delivery of insulin in very small amounts consistently throughout the day gives you more flexibility. You can be active when you want, eat when you are hungry or delay a meal if you're not. You might, for example, have a light lunch and then want a snack later. Giving a bolus with the pump lets you give the insulin you need each time you eat without having to give another shot. We are excited that you will soon begin pump therapy and be able to have the flexibility and control that it gives you. .

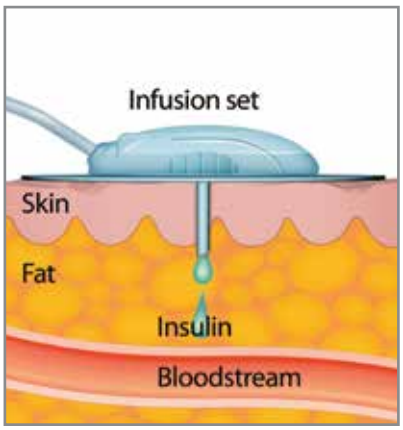
How Pump Therapy Compares to Injections

When taking injections, more than one kind of insulin is needed. In order to provide the basal or background insulin that your body needs, an intermediate or long-acting insulin is taken. These insulins are taken either once or twice a day, but they don't start working right away. They deposit or 'pool' under the skin and are then slowly absorbed into the bloodstream. Depending on the insulin used, it will take between 12 and 24 hours for it all to absorb. This means there is background insulin available, but exactly how much and when the insulin will be working can vary from one day to the next. This can cause high and low blood sugars that you don't expect and make it very hard to keep glucose levels within a good range.



Intermediate and long-acting insulin "pool" under the skin.

On the other hand, when using the pump, the background insulin is not given all at once. Remember it gives you small amounts of rapid-acting insulin throughout each hour. This type of insulin is absorbed into the bloodstream right away, so you can better know what to expect from day to day.



The pump delivers tiny amounts of insulin each hour.

It is because of this that you can set the pump to give different amounts of insulin at different times, and adjust for changes in your daily routine. This ability to adjust insulin to your body's needs cannot be done with injections and can help you achieve better diabetes control.

Key Learning Points

- Insulin pumps use only rapid-acting insulin (U100).
- You can expect rapid-acting insulin to:
  - start working within 10 to 15 minutes after it is given.
  - lower glucose the most 1 to 1½ hours after it is delivered.
  - stop lowering glucose levels within 4 to 5 hours after it is given.
- Insulin pumps deliver basal and bolus insulin much like a healthy pancreas.
- The pump delivers basal insulin in tiny amounts each hour.
- Basal insulin can be set to give you different amounts throughout the day and night.
- A bolus of insulin is given for two reasons:
  - to cover foods that contain carbohydrate.
  - to correct high glucose levels.

Review Questions (circle the best answer)

1. **What type of insulin is used for insulin pump therapy?**

   A Long-acting insulin

   B Rapid-acting (U100) insulin

   C Basal insulin

2. **Rapid-acting insulin enters the blood and begins to work within 10 to 15 minutes after given.**

   A True

   B False

3. **Rapid-acting insulin's ability to lower glucose levels is typically gone after how many hours?**

   A 9 to 10 hours

   B 4 to 5 hours

4. **Basal insulin can be set to give you different amounts to meet your insulin needs.**

   A True

   B False

5. **A bolus is given when food is eaten or when BG level is high.**

   A True

   B False

Answers: 1. B **2.** A **3.** B **4.** A **5.** A

Section 2: Carbohydrate Counting

Carbohydrate counting, or carb counting, is important to good diabetes control. It helps you understand which foods will affect your blood glucose (sugar) levels so that you can give the right amount of insulin for the food you eat.

Why Count Carbs?

There are three main nutrients in food: protein, fat and carbohydrate but **the main nutrient in food that affects blood glucose levels is carbohydrate.**

When you know which foods contain carbohydrate and the amount of carbohydrate you are eating, you can match the amount of insulin you need to the carbohydrate that you eat. This helps to keep blood glucose levels from going too high or too low.

More carbs eaten → More glucose in blood → More insulin needed

Less carbs eaten → Less glucose in blood → Less insulin needed

Carb counting, especially when using the pump, gives you freedom when making food choices while keeping glucose levels under good control.

Your healthcare professional will help you determine your correct insulin dose based on how much carbohydrate you are eating.

Carbohydrate Counting Tools

One of the most important parts of carb counting is knowing how much of a certain food you are eating. You can use:

Measuring Cups and Spoons

Measuring cups and spoons and a food scale are helpful tools for practice. Measuring helps give you a good visual idea of how different serving sizes look like on a plate, bowl or glass which helps you to better estimate when you are not at home.

Your Hands

Your hands can also help you estimate portion sizes, especially when you are away from home.

FIST	PALM	HANDFUL	THUMB	THUMB TIP
1 cup	2 oz	1/2 cup	1 oz	1 tsp

Other Resources

There are other books, apps and online resources that can help you as well. Your healthcare professional may suggest a book or a specific tool that they prefer. Here are a few resources that you may find helpful:

- The Calorie King® Calorie Fat and Carbohydrate Counter by Allan Borushek. Can be found online at **www.CalorieKing.com**.
- American Diabetes Association Guide to Healthy Restaurant Eating: What to eat in America's most popular chain restaurants by Hope Warshaw.
- More American Diabetes Association resources can be found at: **http://store.diabetes.org**.
- Calorie Counter – MyFitnessPal app. MyFitnessPal, Inc.

Methods for Carbohydrate Counting

There are different ways to count carbohydrates – we will look at three. You may use one or a combination of the different methods.

Estimating Carbohydrates – 15 gram servings

Estimating carbs is based on serving sizes that have about 15 grams of carbohydrate. This method can be helpful when you are, for example, eating at a friend's house where no food labels or nutrition information is available.

Here you can see:

- what foods contain carbohydrate.
- the amount that equals about 15 grams of carbohydrate.

Starches

1 slice bread	6 crackers	6" tortilla
¾ cup cereal	1/3 cup rice or pasta	¼ bagel

½ cup starchy vegetables, like corn, peas, beans, legumes

Fruits and fruit juices

½ cup juice	1 small piece fruit	½ banana

Milk and yogurt

1 cup milk (skim, lowfat, or whole)

6-8 oz of light yogurt

Sweets, desserts and other carbohydrate

2" unfrosted cake	2 small cookies
1 tbsp honey, syrup or jelly	½ cup ice cream or pudding

Don't forget sweetened or sports drinks and candy.

For a more complete list of foods and 15 gram servings, see page 29.

Nutrition Labels

Reading food labels is very helpful when you are carb counting. You will find important information on a food label. When counting carbs, there are only two things that you should focus on:

1. Serving Size:

First check the serving size shown on the label. You may be eating more than the amount listed as the serving size. For example, if the serving size is ½ cup and you are eating 1 cup, then you are eating two servings.

2. Total Carbohydrates:

The total carbohydrate is in bold letters on all labels. You will always want to consider the total carb to get the complete picture of the effect on your blood sugar.

So for this particular food, if you eat ½ cup, you will be having 42 grams of carbohydrate. If you are eating a cup, you are having twice as many – 84 grams.

Nutrition Facts

Serving Size: 1/2 cup (56g) dry
Servings per container: 8

Amount Per Serving	
Calories 210	Fat Cal. 10
	% Daily Value
Total Fat 1g	
Saturated Fat 0g	
Polyunsaturated Fat 0.5g	
Monounsaturated Fat 0g	
Trans Fat 0.5g	
Cholesterol 0mg	
Sodium 0mg	**0%**
Total Carbohydrate 42g	**14%**
Dietary Fiber 2g	**8%**
Sugars 3g	
Other carbohydrate 37g	
Protein 7g	
Vitamin A	**0 %**
Vitamin C	**0 %**
Calcium	**0 %**
Iron	**10 %**

Sugar free does not always mean carbohydrate free. Always check the label for Total Carbohydrate.

Meal Size

If you are not counting grams of carbohydrate, you may be estimating the amount you are eating based on your meal size. Below you will see examples of meals sizes that would be used.

Snack = about 15 grams carb

Small piece of fruit

Small Meal = about 30 grams carb

Grilled chicken, green beans, 1 small potato (1 cup)

You can see the plate divided into 3 sections:

- the large section is non-starchy vegetables with little carbohydrate.
- one smaller section is your protein.
- the other smaller section is starch/grain.

A plate that looks like this will typically be around 30 grams of carb.

+

Medium Meal = 45 grams carb

Salmon, lettuce salad, 2/3 cup rice, 1 cup milk

Large Meal = 60 grams carb

2 slices large thin crust pizza

Extra Large Meal = 75 grams carb

3 tortilla shells, ½ cup beans, 1/3 cup rice

Write some of your favorite meals here. Have your healthcare professional help determine the meal size.

Review Questions

1. Look at the food below. Circle the foods that contain carbohydrate:

Corn	Potato	Rice	Crackers
Sugar-free cookies	Honey	Bread	Diet soda
Skim milk	Coffee (black)	Tuna	Cheese
Green beans	Turkey	Cereal	Popcorn
Apple juice	Pinto beans	Orange	Lemonade
French fries	Margarine	Yogurt	Broccoli

2. Put a T next to each True statement :

_____ You should always try to avoid eating carbohydrates.

_____ Selecting healthy carbohydrates and being careful about portion sizes will provide your body with valuable nutrients.

_____ The more carbs you eat, the more insulin you need.

3. Which of these are tools used for Carb counting?

A Estimating Carbs - 15 gram servings

B Nutrition label

C Hand guide

D Measuring cups

E All of the above

Answers: 1. Corn, Potato, Rice, Crackers, Sugar-free cookies, Honey, Bread, Skim milk, Green beans, Cereal, Popcorn, Apple juice, Pinto beans, Orange, Lemonade, French fries, Yogurt, Broccoli **2.** Selecting healthy carbohydrates and being careful about portion sizes will provide your body with valuable nutrients. The more carbs you eat, the more insulin you need. **3.** E

4. Circle the 2 things you should focus on first when using a nutrition label to count carbs?

A Fiber

B Sodium

C Serving Size

D Total Carbohydrates

5. Use the label to answer the following questions:

One serving equals:

A 1 package

B 2 bars

C 6 bars

2 bars = _____ grams of carb

1 bar = _____ grams of carb

3 bars = _____ grams of carb

Nutrition Facts

Serving Size 2 bars (42g)
Servings Per Container 6

Amount Per Serving	
Calories 160	**Fat Cal. 50**
	% Daily Value*
Total Fat 6g	**9%**
Saturated Fat 0.5g	**3%**
Trans Fat 0g	
Cholesterol 0mg	**0%**
Sodium 400mg	**6%**
Total Carbohydrate 36g	**9%**
Dietary Fiber 2g	**8%**
Sugars 11g	
Protein 3g	

Answers: 4. C and D **5.** B, 36, 18, 54

Estimating Carbohydrates – 15 gram servings

This list shows the serving sizes of various foods that contain 15 grams of carbohydrate. You can look for the foods you commonly eat and become familiar with the serving size that equals 15 grams.

Starches

Each serving listed contains about 15 grams of carbohydrate.

Bagel	¼ (1 oz)
Biscuit, 2½" across	1
Bread (white, wheat, rye)	1 slice
Corn bread, 2" square	1
Croutons	1 cup
English muffin	½
Hamburger / hot dog bun	½ bun
Pancake, 4" across	1
Pita, 6" across	½
Popcorn	3 cups
Roll, plain, small	1
Snack chips (potato, tortilla)	9 – 13
Stuffing, prepared	⅓ cup
Tortilla, 6" across	1
Waffle, 4" across	1

Other Starches

Each serving listed contains about 15 grams of carbohydrate.

Brownie, 2" square	1
Cake, unfrosted, 2" square	1
Cake, frosted, 2" square	½
Cookie, small	2
Gelatin, regular	½ cup
Honey	1 tbsp
Jam or jelly, regular	1 tbsp
Pudding, regular	¼ cup
Salad dressing, fat free	¼ cup
Sherbet, sorbet	¼ cup
Syrup, light	2 tbsp

Starchy Vegetables

Each serving listed contains about 15 grams of carbohydrate.

Baked beans	⅓ cup
Beans (garbanzo, pinto, black, white)	½ cup
Corn	½ cup
Corn on the cob, 6" ear	1
Lentils	½ cup
Lima beans	⅔ cup
Mixed vegetables	1 cup
Peas (green, split, black-eyed)	½ cup
Potato, 3 oz	1
Potato, mashed	½ cup
Squash, winter	1 cup
Yam/sweet potato	½ cup

Combination Foods

Each serving listed contains about 15 grams of carbohydrate.

Chili with beans	½ cup
Soup (cream, broth)	1 cup
Split pea soup	½ cup
Thin crust pizza, ⅛ of 12 in	1 slice
Macaroni and cheese	½ cup
Lasagna, 4" x 4"	1 cup

Fruit Juice

Each serving listed contains about 15 grams of carbohydrate.

Apple, grapefruit, orange and pineapple	½ cup
Cranberry, grape and prune	⅓ cup
Cranberry juice cocktail, reduced calorie	1 cup

Cereals and Grains

Each serving listed contains about 15 grams of carbohydrate.

Bran cereals	⅓ cup
Cereals, cooked	½ cup
Cereals, unsweetened, ready-to-eat	¾ cup
Granola, low fat	¼ cup
Grits/oats, cooked	½ cup
Pasta	⅓ cup
Puffed cereal	1½ cups
Rice	⅓ cup

Fruit

Each serving listed contains about 15 grams of carbohydrate.

Apple, small	1 (4 oz)
Apricots, fresh	4 (5½ oz)
Banana, small	1 (4 oz)
Blackberries/blueberries	¾ cup
Cantaloupe/honeydew, cubes	1 cup
Cherries	12 (3 oz)
Fruit, canned	½ cup
Grapefruit, large	½ (11 oz)
Grapes, small	17 (3 oz)
Kiwi	1 (3½ oz)
Orange, small	1 (6½ oz)
Peach, medium	1 (4 oz)
Pear, large	½ (4 oz)
Pineapple, fresh	¾ cup
Plums, small	2 (5 oz)
Raisins	2 tbsp
Raspberries	1 cup
Strawberries, whole	1¼ cups
Watermelon	1¼ cups

Adapted from: *Basic Carbohydrate Counting* [brochure], American Diabetes Association, Inc. and American Dietetic Association; 2003. Kulkarni K. Warshaw HS. Why count carbs? In: Landrum S, ed. *Complete Guide to Carb Counting*. 2nd ed. Alexandria. VA. American Diabetes Association; 2004: 211-255.

Milk

Each serving listed contains about 12 grams of carbohydrate.

Milk:	
Fat free, 1%, 2%, or whole	1 cup
Buttermilk	1 cup
Evaporated milk	½ cup
Yogurt:	
Flavored, fat-free, light	⅔ cup (6 oz)
Plain, fat-free	⅔ cup (6 oz)
Plain	cup

Non-starchy vegetables

One cup raw or ½ cup cooked serving of vegetables contains about 5 grams of carbohydrate.

Artichoke
Asparagus
Beans (green, wax)
Broccoli
Cabbage
Carrots
Cauliflower
Celery
Cucumber
Greens (collard, mustard)
Mushroom
Okra
Onions
Pea pods
Peppers
Salad greens (lettuce)
Spinach
Summer squash
Tomato/tomato juice
Tomato/vegetable juice
Zucchini

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