

# Diabetes Update 2014


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October 24, 2014

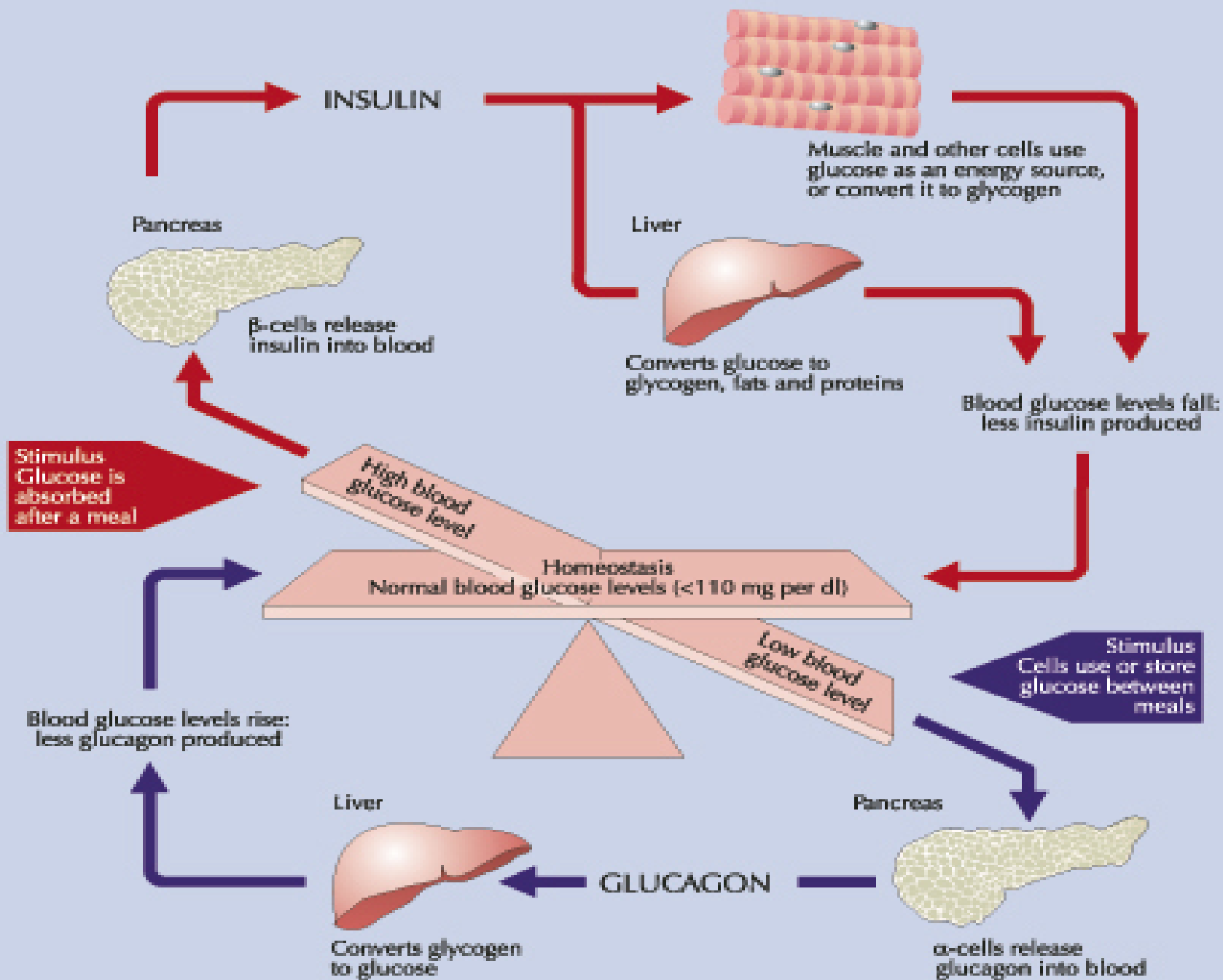
# What is Diabetes?

Diabetes mellitus is a metabolic disease characterized by hyperglycemia. This is a result of inadequate insulin secretion, insulin action, or both.\*

\*American Diabetes Association: Clinical Practice Recommendations 2004  
*Report of the Expert Committee on the Diagnosis and Classification of Diabetes Mellitus*



# **PATHOPHYSIOLOGY OF GLUCOSE REGULATION**





# Normal Blood Glucose Control

In people without diabetes, **glucose** stays in a healthy range because...

Insulin is released at the right times and in the right amounts



Insulin helps glucose enter cells

# High Blood Glucose (Hyperglycemia)

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In diabetes, blood glucose builds up for several possible reasons...

Too little insulin is made

Cells can't use insulin well

Liver releases too much glucose



# Diagnosing Diabetes

## Blood Sugar Levels

	No Diabetes	Pre-Diabetes	Diabetes Diagnosis
<b>Fasting</b>	70 - 99	100 - 125	126 or higher
<b>2 hour Oral Glucose Tolerance test</b>	70 - 145	146 - 199	200 or higher
<b>A1c</b>	5.6% or lower	5.7% - 6.4%	6.5% or higher

# Symptoms of Diabetes

## Are due to high blood sugars

- Excessive thirst
- Frequent urination
- Blurry vision
- Numbness or tingling in hands or feet
- Feeling tired most of the time, especially after eating
- More infections than usual
- Wounds that are slow to heal

# Two Main Types of Diabetes

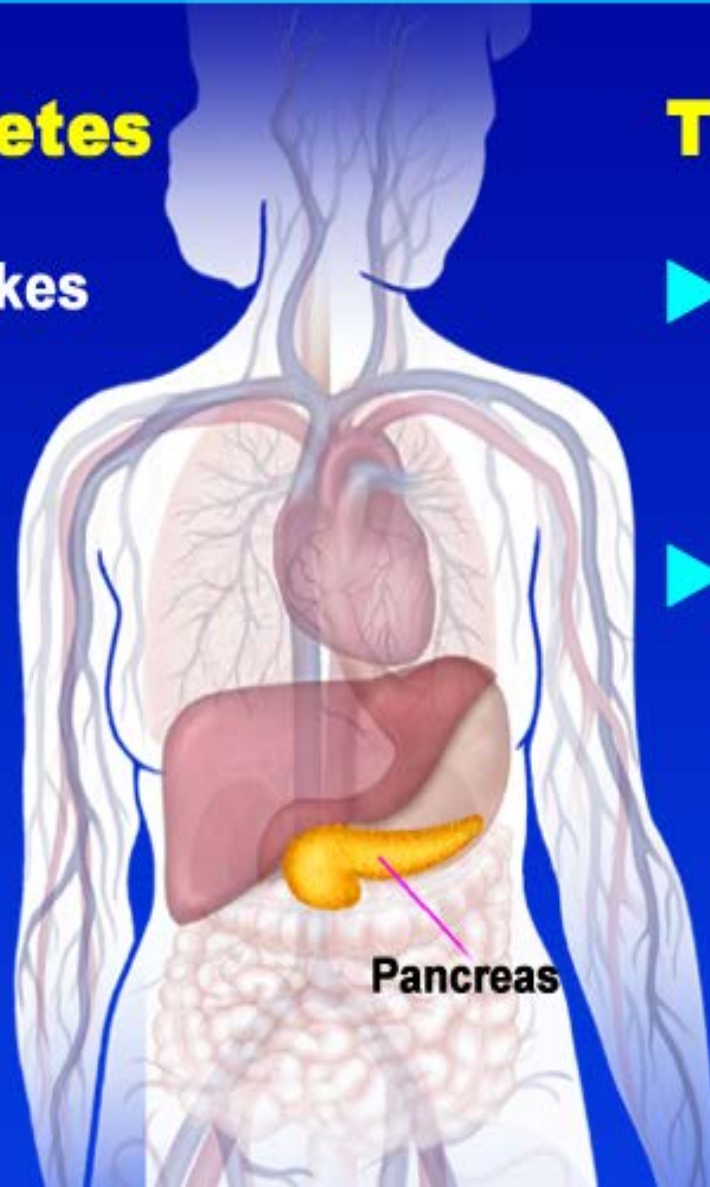
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## Type 1 Diabetes

- ▶ Pancreas makes too little or no insulin

## Type 2 Diabetes

- ▶ Cells do not use insulin well (insulin resistance)
- ▶ Ability for pancreas to make insulin decreases over time





# Type 1 Diabetes

- ▶ 1 in 10 people with diabetes have type 1
- ▶ Most people are under age 20 when diagnosed
- ▶ Body can no longer make insulin



Insulin is **always** needed for treatment



# Type 2 Diabetes

- ▶ **9 in 10 people with diabetes have type 2**
- ▶ **Most people are over age 40 when diagnosed, but Type 2 is becoming more common in children and teens**
- ▶ **Type 2 is more likely in people who:**
  - **Are overweight**
  - **Belong to certain ethnic groups**
  - **Have a family history of type 2 diabetes**



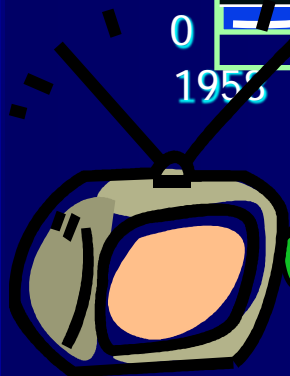
# Diabetes in the US

29 million (9.3%) - 2012

20 million in 2006

18,000,000

Persons With Diagnosed Diabetes (millions)



ber 1995 (update 2006), NIDDK publication NIH 96-1468.  
Kenny SJ et al. In: *Diabetes in America*. 2nd ed. 1995:47-67.



# Diabetes in New Mexico\*

## 2010

- 130,000 New Mexicans diagnosed
  - 1 in 11 adults (8.1%)
  - 1700 children (type 1 and type 2)
- 4% of non-Hispanic Whites
- 6% of Hispanics
- 9% of Native Americans

*\* The Behavioral Risk Factor Surveillance System (BRFSS), 2000  
Updated 2010*

# Pre-Diabetes 2010

- 86 million US adults
- 106,310 NM adults (7%)
- 15-30% will develop diabetes within 5 years

# Diabetes Is...

## Common



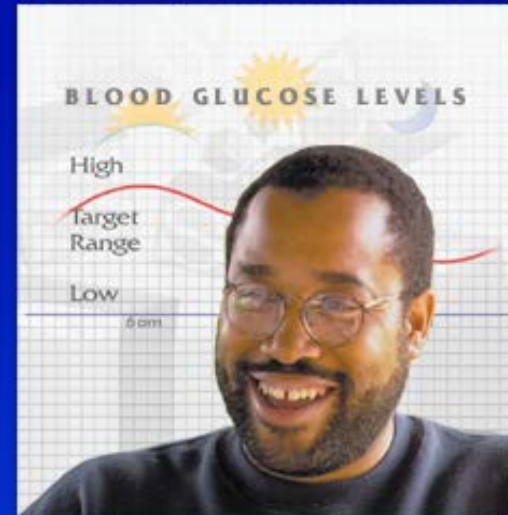
Affects 1 in every  
16 people

## Chronic



A lifelong condition

## Controllable



Good management  
depends on YOU!

# True or False?

Diabetes is a fairly easy disease to manage.

# Diabetes Treatment Plan

What the patient is told:

- Diet
- Activity
- Medications
- Monitoring
- Managing stress

**Simple, right?**

# Diabetes Treatment Plan

## What the patient hears:

- No white foods-bread, tortillas, rice, potatoes, all my favorite foods!!!! And there are 4 birthday parties this month
- Exercise- UGH, I haven't been to the gym in years, and who can afford it???
- 100 pills, stick myself with insulin??? Oh my gosh, how will I do this???
- Check my blood sugar? Its 200, what does that mean, am I going to DIE????

# Diabetes is a Self-Managed Disease

But... "many hands make light work"

~John Heywood

# The Team Approach to Diabetes Care

- Patient
- Family/ Support System
- Community/ Community Health Workers
- Provider (doctor, PA, nurse practitioner)
- Medical Home Team
- **Diabetes Educator/ Dietitian**
- Dentist, Optometrist, Foot Doctor, Psychologist, and others



# Diabetes Self-Management Education (DSME)

**“Diabetes education focuses on seven self-care behaviors that are essential for improved health status and greater quality of life.”**

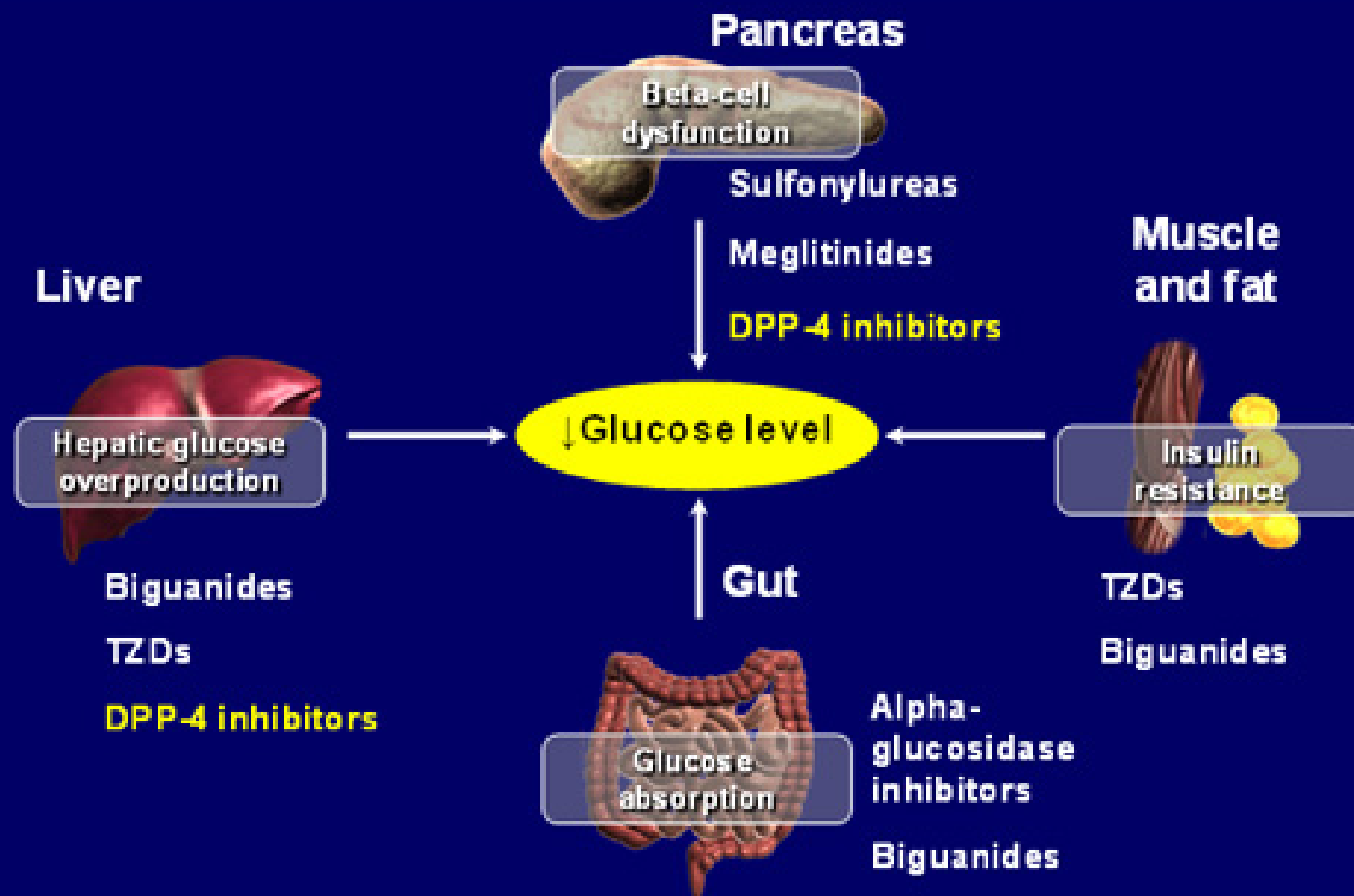
<http://www.diabeteseducator.org/DiabetesEducation/Definitions.html>

# The AADE 7™ Self- Management Behaviors

- \* Healthy eating
- \* Being active
- \* Monitoring
- \* Taking medication
- \* Problem solving
- \* Healthy coping
- \* Reducing risks

<http://www.diabeteseducator.org/DiabetesEducation/Definitions.html>

# Major Targeted Sites of Oral Drug Classes



DPP-4=dipeptidyl peptidase-4; TZDs=thiazolidinediones.

DeFronzo R.A. *Ann Intern Med.* 1999;131:281–303.

Buse JB et al. In: *Williams Textbook of Endocrinology*, 10th ed. Philadelphia: WB Saunders; 2003:1427–1483.

# Diabetes Pills

<u>Name</u>	<u>Primary Action</u>
■ Metformin/ Glucophage	■ Decrease liver sugar output
■ Glyburide/ Glipizide/ Glimiperide	■ Increase insulin production
■ Actos/ Avandia	■ Increase insulin sensitivity in muscle
■ Januvia/ Onglyza	■ Improves after-meal blood glucose disposal

# Combination Medications

- Glucovance
  - Glucophage
  - Glucotrol
- Metaglip
  - Metformin
  - Glipizide
- Janumet
  - Januvia
  - Metformin



# INJECTABLE Diabetes Medications

## Class

- Incretin mimetics
- Synthetic Amylin analogs
- Insulins
  - Rapid/Short Acting
  - Intermediate Acting
  - Long Acting

## Primary Action

- Improve post-meal blood glucose disposal, improve satiety
- Provide additional insulin to transport glucose from blood into muscles and cells

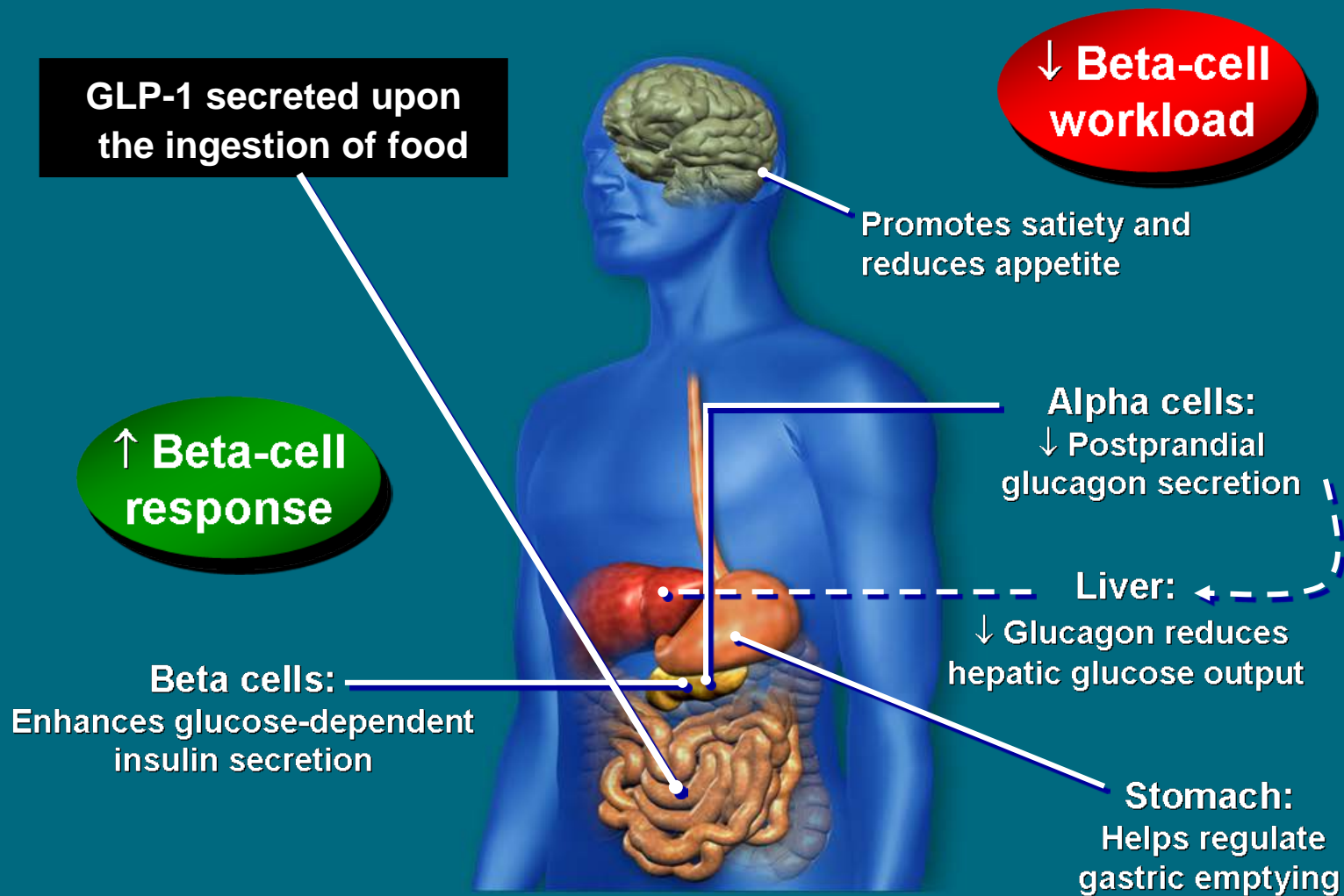
# Incretin Mimetics



- Exenatide
  - Byetta- twice a day
  - Bydureon- weekly
- Liraglutide
  - Victoza- once a day
- Type 2 Diabetes
- Injection- variable dose schedules
- Improves beta cell function
- Improves satiety
- Improves post-meal glucose levels
- S/E: nausea, weight loss

# GLP-1 Effects in Humans

## Understanding the Natural Role of Incretins



Adapted from Flint A, et al. *J Clin Invest.* 1998;101:515-520  
Adapted from Larsson H, et al. *Acta Physiol Scand.* 1997;160:413-422  
Adapted from Nauck MA, et al. *Diabetologia.* 1996;39:1546-1553  
Adapted from Drucker DJ. *Diabetes.* 1998;47:159-169



# Insulins

- **Rapid acting**

- Lispro (Humalog)
- Insulin Aspart (Novo Log)
- Glulisine (Apidra)

- **Short acting**

- Regular

- **Intermediate acting**

- NPH

- **Long acting**

- Glargine (Lantus)
- Detemir (Levemir)

- **Combinations**

- 70/30
- 75/25
- 50/50

# Rapid-Acting Insulins

Starts lowering blood glucose within  
10 – 15 minutes after injection



**Lispro (Humalog), aspart (Novalog), and glulisine (Apidra):**

- ▶ Should be taken **immediately** before eating
- ▶ Reduce blood glucose after eating

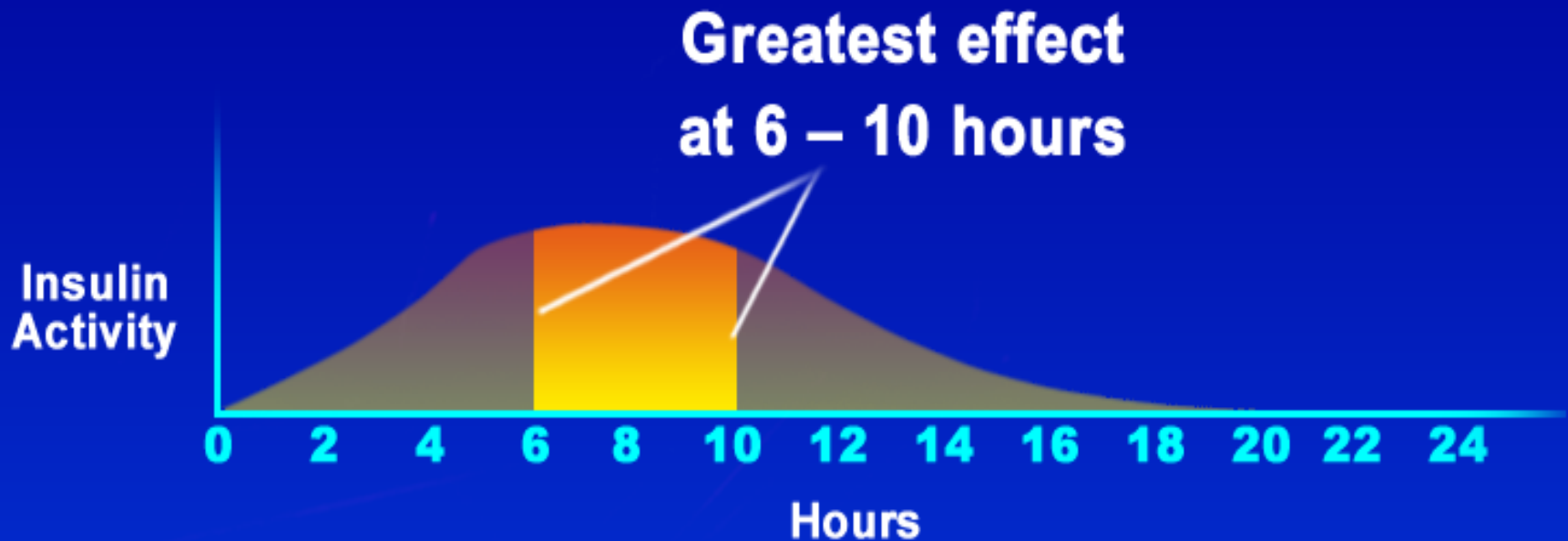
# Short-Acting Insulins



**Regular insulin (Humulin R and Novolin R):**

- ▶ **Should be taken 30 – 60 minutes before eating**
- ▶ **Reduces blood glucose after eating**

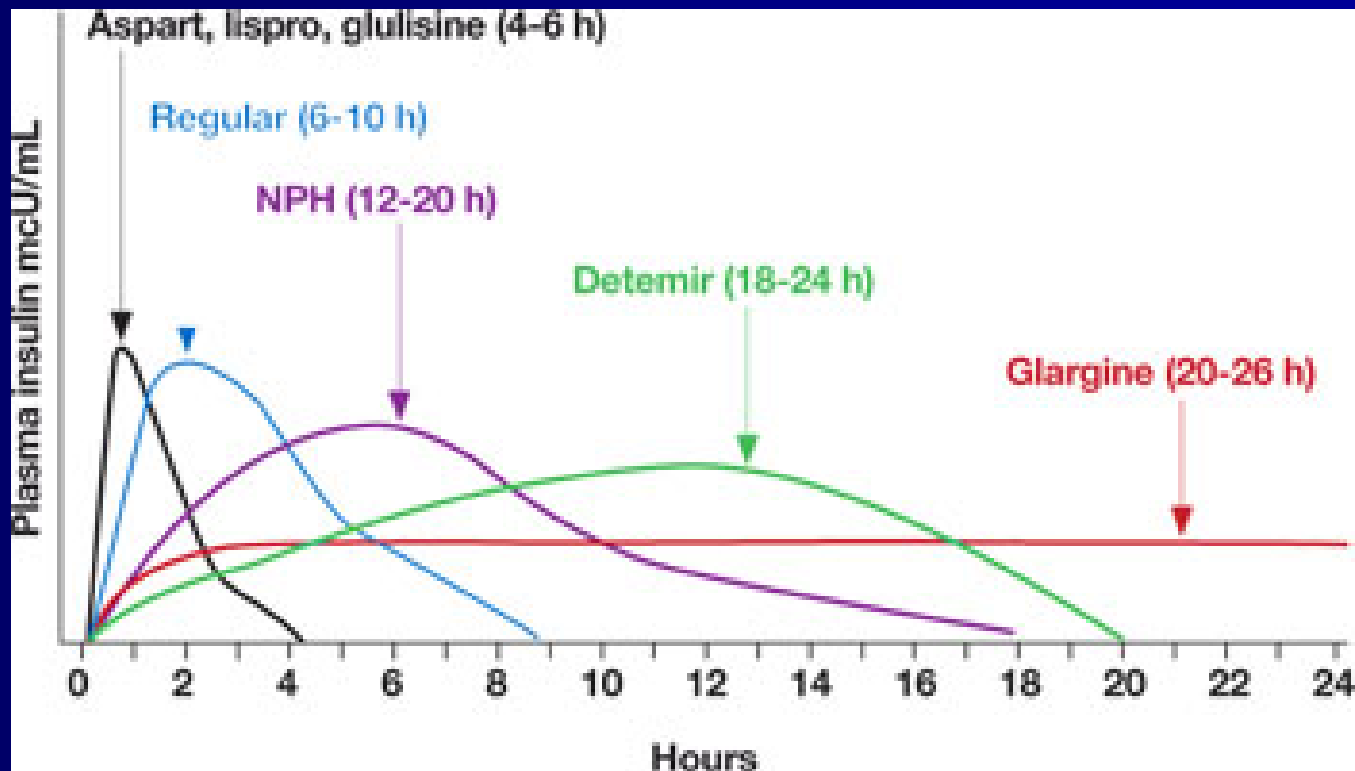
# Intermediate-Acting Insulins



**NPH (Humulin N, Novolin N) and Lente (Humulin L, Novolin L):**


- ▶ Usually taken before breakfast, dinner, or bedtime
- ▶ Usually used with rapid- or short-acting insulins

# Long-Acting compared to the other insulins



# Glucose and A1C Levels

Test	Suggested Ranges for People with Diabetes
Blood glucose before meals	90 – 130 mg/dL
Blood glucose after meals	Less than 180 mg/dL
A1C	Less than 7%



# HbA1c

## ( also known as A1c)

- A test that measures the amount of glucose bound to red blood cells
- Represents 3 month average blood sugar, based on the lifecycle of the red blood cell
- Goal of 7% is equal to average estimated glucose of 154 mg/dl
- A very high HbA1c represents poor control and higher risk of diabetes complications

# A1c / Average Blood Sugar Comparison

A1C (%)

Avg. Blood Sugar  
(mg/dl)

5

80

6

120

7

150

8

180

9

210

10

240

11

270

12

300



# Blood Sugar Testing: Using Results

	Before Breakfast	After Breakfast	Before Lunch	After Lunch	Before Dinner	After Dinner
Day 1	130		65		120	
Day 2	120		75		90	
Day 3	110		60		115	

# Blood Sugar Testing: Using Results

	Before Breakfast	After Breakfast	Before Lunch	After Lunch	Before Dinner	After Dinner
Day 1	120			215		225
Day 2	130		120	225		
Day 3	110				125	285

# Diabetes and Illness

- Illness can make blood sugars go up and be more difficult to control
- High blood sugars can make any illness last longer, delay wound healing, or make infections harder to treat
- High blood sugars can lead to a medical emergency called DKA or Diabetic Ketoacidosis
  - Signs: Throwing up, can't keep food or drink down, stomach pain, very weak, can go into a coma

# Sick Day Management

- Have a plan before it is needed
- Continue diabetes medications
- Drink plenty of fluids
- Consume carbohydrates: solid or liquid
- Test blood sugar and urine ketones often
- Know when to call the doctor or seek help

# Sick Day Foods

(Equal to 15 gms carbohydrate)

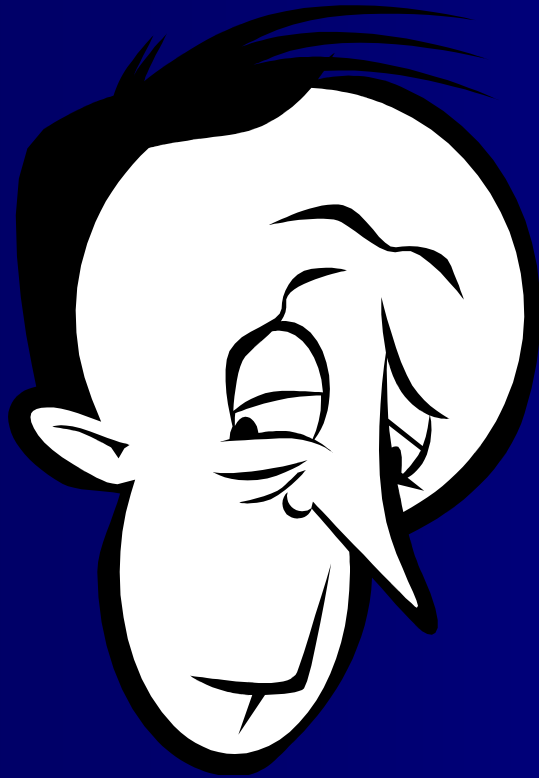
- 4 oz juice or regular soda
- 8 oz Gatorade™ or Pedialyte™
- ½ cup regular gelatin
- ½ cup unsweetened applesauce
- ½ cup mashed potatoes
- 1/3 cup rice
- 6 saltine crackers
- 1 cup soup
- 1 popsicle or ½ cup ice cream or sherbet
- 3 graham cracker squares

# Sick Day Management: When to Call the Doctor

- Blood sugar higher than 240 with treatment for 8 hours or higher than 400 for 4 hours
- Fever of 101 or higher
- Sick for 24 hours with no improvement
- Nausea, vomiting or diarrhea for more than 4-6 hours
- Symptoms of dehydration
- Symptoms of DKA- can lead to coma if not treated
  - Difficulty breathing
  - Moderate or Large urine ketones
  - Abdominal pain and vomiting

# Hypoglycemia

(low blood sugar)



Signs

Symptoms

Treatment



# Hypoglycemia: Signs

- Blood Sugar 70 or lower
  - Mild
  - Moderate
  - Severe
- Causes
  - Too much insulin
  - Not enough food
  - Exercise
- Increased Risk
  - Elderly
  - Poor nutrition/ chronic illness
  - New to meds



# Hypoglycemia: Symptoms



- Headache
- Hunger or nausea
- Weak
- Dizzy
- Shaky
- Anxious
- Sweaty
- Irritable/ mood changes
- Combative
- Difficulty concentrating
- Slurred speech
- Unconsciousness

# Hypoglycemia: Treatment



- 15-20 gm fast-acting carbohydrate (sugar)
- Re-test blood sugar in 15 minutes, if still low, repeat the treatment
- **Do not over-treat**
- Identify and treat cause
- Monitor blood sugar frequently

# Hypoglycemia: Treatment



## 15-20 gm Carbohydrate =

- 4 – 6 oz. fruit juice
- 1 small piece of fruit
- 5 pieces of hard candy
- 8 oz. fat-free milk
- 4 oz. Regular soda
- 4 glucose tablets
- 1 tablespoon jelly
- 1 tablespoon honey

# Glucagon Emergency Kit



# Hypoglycemia: Patient Education



- Recognize signs
- Appropriate treatment procedure
- Always carry something for hypoglycemia
- Educate family members
- Monitor trends
- Safety issues
- Prevention measures

# The "Diabetic Diet"

P.S. There is no "diabetic diet"

# Myths and Facts about Diabetes

- Eating too much sugar causes diabetes
- People with diabetes can't eat sweets or chocolate
- A low carb diet is the best for people with diabetes
- Your body needs carbohydrates for energy
- Fruit is healthy, so is it OK to eat as much as you want.
- You are in charge of managing your diabetes

# What Happens When We Eat?

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After eating, most food is turned into **blood glucose**, the body's main source of energy



# Total Carbohydrates Count

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Carbohydrates give energy



But too much carbohydrate can raise  
blood glucose above your target range

*Ask your care team: How much carbohydrate is right for you?*

# Where Carbs are Found

Starchy vegetables- lets name 'em

What about beans?

Dairy products- let name 'em

What about cheese?

Grains/ breads- let's name 'em

Snack foods?

Fruits- All fruits have some sugar/energy  
with various amounts of fiber

?Others?- let's name 'em

# Carb Counting/ Management

- Portion Is a measure  
15 grams = 1 Carb Portion (CHO)
- Serving Is an amount determined  
by manufacturer (or your Aunt)  
Is term used from food groups at USDA  
Is labeled by weight
- Exchange Is an ADA method of carb counting  
very last century



# Control Portion Sizes

1 serving of raw vegetables



1 serving of meat



1 serving of cooked vegetables



1 serving of cheese

1 serving of pasta

# Using a Food Label

## Nutrition Facts

Serving Size 1 Cup (239g)

Servings Per Container About 2

### Amount Per Serving

**Calories** 150    **Calories from Fat** 60

% Daily Value\*

**Total Fat** 6g                      **9%**

Saturated Fat 1.5g                **8%**

Trans Fat 0g

Polyunsaturated Fat 1.5g

Monounsaturated Fat 2.5g

**Cholesterol** Less than 5mg    **1%**

**Sodium** 250mg                    **10%**

**Total Carbohydrate** 19g        **6%**

Dietary Fiber Less than 1g    **3%**

Sugars 0g

**Protein** 3g

Vitamin A 0% • Vitamin C 0%

Calcium 2% • Iron 6%

\*Percent Daily Values are based on a 2,000 calorie diet





# Cut Down on Fat and Cholesterol

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High Calories

Weight Gain

High Cholesterol & Saturated Fat

Heart Attack  
Risk

# Messaging to the Patient

- Deciding to improve
  - one meal at a time
  - one event at a time
  - one day at a time
- Defining an achievable goal
- Self-recognition for goals met

# How You Can Help

- Teaching not telling
- Helping them start
- Food for thought
- Small changes big rewards



# Healthy Food Choices Help Keep Blood Glucose on Target



Less healthful choices



More healthful choices

# Make Healthier Food Choices

**Instead of this:**



**Try this:**



# Tips for Healthier Eating at Home



## *Try:*

- ▶ **New recipes low in fat and high in fiber**
- ▶ **Low-fat or fat-free foods (but check carbohydrate content)**
- ▶ **Fresh fruits and vegetables**



# Tips for Healthier Eating Dining Out

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## *Order:*

- ▶ An appetizer as an entrée
- ▶ Sauces and dressings on the side
- ▶ Half-size portions



# Cultural Culprits: Our Fast Food Nation

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**Large Soda (32 oz.)**  
300 calories  
19 tsp. sugar

**Large Fries**  
520 calories  
25 g fat  
4.5 g saturated fat

**Double  
Cheeseburger**  
770 calories  
47 g fat  
20 g saturated fat



**Apple Pie**  
260 calories  
13 g fat  
3.5 g saturated fat

**The average fast-food meal  
has close to a full day's calories**

# McDonald's™ Burger/Fries

	<b>Calories (+/- cheese)</b>	<b>Fat gm</b>	<b>Carb gm/ CHO port.</b>	<b>Sodium gm/ +/- cheese (no salt)</b>
<b>Big Mac Burger</b>	540	29	<b>45 gm/ 3</b>	1040
<b>¼ pound Burger</b>	510 (410)	26 (19)	<b>40 (37)/ 2.5</b>	1190/ 730
<b>Value Burger (99c)</b>	300 (250)	12 (9)	<b>33 (31)/ 2</b>	750/ 520
<b>Medium Fry</b>	380	19	<b>48/ 3</b>	<b>270 (175)</b>
<b>Small Fry</b>	230	11	<b>29/ 2</b>	<b>160 (101)</b>



# Tortilla Reference



# Tortilla Reference

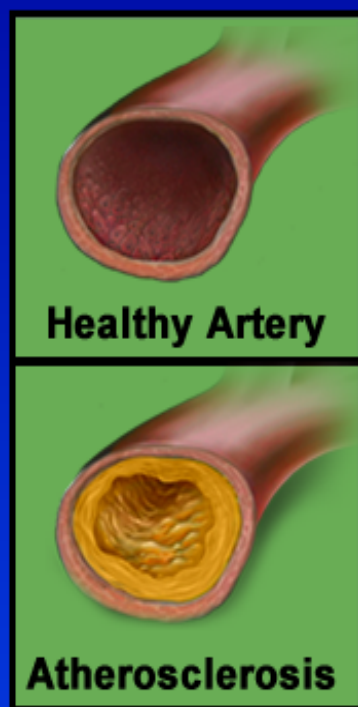
<b>Tortilla</b>	<b>Calories</b>	<b>Fat gm</b>	<b>Carb gm/ carb portion</b>	<b>Fiber gm</b>
6" Corn	56	1	9 gm/ 0.5	1
6" Flour	100	2.5	16 gm/ 1	1
7" Multi-grain	150	4.5	23 gm/ 1.5	5
7" Flour (homestyle)	180	4	31 gm/ 2	3
7" Whole Wheat	139	2.5	25 gm/ 1.5	4
10" Flour (burrito)	210	5	36 gm/ 2.5	1
11" Multi-grain	210	6	32 gm/ 2	7



# Tips to Remember

- Decide to investigate menu at a given restaurant
- Decide on weekly menu at home then make shopping list
- Decide to pay attention to one thing and build on it
- Define success and practice new rewards

# Diabetes Increases the Risk of Large Blood Vessel Damage



**Macrovascular complications:**

**Stroke**

**Heart attack**

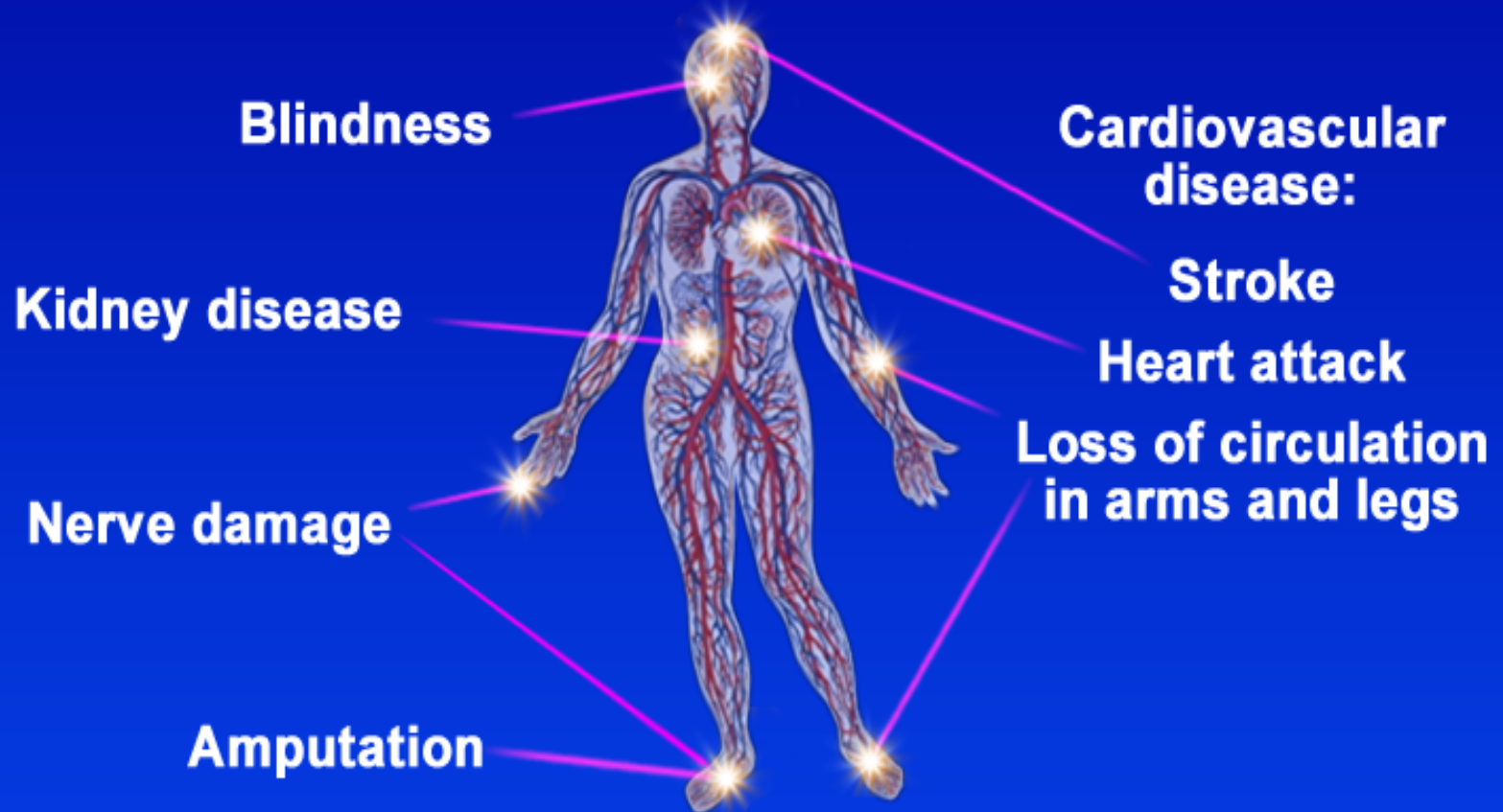
**Poor circulation**

**Over time, fatty deposits can clog large blood vessels**

# Hyperglycemia Can Cause Serious Long-Term Problems

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## Chronic complications of diabetes



# Good News for Type 2 Diabetes

Keeping A1C in target range reduces:

**Heart attack**

as  
much as  
16%



**Eye damage**

as  
much as  
21%



**Kidney disease**

as  
much as  
34%



United Kingdom Prospective Diabetes Study

# Co-morbidity Management

- Blood pressure control
- Cholesterol control
- Complication screening and prevention
  - Yearly eye exam
  - Yearly foot exam and daily foot care
  - Yearly blood and kidney tests
  - Vaccines
  - Medic alert
  - Regular dental care
  - Education

# Cholesterol and Diabetes

- LDL or "bad cholesterol" should be lower than 100
- HDL or "good cholesterol" should be higher than 45
- Triglyceride level should be lower than 150
- Diet and exercise can help improve cholesterol

# High Blood Pressure and Diabetes

- Goal blood pressure
  - Lower than 130/80
- Medications recommended because they also can protect kidneys
- Many people need 2 or 3 medications to reach goal
- Diet and exercise can help improve blood pressure

# The Good News About Diabetes

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Avoid diabetes complications by:



- ▶ Keeping blood glucose as near normal as possible
- ▶ Learning self-care skills
- ▶ Getting support from family and diabetes care team
- ▶ Taking medication, as needed

**People with diabetes can lead full, productive lives!**



# On the Horizon

- New medications
- "Smart" insulin pumps
- Continuous glucose monitoring
- "Artificial Pancreas" technology
- Pancreas transplants
- Gastric bypass surgery

# On the Horizon: Medications

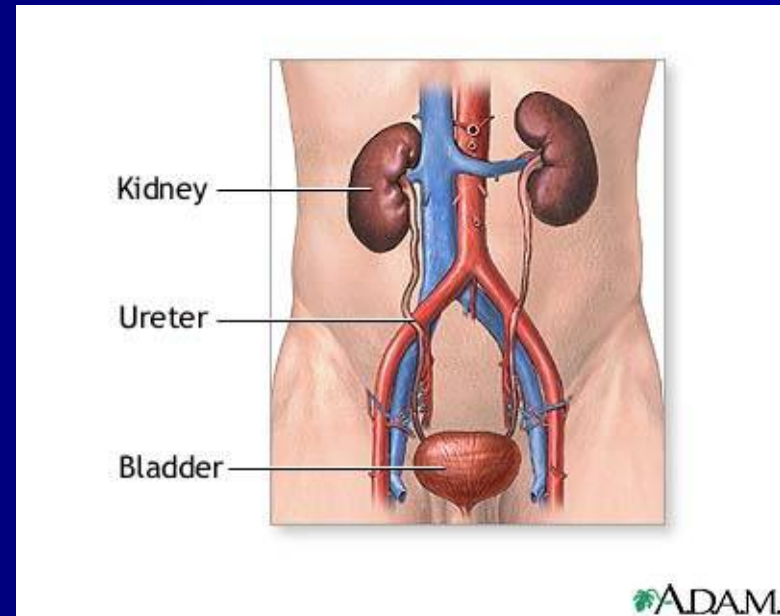
## ■ Insulin Degludec

- ultra long-acting
- 42 h effective duration
- Launch in early 2013



## ■ SGLT2 Inhibitors

- Decrease renal glucose reabsorption
- Increase glucosuria
- Secondary wt loss due to increased calorie excretion (glucose)
- May increase risk of UTI/ bladder infections



# Some Available Pumps



**Animus with  
"Ping"**

**Omni Pod  
with PDM**



**Medtronic  
with CGM**



**t:slim  
(touch simplicity)**

# Postprandial Excursions

