

## Diabetes, Pre-Diabetes and Insulin Resistance

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### What is Diabetes?

- Most of the food we eat is broken down by the body into glucose and released into the bloodstream
- Glucose is the body's primary source of fuel
- In response to glucose levels, the pancreas releases the hormone insulin
- Insulin attaches to insulin receptors and allows glucose to move from the bloodstream into cells for energy

## Type I Diabetes

- Type 1 diabetes is an autoimmune disorder in which the immune system attacks the insulin producing cells of the pancreas
- The pancreas is unable to produce enough insulin, and glucose remains in the bloodstream leading to high blood sugar levels
- Symptoms often occur suddenly and may include increased thirst, increased hunger, and frequent urination, weight loss, blurred vision, and fatigue
- Type 1 diabetes is not preventable, and individuals must inject themselves with insulin daily

## Type II Diabetes

- In individuals with type 2 diabetes, the pancreas produces insulin but cell receptors become insulin resistant, and glucose remains in the bloodstream
- The pancreas works overtime producing more insulin to try to get the cells to respond. Eventually the pancreas becomes exhausted and is unable to make as much insulin.

## Diabetes

- Based on the National Diabetes Statistics Report, 2014, more than 29 million people in the U.S. have diabetes aged 20 years or older (12.3% of the adult population)
- This number has increased from 26 million in 2010.
- In 2012 alone, 1.7 million people aged 20 years or older were newly diagnosed with diabetes.
- 86 million people aged 20 years and older have pre-diabetes (37% of adult population), and if no precautions or actions are taken, 15-30% of people with pre-diabetes will develop type 2 diabetes within 5 years.

- 85-90% of diabetes cases are Type 2
- 25% ( 1 in 4) of people with diabetes do not know they have it
- 27% of population 60 years and older have diabetes
- 7<sup>th</sup> leading cause of death in the U.S.

## What do we know

- 86 million people have **pre-diabetes**
- 35% of U.S. adults aged 20 years or older have prediabetes
- Pre-diabetes puts people at increased risk for diabetes

- Diabetes and its related complications account for \$245 billion in total medical costs to include lost work and wages.
- This number is up from the reported \$174 billion in 2010.
- Over \$500 billion of an estimated \$3 trillion spent on healthcare last year was spent on conditions related to three chronic diseases: diabetes, heart disease and obesity.
- In the United States, the number of Emergency Department visits with diabetes as any-listed diagnosis increased from 9,464,000 in 2006 to 11,492,000 in 2009.

- Based on studies the average lifetime cost of caring for a type 2 diabetic patient is approximately \$85,200 and can range from \$55,000 to \$130,000.
- Studies have shown that better control of diabetes can reduce cost, increase quality of life, and decrease mortality rate.
- One study showed that just by reducing A1c by 1% to 1.5%, type 2 diabetic patients can cut costs to \$1,717 per target patient over 1 year.
- If we can prevent the 30% with pre-diabetes from developing diabetes we can save \$74 billion dollars in medical cost and lost productivity.

## How Do You Get Type II Diabetes?

- **Lifestyle factors increase your odds of getting type 2 diabetes.**
- **Weight**
  - Fat cells have fewer insulin receptors than muscle cells, and being overweight or obese can lead to insulin resistance.
- **Diet**
  - Diets containing high amounts of refined carbohydrates and processed foods are more likely to raise blood sugar levels. This creates more work for the pancreas and promotes weight gain.

- **Activity**
  - Being inactive elevates blood sugar levels and may lead to weight gain. Regular exercise helps lower blood sugar levels.
- **Stress**
  - Prolonged periods of stress increase levels of cortisol in the body, which antagonizes insulin.
- **Genetics**
  - Certain ethnic groups have a higher incidence of diabetes including African American, Native American, Pacific Islander, Latino, and Asian.

## How is Diabetes Diagnosed?

- There are some symptoms associated with diabetes, but often people may not experience any symptoms. Routine blood and urine tests can confirm a diagnosis of diabetes.
- **Symptoms-**
  - Increased thirst
  - Unusually Frequent Hunger
  - Frequent Urination
  - Fatigue
  - Infections
  - Blurred vision
  - Cramps or burning sensation in the feet and/or legs
  - Unexplained weight loss
  - Sores that do not heal

## Diagnosis

- The most common diagnostic tests include the Fasting Plasma Glucose Test, Random Plasma Glucose Test, and the Oral Glucose Tolerance Test.
- Tests should be repeated every 3 years, or more often for individuals with a family history of diabetes, certain ethnic groups, history of gestational diabetes, low HDL cholesterol, high levels of triglycerides, high blood pressure, or pre-diabetes.

- **Fasting Plasma Glucose Test (FPGT)**
  - measures the amount of glucose remaining in the blood after fasting for at least 8 hours. Blood sugar levels of 126 mg/dL or higher indicate diabetes.
- **Random Plasma Glucose Test (RPGT)**
  - does not require fasting.
- **Oral Glucose Tolerance Test (OGTT)**
  - assesses blood sugar levels a few hours after drinking a solution of glucose and water. Blood sugar levels of 200 mg/dL in either the RPGT or OGTT indicate diabetes.

## Pre-diabetes

- Pre-diabetes is when a person's blood glucose levels are higher than normal but not high enough to be type 2 diabetes
- People with pre-diabetes are *more likely* to develop type 2 diabetes
- **Fasting blood sugar 100-125 mg/dL**
- A1C 5.6% or below is normal. In prediabetes, A1C levels range between 5.7%-6.4%. If the A1C is 6.5% or above, a person has diabetes.

## Pre-diabetes

- **If you have pre-diabetes, will you definitely develop type 2 diabetes?**
- No. Research shows that you can lower your risk for type 2 diabetes by 58% by:
  - Losing 7% of your body weight (or 15 pounds if you weigh 200 pounds)
  - Exercising moderately (such as brisk walking) 30 minutes a day, five days a week
  - Don't worry if you can't get to your ideal body weight. Losing just 10 to 15 pounds can make a huge difference. For some people with pre-diabetes, early treatment can actually return blood glucose levels to the normal range.

- Just a 7% loss of body weight (only 11 lbs if you are 160 lbs) will improve insulin action by 57%.
- That is a bigger benefit than a person would get from most diabetes pills.
- The American Diabetes Association confirms that a 10-15 pound reduction in body weight will lower blood glucose, blood pressure, cholesterol, and reduce stress on knees and hips.

## Cancer Risk

- Prediabetes increases cancer risk in adults by 15%, with significantly increased risk for cancer of the stomach, liver, pancreas, breast, and endometrium, in a meta-analysis published in Diabetologia.

## Insulin Resistance

- Insulin resistance is not a disease as such but rather a **state or condition in which a person's body tissues have a lowered level of response to insulin**, a hormone secreted by the pancreas that helps to regulate the level of glucose (sugar) in the body.
- As a result, the person's body produces larger quantities of insulin to maintain normal levels of glucose in the blood.
- Insulin resistance can be thought of as a set of metabolic dysfunctions associated with or contributing to a range of serious health problems. These disorders include type 2 diabetes, metabolic syndrome (formerly known as syndrome X), obesity, and polycystic ovary syndrome. Some doctors prefer the term "insulin resistance syndrome" to "metabolic syndrome."

## Causes of Insulin Resistance

- Genetic factors. Insulin resistance is known to run in families.
- Obesity. Being overweight keeps the muscles from using insulin properly, as it decreases the number of insulin receptors on cell surfaces.
- Low level of physical activity. Because muscle tissue takes up 95% of the glucose that insulin helps the body utilize (brain cells and blood cells do not depend on insulin to help them use glucose), inactivity further reduces the muscles ability to use insulin effectively.
- Aging. The aging process affects the efficiency of glucose transport.

## Diabetes and Heart Disease



- High levels of blood sugar cause damage to nerves and blood vessels. Blood vessels become thicker, narrower and less elastic which reduces the ability of blood to pass through.
- High blood glucose levels are also associated with higher levels of fat in the blood. These fats, known as lipids, narrow and clog blood vessels.
- Inadequate circulation due to the narrowing or clogging of vessels restricts blood flow to vital organs, like the heart and brain, and throughout the body.

## Diabetes and Heart Disease

- *Heart disease is the leading cause of death in people with diabetes, and has been coined “the frequent, forgotten, and often fatal complication of diabetes.”*
- People with diabetes are up to 5 x more likely to develop heart disease or suffer a stroke than those without this condition.



- **Not everyone with diabetes will develop all or any complications, but damage to vessels and nerves from uncontrolled blood sugar levels can effect the whole body.**



- **Heart**
- **Mouth:** severe gum disease
- **Lungs:** decreased function, increased breathing problems
- **Gastrointestinal Tract:** bloating, diarrhea, and constipation. People with diabetes have 3 x the normal risk of developing colorectal cancer
- **Skin:** dry and itchy skin, increased risk of fungal and other infections
- **Genitals:** decreased blood flow which may impair function and raises the incidence of yeast infections
- **Feet:** increased risk for injury and infection due to reduced sensation
- **Brain:** increased risk for Alzheimer's disease and other forms of dementia
- **Eyes:** retinopathy and glaucoma
- **Liver:** nonalcoholic steatohepatitis (NASH), increased risk of liver cancer
- **Kidneys:** impaired function which may lead to kidney failure
- **Bladder:** incontinence and increased urinary tract infections
- **Immunity:** slower reacting white blood cells, increased risk and severity of infections, flu and pneumonia

## Reducing Risks

- There are several healthcare services that are recommended on a regular basis that can reduce your risk of diabetes-related complications:
  - **Annual eye exams**
  - **Routine medical follow-up appointments**
  - **Regular dental exams**
  - **Daily foot checks**
  - **Stopping smoking**
  - **Flu vaccinations**
  - **Daily baby aspirin use (if approved by your doctor)**

## Why is Good Nutrition Important?

- Eating a healthy diet can:
  - Help you control blood sugar and lipids
  - Help you maintain a healthy weight or lose weight if you are overweight
  - Allow you to take less medication or avoid taking medication for Type 2 diabetes

## Why is Good Nutrition Important?

- Prevent complications from high blood sugar:
- Nerve problems
- Kidney problems
- Vision problems
- Heart disease
- Circulatory problems



## Nutrition Guidelines for Type 2 Diabetes

- Lose weight if you are overweight
- Exercise to promote or maintain weight loss and to control blood sugar
- Monitor carbohydrate intake to maintain blood sugar control
- Eat carbohydrates mainly from fruits, vegetables, whole grains, legumes and low-fat or skim milk



## Guidelines for a Healthy Diet

### ■ Estimated Calorie Intake:

- On average, women should consume no less than 1,200 calories a day, and men no less than 1,500 calories to ensure adequate nutrition. Calorie needs based on height, weight, age, activity level. [www.mypyramid.gov](http://www.mypyramid.gov) (-500 calories per day to lose wt.)

### ■ Distribution of Calories from Major Nutrients:

- **Carbohydrates:** ~40-45%
- **Fat: “healthy fats”** ~30%
  - with  $\leq 7\%$  from saturated fat
- **Protein: non-animal/animal** ~25-30%

## Nutrition Guidelines for Type 2 Diabetes, Pre-diabetes and Insulin Resistance

- Consume 40% of calories from **carbohydrates** (do not use extremely low carbohydrate diets to treat diabetes) – example: 1500 calories x .40 = 600 calories from carbs, divided by 4 (calories per gram) = 150 grams of carbs per day

## Carbohydrate Intake

■ Total Calories	Carbs (grams)	Each Meal 3/day	Snack(s) 1-2/day
1200	120	30 g	15-30 g
1500	150	30-45 g	15-30g
2000	200	45-60 g	30-45g
2500	250	60 g	60 g

## Fat Intake

- Consume 30% of calories from **fat**:  
 Example:  $1500 \times .30 = 450$ , divided by 9  
 (calories per gram) = 50 grams total fat per  
 day  
 Best fat sources: olive oil, nut oils, canola  
 oil, nuts, seeds, salmon, avocado

## Chipotle Burrito

- Chipotle's Vegetarian Burrito (with black beans, rice, cheese, guacamole, and salsa) weighs over a pound and provides 1,120 calories and 42 grams of fat!



## Protein Intake

- Consume 30% of calories from protein- for those without existing kidney problems- from non-animal as well as animal sources: example:  $1500 \times .30 = 450$  divided by 4 (calories per gram) = 112 grams of protein per day
- **Best protein sources**; fish, skinless chicken or turkey, nonfat/low-fat dairy products, beans/peas
- Always follow the advise of your physician/dietitian/nurse/CDE

## Saturated FAT

- A diet high in saturated fat is a key contributor to type 2 diabetes
- People with type 2 diabetes have overly active immune responses, leaving their bodies rife with inflammatory chemicals
- New research finds that saturated fatty acids, but not the unsaturated type, can activate immune cells to produce inflammatory proteins
- These inflammatory proteins then act on tissues and organs such as the liver, muscle and fat tissue to *turn off their response to insulin*, making them insulin resistant

## Saturated Fat Intake

- Saturated (animal) fats: meat, sausage, etc.
- Limit saturated fat to 7% of calories
- Example:  $1500 \times .07 = 105$ , divided by 9 (calories per gram) = 11 grams or less of saturated fat per day



## Red Meat and Diabetes

- Study by Harvard School of Public Health found strong association between consumption of red meat – especially processed red meat – and an increase of type 2 diabetes
- 442,101 participants in study.
- Daily serving 3-4 oz of unprocessed red meat was associated with a 19% increase risk of type 2 diabetes
- One daily serving of half that quantity in processed meat (one hot dog or sausage or 2 slices of bacon) associated with a 51% increased risk



## Diabetes and Dairy

- Study in *The Lancet Diabetes & Endocrinology*, revealed that certain types of fats commonly found in dairy products like yogurt and milk may actually have a **protective effect against type 2 diabetes**
- Swedish researchers also reached a similar conclusion, finding that people who consumed the highest amounts of full-fat dairy had a **23% lower diabetes risk** than those who consumed the least



## Trans Fats

- Found mainly in packaged and processed foods. Look for “partially hydrogenated”
- Ideal intake: 0 grams
- Limit use of packaged crackers and cookies
- Limit use of commercial bakery products like cakes, cookies, etc
- Use soft margarine instead of stick
- Read food labels for trans fat

## Portionsforhealth.com



## Leafy Greens

- Fill ½ plate with non-starchy veggies
- In a large European report that weighted fruit and veggie consumption against diabetes risk, the strongest positive relationship was observed for leafy greens
- 9 servings/week was associated with a 16% reduced risk compared with consuming a serving or less



## Use a food log to start

- Once you know how many grams of:
- Carbohydrates
- Fats
- Protein
- Start keeping a food log to see how you are progressing and adjust accordingly
- [www.calorieking.com](http://www.calorieking.com), [www.sparkpeople.com](http://www.sparkpeople.com)
- Loseit app
- **Diabetes Goal Tracker Mobile App**



## Carbohydrates

- Carbohydrates are broken down and converted to glucose, the body's primary source of energy.
- Carbohydrates activate a stronger insulin release and response than protein or fats.
- Even distribution of carbohydrates throughout the day are important for good control of blood sugar levels.
- Consuming smaller amounts of food more frequently results in steadier, more even blood glucose levels.

## Carbohydrate Quality

- Various forms of carbohydrates affect blood glucose levels in different ways
- Carbohydrates containing soluble fiber can help slow the release of glucose
- **Best sources are:**
  - Fruits
  - Vegetables
  - Oat bran and barley
  - Legumes/ beans and peas



## Carbohydrate Quality (Cont...)

- The more refined a food substance is, the faster the release of glucose into the blood stream.  
Example: whole wheat bread vs. white bread
- Choose solid forms of foods rather than liquid
  - For example: an orange instead of orange juice
- Raw and whole foods are generally more slowly absorbed than cooked and processed carbohydrates
- Avoid/limit foods high in simple sugars which hasten the release of glucose
  - For example: white bread, white rice, cookies, candies, cake, pie, etc.



## Good Carbs and Fiber

- **BEST FOODS FOR HIGH-QUALITY CARBS:** *Vegetables, fruits (fresh and frozen, unsweetened), beans, peas, lentils, brown rice, wild rice, barley, oatmeal, whole-grain cereals, whole-grain breads, whole-grain crackers, quinoa, amaranth, wheat berries, millet*
- **BEST FOODS FOR SOLUBLE FIBER:** *Psyllium seeds (ground), oat bran, rice bran, oatmeal, barley, lentils, brussels sprouts, peas, beans (kidney, lima, black, navy, pinto, soy and garbanzo), apples, blackberries, pears, oranges, grapefruit, cantaloupe, strawberries, bananas, peaches, broccoli, carrots, cauliflower, cabbage, spinach, sweet potatoes, yams, white potatoes, tomatoes, avocado, raspberries, corn, almonds, flaxseed (ground), chia seeds, sunflower seeds*

## Sugar Substitutes

- Use sparingly in place of sugar
- Can possibly promote weight gain



## Fiber

- Fiber can significantly reduce risk of heart disease, diabetes, cancer and obesity
- Fiber is one of the best ways to control blood sugar
- Soluble fiber delays movement of food into small intestines
- Slows post-meal surges in blood sugar
- 1 tsp fiber (Metamucil, Konsyl) in 1 cup of water before meals can drop blood sugar levels from 210 to 140 mg/dL

## Fiber

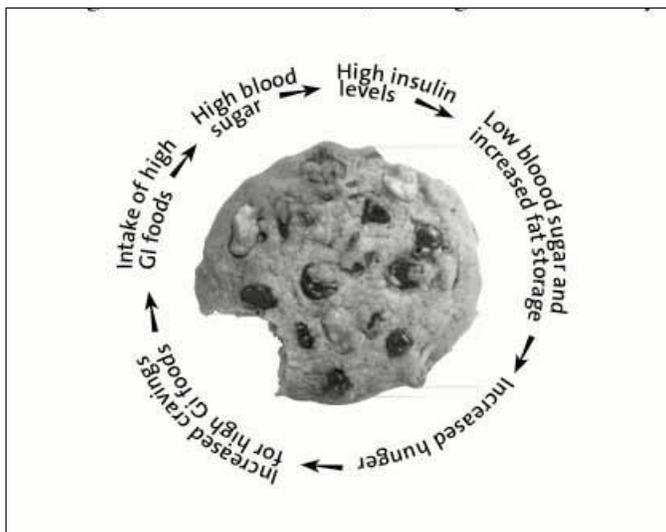
- Aim for 25-40 grams per day or 20 grams per 1,000 calories
- Best sources of soluble fiber: fruits, vegetables, oat bran, barley, beans/legumes and peas



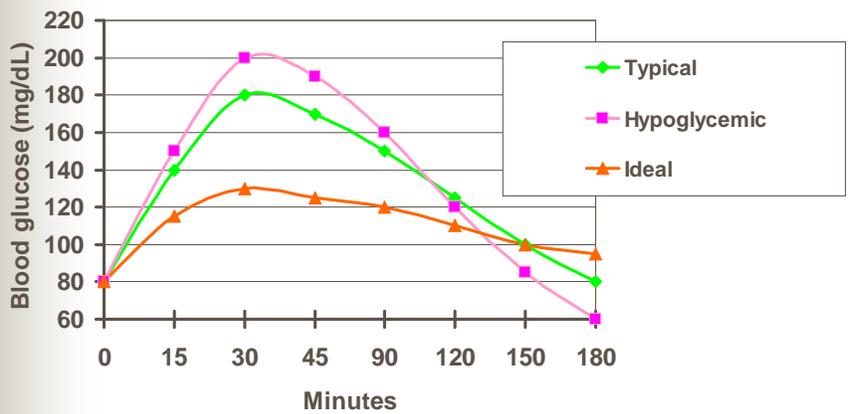
## Insulin Response & Overweight

- **Insulin is a 'storage hormone'** – it signals the body to store sugar, fat, and protein.
- As long as your insulin level is high you are in storage mode and you cannot lose weight!
- High intake of sugar/refined carbs over time produces 'insulin resistant' cells.

## Vicious Cookie Cycle



## After Meal – Glucose Response



## Bottom Line

- **Eat Less:** refined starches like white bread, white rice, white pasta, white potatoes
- **Eat Less:** sugary foods like cookies, cake, pastry, sugary beverages
- **Eat More:** vegetables, fruit, whole grains and legumes
- **Add** lean protein and good fats to slow release of glucose

## Combine Carbohydrate with Protein/Fat

- Foods comprised of protein and fat take longer to digest than carbohydrates
- Proteins and fat slow down digestion
- Protein and fat along WITH carbohydrates break down to glucose much slower and raise blood sugar more slowly than carbohydrates alone
- Example: Apple with 10 almonds  
Whole grain crackers with low-fat cheese

## Drink Coffee



- A 2014 report discovered that drinking 3-4 cups of coffee a day may reduce your risk of becoming diabetic by up to 26%
- Effects were nearly as strong for decaf
- Sweeten with stevia and cinnamon which has been shown to have glucose lowering effects

## The Diabetic Diet: Debunking the Myths



- **Myth I**
- Simple vs. Complex Carbs: Table Sugar
  - For many years people believed that diabetics have to avoid simple carbohydrates like table sugar and opt for complex carbs such as potatoes instead.
  - Healthy eating still focuses on minimizing highly processed foods, which are often full of refined flour and sugar, but 15 grams of carbohydrates is the same **whether it comes from fruit or fudge**



## Myth II

### ■ The Diabetic Diet

- Eating with diabetes is not a life sentence to a rigid, deprived meal plan.
- All foods can fit into the diabetic diet, and will have different responses for each individual.
- The best diet is the same kind of healthy eating that is best for everyone.



## Diabetes and Alcohol



- The enjoyment of social drinking makes eliminating alcohol from the diabetic diet difficult. Using proper precautions, diabetics can still take pleasure in drinking in moderation.
- When you drink alcohol, your liver stops producing glucose and switches over all its resources to the job of clearing the booze from your bloodstream. Without any food delivering glucose to your blood and no supplemental glucose coming from the liver, you are at very high risk for hypoglycemia, especially if you drink on an empty stomach or after taking insulin or glucose-lowering oral medications.
- It takes 2 hours for 1 ounce of alcohol to be broken down and leave the body's system, so the risk continues long after you finish a drink (up to 24 hours afterward).

## Alcohol

- For individuals with well-controlled diabetes, alcohol intake should follow the same guidelines established for the general population by the United States Department of Agriculture (USDA):
  - A maximum of two drinks per day for men and one drink for women (women have a lower body water content and metabolize alcohol more slowly than men)
  - A maximum of one drink for anyone over the age of 65.
- One drink is defined as:
  - 12 ounces of regular beer (150 calories)
  - 5 ounces of wine (100 calories)
  - 1.5 ounces of 80-proof distilled spirits (100 calories)
  - Check blood glucose for next 24 hours



## Blood Sugar Management: Hypo- and Hyperglycemia

- Hypoglycemia: Low blood sugar
  - Sometimes referred to as an “insulin reaction”, hypoglycemia occurs more frequently in people with diabetes who take insulin
  - Typical hypoglycemic threshold: 70 mg/dl (3.9 mmol/l)
  - Commonly caused by certain oral medications, missed meals, and exercise without proper precautions

## Hypoglycemia (Cont...)

- Symptoms may include erratic heartbeat, sweating, dizziness, confusion, unexplained fatigue, shakiness, hunger, and potential loss of consciousness
- Once recognized, treat immediately with a fast-acting carbohydrate, such as glucose tablets or juice



## Hypoglycemia Treatment

- Check blood glucose right away
- If you can't check, treat anyway
- Eat 3-4 glucose tablets or 3-5 hard candies you can chew quickly (such as peppermints) or 4 oz fruit juice or ½ can regular soda
- Check blood glucose again after 15 minutes
- If still low, treat again
- If symptoms don't stop, call your healthcare provider

## Hyperglycemia

- **Hyperglycemia: High blood sugar**
  - May lead to 1 of 2 conditions:
  - **Diabetic ketoacidosis (DKA)**
    - More common in Type 1 diabetes
  - **Hyperglycemic hyperosmolar nonketotic syndrom** (HHNS or hyperglycemic hyperosmolar nonketotic coma)
    - Known as a **Diabetic coma**
    - More common in Type 2 diabetes

## Prevention of Hyperglycemic Conditions

- Check blood glucose levels regularly
- Eat regular meals at consistent times
- Take extra care of yourself particularly when you are sick, and check blood glucose levels every 4 hours
- If blood glucose over 250 mg/dl check for ketones
- Call healthcare provider if moderate to large amounts of ketones



## Blood Sugar Management

- Maintaining blood glucose levels through proper dietary changes, exercise and/or medication and insulin therapy is essential for effective diabetes control.
- Avoiding fluctuations of high and low blood sugar levels will reduce the risk of diabetes complications and improve the way you feel.
- It is important to test blood glucose levels frequently each day and get regular A1c tests from your health care provider to make sure that your blood glucose levels are in target range.

## What Numbers Should You Be Looking For?

- **The American Association of Clinical Endocrinologists (AACE) recommends the following general blood glucose testing goals for adults with type 1 and type 2 diabetes:**
  - Preprandial (fasting, or before a meal): <110 mg/dl (6.1 mmol/l)
  - Two hours postprandial (after the start of a meal): <140 mg/dl (7.8 mmol/l)
  - A1c (three month blood glucose average): 6.5% or lower
- **The American Diabetes Association (ADA) suggests:**
  - Preprandial: 70-130 mg.dl (3.9-7.2 mmol/l)
  - Postprandial (1-2 hours): <180 mg/dl (<10.0 mmol/l)
  - A1c (three month blood glucose average): 7.0% or lower
- Self-testing blood glucose levels will be determined by your physician according to your individual medical history and lifestyle requirements

## Weight Management

- Excess weight is an issue for many people
- Being overweight or obese promotes insulin resistance and fat makes it harder for the body to use insulin to process blood glucose.
- Excess glucose is stored by the body as fat, making weight problems worse for people with diabetes, pre-diabetes and insulin resistance.

## Body Mass Index (BMI)

- BMI measures weight in relationship to height as an indicator of body fat.
- Adult BMI Range:
 

■ Normal:	$\leq 24.9$
■ Overweight:	25-29.9
■ Obese:	30-39.9
■ Extreme:	$\geq 40$



## BMI – Body Mass Index

- Location of pounds also make a difference.
- People who have an apple-shaped body, that carry extra weight around the waist, are at a higher risk for developing type 2 diabetes and heart disease.
- <http://www.bmi-calculator.net>
- Waist size: < 35” women
- Waist size: < 40” men



## Effective Weight Management

- The same things that are good for controlling blood sugar are also key to weight control: healthy dietary habits and regular exercise.



## Exercise

- Start your workout at a healthy blood sugar level.
- This will prevent symptoms of low blood sugar from occurring during your workout.
- To do this check your blood sugar levels before you start exercising.
- If your levels are below 100 mg/dl, then you'll want to eat some carbohydrates to bring them up to the proper level before you exercise

- If your levels are higher than 250 mg/dl, then you need to check for ketones in the urine.
- If ketones are present, you'll want to avoid exercising at that time.
- If no ketones are present, you can drink some water and proceed with moderate exercise.”

## Supplements

- Very important not to replace conventional medical therapy for diabetes/pre-diabetes without communicating with health care professional
- Diet and exercise are key, but supplements can help.
- Work with a health care professional if you'd like to try supplements
- Start with one supplement at a time and see how blood sugar improves

## Recommendations

- **Multi-vitamin/mineral for diabetics**
- **GTF (glucose tolerance factor) chromium:** This trace element plays a role in blood sugar regulation by working with insulin to help transport glucose into cells. Can take 1,000 mcg daily.
- **Alpha-lipoic acid:** An antioxidant that can enhance glucose uptake, inhibit glycosylation (the abnormal attachment of sugar to protein), and helps promote and maintain eye and nerve health. Start with 100 milligrams a day. Higher doses (600 milligrams a day) help treat and prevent diabetic neuropathy (nerve damage from impaired circulation).
- **Magnesium:** 1 in 4 people with diabetes may have low blood levels of magnesium (Archives of Internal Medicine). To help promote healthy insulin production, take 350 mg daily. (Magnesium glycinate is a good form with less of a laxative effect.) Magnesium citrate is good to help move bowels.

## Recommendations

- Vitamin D – at least 1,000 IU daily with food. Best to test blood levels first.
- Large study showed a strong inverse association between blood levels of Vitamin D and diabetes
- Lower a person's Vitamin D level, higher chance they had diabetes – check your levels!
- Vitamin D in infancy helps prevent type 1 diabetes
- Vitamin D deficiency may also play a role in development of type 2

## Supplements

- Coenzyme Q10: A powerful antioxidant that may help maintain a healthy heart. Take 60-100 milligrams of a softgel form with your largest meal.
- Cinnamon: 1 tsp in food or 500 mg Ceylon cinnamon in capsule form twice daily.
- Glucomannan - fiber



- Two main varieties of cinnamon, which come from different plants
- Ceylon cinnamon, referred to as true cinnamon, and Cassia cinnamon, which is lower in cost.
- Cassia is typically what you see in supplements/spice jars
- Both types of cinnamon have shown blood sugar lowering and lipid lowering benefits in studies.
- However, Ceylon cinnamon is much safer when you get into larger doses, such as above 1,000 mg daily
- Coumarin, a blood thinning agent, naturally occurs in much higher amounts in Cassia than in Ceylon cinnamon.
- Coumarin not only could cause excess bleeding in someone on blood thinning therapy, but in very high doses, coumarin can also have toxic effects on the liver and kidneys."

## Vinegar/Sour Dough Bread

- When lactic acid is added to sourdough bread, it does two things: changes the flavor so that you get that tangy, delicious bite of sourdough and mediates the glycemic impact of all that white wheat flour.
- Lactic acid isn't the only one that helps keep blood sugar in check. The acetic acid in vinegar and the citric acid in lemons and limes has the same effect.)

## Summary

- Good nutrition is one of the keys to managing Type 2 Diabetes, Pre-diabetes and Insulin Resistance
- Nutrition guidelines focus on controlling carbohydrate and fat intake
- Weight management and exercise are also key
- Seek help to set and reach your nutrition and exercise goals

## Summary

- Talk to your doctor, dietitian, diabetes educator about which changes are most important for you
- Start slowly by changing your habits one at a time for a lifestyle program you can live with
- Seek support from your dietitian and/or diabetes support team

## Resources

- American Diabetes Association  
[www.diabetes.org](http://www.diabetes.org)
- Joslin Diabetes Center [www.joslin.org](http://www.joslin.org)
- National Diabetes Information Clearinghouse  
[www.diabetes.niddk.nih.gov](http://www.diabetes.niddk.nih.gov)
- Calorieking.com
- Dwlz.com (Restaurants)
- <http://www.changingdiabetes-us.com/>

## Resource Books

- *American Diabetes Association Complete Guide to Diabetes*
- *Diabetes for Dummies*
- *The All-Natural Diabetes Cookbook* by Jackie Newgent, RD
- *The Mediterranean Diabetes Cookbook* by Amy Riolo
- *Magic Menus* – American Diabetes Assoc.
- *The New Glucose Revolution* by Jeannie Brand-Miller, PhD

## Remember

- Type 2 Diabetes, Pre-diabetes and Insulin Resistance are mainly diseases of “lifestyle.”
- You can prevent many of the problems through diet, exercise and stress reduction
- Take care of yourself – you’re worth it!!!

